APPENDIX H

RESPONSES TO REGULATORY COMMENTS

RESPONSES TO COMMENTS

Environmental Restoration Program
First Five-Year Review Report
Operable Unit 6
Edwards Air Force Base, California
Draft Final, June 2011

Reviewer	Comment #	Comment	Response
Joe Healy (EPA)	General Comment 1	The report does not clearly indicate which specific media risk pathways you are addressing as ROD requirements for which types of receptors. Unfortunately, the RAOs are too general, on their own, to help the reader determine the answers to these important questions. At the time of the FFA party discussions on your annotated outline of the Five Year Review Report, I strongly recommended that you provide the answers within the context of the risk pathway flow charts you have used in the past. Although you included more information in these flow charts (i.e., Figures 7-1,7-2, and 7-3) for Section 7.2 of the Report, neither the figures themselves or the accompanying text of Section 7.2 provide a clearly definitive indication of what you are addressing as ROD requirements. The following points illustrate some of the problems this lack of clarity can create.	Comment noted. Section 4.1 has been revised to include the following clarification regarding exposure pathways addressed by the RAOs: “The exposure pathways that need to be prevented and/or minimized are groundwater ingestion and dermal contact, and inhalation of groundwater vapors. Though the inhalation pathway includes direct inhalation of vapors from groundwater and indirect inhalation within buildings through the vapor inhalation pathway (VIP), the selected remedy was designed to be protective of direct inhalation only as the risk assessment showed no unacceptable VIP risk requiring action (this is further discussed in Section 7.2.4).” Section 7.2 and associated figures have been revised per comments listed below.
Joe Healy (EPA)	General Comment 2	For example, Section 4.1.1 mentions that you have a LUC "to restrict residential development where contamination is at levels that do not allow for unlimited use and unrestricted exposure, and to maintain worker safety." However, the Section 7.2 figures do not show an exposure route for potential future residential receptors. Thus, the reader cannot determine which specific pathways for potential future residents your	Future “Residential/Sensitive Use” human receptors has been added to Figures 7-1, 7-2, and 7-3.

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		remedy implementation is required to address with LUCs. This, in turn, begs the question of whether MCLs in groundwater are intended as a protective level for the vapor intrusion pathway with a hypothetical future residential or sensitive use scenario.	
Joe Healy (EPA)	General Comment 3	A way to clearly resolve this problem, and others like it (see my specific comments), would be to show all receptor types in the figures and shade the individual boxes of only those receptor pathways for which the ROD does not require a response action. A footnote to the figure could state the meaning of the shading versus a cell without a shaded background. "Risk Mgt. Decision/RA" footnotes would further clarify the un-shaded receptor cells, for which the ROD is required to address, and for which the Five Year Review must determine the protectiveness status.	Both gray shading and yellow highlighting have been added to Figures 7-1, 7-2, and 7-3. The gray shading indicates "…pathways not retained either because pathway does not exist or risks are within acceptable limits." The yellow highlights "…indicate pathway retained for a CERCLA response" A "Risk Mgt. Decisions/RA" column has been added for the "Human Receptor" with notes detailing risk management decisions, whether the exposure pathway is being addressed by the RA, or if the exposure pathway is under review during the next five-year review period.
Joe Healy (EPA)	General Comment 4	By this simple clarification technique (i.e., shading), the reader could quickly see whether potential future residents are protected from exposure to groundwater contaminants as a voluntary by-product of the clear ROD requirement to protect industrial and construction workers or as a separate ROD requirement specifically for future residents. **Please call me as soon as possible to discuss the best ways to resolve the general problems illustrated by the above examples.**	Comment noted and the suggested clarification techniques have been used to modify Figures 7-1 through 7-3.
Joe Healy	General	Related to my General Comment A, but opposite in	

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(EPA)	Comment 5	nature to the problems of a lack of clarity in describing which specific media risk pathways you are addressing as ROD requirements, this comment addresses a different potential confusion from your attempt to improve the risk pathway flow charts you have used in the past. Figures 7-1 and 7-2 clearly might indicate that you believe the ROD requires you to address potential future construction workers from exposure to surface water and stormwater runoff for several exposure routes. However, the RAOs are only concerned with groundwater contamination. Furthermore, the ROD determined that no further action was needed for soils. The supporting text for these two figures does not specify that you discovered new levels of contamination in drainage areas and dilution pits that would necessitate protection by additional cleanup or by extending the objectives of existing LUCs (e.g., media concentration levels that would result in the contamination of stormwater that comes in contact with the newly discovered contamination). In fact, the supporting text maintains that the soils are still no longer of concern. If this is the case, it would be inappropriate to indicate that ROD required LUCs are addressing human exposure to surface water and stormwater. Instead, I strongly recommend that you use shading for these pathways to indicate that they were screened out of the CERCLA	Soil, stormwater runoff, and surface water exposure pathways in Figures 7-1, 7-2, and 7-3 have been shaded to indicate the pathways are no longer a CERCLA concern. Footnotes for Risk Mgt. Decisions/RA for the soil pathways have been added.

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		response program (i.e., there are no ROD requirements for a response even though the Air Force might currently have LUCs in place that positively benefit potential human receptors to these already CERCLA-safe media exposures). **Please call me as soon as possible if you think I am misunderstanding Section 7.2 for surface water and stormwater runoff.**	
Joe Healy (EPA)	Specific Comment 1	Page 4-1, Section 4.1, Remedy Selection. This section is confusing when the reader tries to use it in conjunction with Section 7. We need to know what the ROD required you to do (RAOs and Remedy Components) under CERCLA and whether your implementation of these requirements is still protective for each of the media, pathways, and receptors that remain of concern under CERCLA. In particular, it is not clear whether and how the vapor intrusion pathway is considered as "inhalation of groundwater vapors." It is also not clear whether you are required to be concerned about human receptors under a potential future residential or sensitive use scenario. I think you could easily clear up this confusion by specifying the key objectives of the various LUCs. For example, is one of the official objectives of the specific LUC that prohibits residential development, the prevention of human exposure to the vapor intrusion pathway under a hypothetical future residential or	Section 4.1 has been revised to include the following clarification regarding VIP and inhalation of groundwater vapors as addressed by the RAOs: "The exposure pathways that need to be prevented and/or minimized are groundwater ingestion and dermal contact, and inhalation of groundwater vapors. Though the inhalation pathway includes direct inhalation of vapors from groundwater and indirect inhalation within buildings through the vapor inhalation pathway (VIP), the selected remedy was designed to be protective of direct inhalation only as the risk assessment showed no unacceptable VIP risk requiring action (this is further discussed in Section 7.2.4)." Additionally Section 4.1.1 has been revised to include the following clarification regarding specific LUC objectives:

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		sensitive use scenario? Or is that LUC only concerned with a hypothetical future drinking water well?	"The RA includes LUC implementation during remediation of contaminated groundwater to restrict residential development (including child development centers, kindergarten through 12th grade schools, play areas, and hospitals) where contamination is at levels that do not allow for unlimited use and unrestricted exposure, and to maintain worker safety. Once cleanup levels for groundwater are achieved and indicate that the site is available for unlimited use and unrestricted exposure, LUCs will no longer be maintained, monitored, reported, or enforced. LUCs involving restrictions on residential use were developed to prevent and/or minimize ingestion and dermal contact with groundwater, and direct inhalation of groundwater vapors. LUCs were not specified for the indirect inhalation of groundwater vapors through the VIP into buildings because the risk assessment showed no unacceptable VIP risk for the current industrial use and the residential scenario was not evaluated. The VIP is further discussed in Section 7.2.4."
Joe Healy (EPA)	Specific Comment 2	Page 4-1, Section 4.1, Remedy Selection. Similar to the preceding comment about Section 4.1, the LUCs associated with groundwater inhalation in Figures 7-1 and 7-2 appear to only address current industrial and potential future construction activities. If the LUCs are based on areas of groundwater contamination that exceed MCLs, are these LUC compliance levels also protective	Please see response to Specific Comment 1. Additionally, Figures 7-1, 7-2, and 7-3 have been revised to include the following note: "In 2006 when the Record of Decision was signed documenting the CERCLA response (RA), the inhalation pathway of concern did not include VIP. However, due to

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		for the hypothetical future residential or sensitive use scenario, which is not indicated in the Figures? Between Section 4 and 7, you do not clearly indicate whether you are required under the CERCLA ROD to protect humans for the vapor intrusion pathway under a hypothetical future residential or sensitive use scenario. Revise both sections so that it is clear and consistent in each section.	changing toxicity criteria and risk assessment methodologies (see Sections 7.2.3 and 7.2.4), the reassessment of the VIP to verify protectiveness is included as a recommendation (Section 9.0)"
Joe Healy (EPA)	Specific Comment 3	Page 7-4, Section 7.2.1, Changes in Standards. Did the ROD specifically determine that MCLs in the shallowest groundwater would still be protective for the VIP for the potential future residential scenario? If so, would this need to be reconsidered in light of more recent changes in the approach taken to assessing risk for the VIP?	Section 3.2 indicates that the projected land use for this OU is industrial and that no residential use is proposed or anticipated according to the current General Plan. As a result, potential risks via the VIP for the residential exposure scenario were not determined, and thus remediation goals for this pathway were not established in the ROD. Figure 7-3 indicates "Yes" for future Residential Inhalation VIP and the VIP will need to be reconsidered in the next OU6 5-year review.
Joe Healy (EPA)	Specific Comment 4	Page 7-4, Section 7.2.1, Changes in Standards. Did the ROD specifically determine that MCLs in the shallowest groundwater would still be protective for the VIP for the potential future industrial site workers inside buildings (e.g., office workers)? If so, would this need to be reconsidered in light of more recent changes in the approach taken to assessing risk for the VIP?	The ROD did not consider whether the MCLs would be protective of the VIP. The five-year review discusses the VIP in Section 7.2.4. This discussion shows that the VIP pathway was not assessed for two sites (Sites N4 and N14) because no buildings were present, and thus the potential exposure pathway was incomplete. The VIP for the remaining four sites were evaluated, and the discussion in the five-year review indicates that the results were all within or below the risk management levels and that these results would likely not change if re-assessed using current VIP

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			investigation methodologies. Although VOC concentrations in soil vapor have not been measured in the past 5 years, it is reasonable to conclude that since groundwater is the source of the VOCs in the soil vapor, and groundwater VOC levels have generally decreased since the risk assessment was conducted in 2002/2003, that VIP risks have also decreased from those reported in the ROD. Since these risk levels were acceptable when the groundwater VOCs were present at levels over their MCLs, it is reasonable to conclude that they will remain acceptable when VOCs in groundwater are present at their respective MCLs. In addition, Section 7.2.2 indicates that since routine building office use is planned to be relocated to areas outside current and anticipated plume boundaries, the VIP pathway is likely to be incomplete into the foreseeable future; however, the VIP will need to be reconsidered in the next OU6 5-year review
Joe Healy (EPA)	Specific Comment 5	Page 7-5, Section 7.2.2, "office activity will be relocated". I understand that a ROD required LUC prohibits residential development within the LUC compliance zone (e.g., above impacted groundwater).	The last two sentences of the referenced paragraph have been modified as follows to indicate that items discussed in the Edwards Air Force Base General Plan and National Aeronautics and Space Administration, Dryden Flight

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		However that does not necessarily mean office workers are prohibited. I don't think the ROD required a LUC for this. Please clarify in the top paragraph on this page, whether the items described in the General Plan and the NASA DFRC MP are also specific ROD requirements. If they are not, are you implying that maybe they need to be ROD required LUCs for sufficient protectiveness?	Research Center Master Plan are not ROD requirements: "Though not a ROD requirement, the current GP (Edwards AFB, 2009) continues to indicate that OU6 will be used for industrial purposes and the NASA DFRC MP (Development One, 2009) indicates that office activity will be relocated to areas outside the portions of OU6 where groundwater is impacted or anticipated to be impacted in the future." This idea will be reinforced in the paragraph following the paragraph referenced above as follows: "Conditions at the sites addressed in the OU6 ROD are essentially unchanged since the signing of the ROD, and no change is anticipated. The proposed relocation of office activity to areas outside the groundwater plume are expected to reduce the potential exposure to site-related chemicals, but are not a ROD requirement and will not significantly change exposure pathways for either human or ecological receptors."
Joe Healy (EPA)	Specific Comment 6	Page 7-5, Section 7.2.2, "office activity will be relocated". An activity that is sometimes associated with office work is a day care facility. At one time, NASA had a day care facility potentially threatened by the neighboring Site 25 plume. A day care facility is a	ROD Sections 2.6 and 2.12.2.1 note that sensitive use facilities (day care centers, kindergarten through 12th grade schools, play areas, and hospitals) are included in residential development restrictions. No modification to the ROD land use control (LUC) requirements is necessary.

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		sensitive use. You have a LUC prohibiting residential development. Does that LUC also specifically include sensitive uses? Is this something that might need to be made a ROD LUC requirement?	
Joe Healy (EPA)	Specific Comment 7	Page 7-5, Section 7.2.2, Changes in Exposure Pathways, 3rd paragraph. You state that Figures 7-1, 7-2, and 7-3 are revised versions of those presented in the ROD so that you could point out some pathways that no longer exist due to changes in facility use. You seem to either have a typo or need to provide additional explanations as to why you are indicating that the ROD requires response actions for stormwater runoff and surface water. In the very next sentence you state that some of these changes involved removal actions prior to the FS and ROD, which should have eliminated these pathways entirely. However, you indicate that the ROD is still addressing them, but you have no RAOs in the ROD that specify these media as the objects of remedial actions. This is very confusing. I think it would be best cleared up by re-writing this paragraph and then using dashed arrows for these two media pathways. You would then need to remove the footnote 3 under Risk Management Decisions column in Tables 7-1 and 7-2 for the surface water and stormwater pathways.	Tanks, drum storage/dispensing areas, and auxiliary propulsion unit dilution pits were removed prior to the Feasibility Study, ROD, and remedial action implementation. Pathways for surface water and stormwater runoff at Sites N2 and N3 have been changed to "Pathway no longer exists due to a previous Air Force construction project" (dashed lines) and the Future Construction Worker scenario has been changed to "Incomplete, not applicable because pathway no longer exists". We believe that reference to Tables 7-1 and 7-2 in the comment is meant for Figures 7-1 and 7-2. The Risk Mgt. Decisions/RA footnotes have been deleted to reflect that the sources were removed prior to the ROD. The second sentence of the paragraph has been modified as follows: "These figures have been updated from those presented in the ROD and include footnotes for complete and potentially complete pathways to explain either why they are not being

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			addressed as part of the RA because of risk management decisions or indicate the remedial actions that have been implemented in accordance with the ROD."
Joe Healy (EPA)	Specific Comment 8	Page 7-5, Section 7.2.2, Changes in Exposure Pathways, 3rd paragraph. You state that the removal of tanks, drum storage/dispensing areas, and APU dilution pits occurred before the ROD, and thus did not occur within the [five year] review period. I don't understand how that is relevant. The pathways emanating from these removed sources were eliminated prior to the ROD and thus should never have been part of the ROD. In fact I do not see any evidence that they are part of the RAOs or the Selected Remedy components in the ROD. Thus, why do you seem to indicate that they need to be reviewed?	Please see response to Specific Comment 7.
Joe Healy (EPA)	Specific Comment 9	Pages 7-6 and 7-7, Figures 7-1 and 7-2, Groundwater Inhalation pathway. It seems like you should distinguish between direct inhalation of the exposed groundwater (e.g., to future construction workers) and the potential for VIP for potential future buildings or confined spaces by using two separate lines. If you added a line for VIP you could indicate that there are no complete pathways for current industrial (due to no buildings above high concentration areas?), but that there could be for potential future buildings located above high concentration areas. Thus, you would also need to add	As suggested, the inhalation pathway has been divided into "Inhalation – Direct" and "Inhalation – VIP" and "Future Industrial Human receptors" have been added. As noted in the response to General Comment 2, future residential/sensitive use receptors have also been added to the exposure pathway figures.

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		another column titled "Future Industrial." In addition, EPA thinks you definitely need a "Future Residential/Sensitive Uses" column. By adding these columns and the distinguishing VIP line, you will provide a much clearer justification for why you are planning to further evaluate the VIP during the next five years.	
Joe Healy (EPA)	Specific Comment 10	Page 7-9, Section 7.2.3, Changes in Toxicity, 1st paragraph. In addition to the normal groundwater drinking pathways, you are using MCLs for a risk-based pathway that culminates at the surface indoors or in confined spaces. MCLs need to be validated as appropriate risk-based standards for the VIP. I think other OUs use the exposure point concentration standard of concern to indoor residential and then back-calculate through running J&E model backwards to arrive at an equivalent risk based groundwater concentration. You probably need to consider doing this exercise to be sure that such a groundwater concentration is not lower than the MCL, which is the currently stated compliance action level for VIP. You need to establish whether appropriate toxicity values for the VIP still support the use of the MCL as the groundwater standard that would be safe for the indoor air receptors of concern.	Although VOC concentrations in soil vapor have not been measured in the past 5 years, it is reasonable to conclude that since groundwater is the source of the VOCs in the soil vapor, and groundwater VOC levels have generally decreased since the risk assessment was conducted in 2002/2003, that VIP risks have also decreased from those reported in the ROD. Since these risk levels were acceptable when the groundwater VOCs were present at concentrations over their MCLs, it is reasonable to conclude they will remain acceptable when VOCs in groundwater are present at their respective MCLs. The five-year review has been revised as discussed in the 20 July 2011 RPM meeting, to include information on which buildings are routinely occupied. This information has been used to determine whether the VIP is complete at any of the sites in question, and help indicate whether additional information is necessary to update the VIP risk assessment or to determine if subsurface VOCs pose an imminent risk to workers via the VIP.

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Joe Healy (EPA)	Specific Comment 11	Page 7-11, Section 7.2.4, Changes in Risk Assessment Methods. How will you re-evaluate Sites N2, N3, and N7 for potential future buildings and for confined spaces under both residential and industrial scenarios? Wouldn't you need to rely on groundwater data for areas without current structures as you did for the 2007 South AFRL ROD?	As discussed in the 20 July 2011 RPM meeting, the five-year review has been revised to include information on which buildings are routinely occupied. This information has been used to determine whether the VIP is complete at any of the sites in question, and help indicate whether additional information is necessary to update the VIP risk assessment or to determine if subsurface VOCs pose an imminent risk to workers via the VIP. It should be noted that the VIP assessment will focus only on the industrial scenario since residential development is not anticipated at OU6.
Joe Healy (EPA)	Specific Comment 12	Page 7-11, Section 7.2.4, 3rd paragraph. You state that "While the use of groundwater data is acceptable, under current guidance groundwater data should only be considered when SV data cannot be collected and only for initial screening purposes." Because of this, are you considering changing the LUC compliance standards (i.e., the concentrations at which you could remove the LUCs for a particular pathway and receptor of concern) from groundwater MCLs to SV levels? This topic needs much more discussion in this report and will likely need to be added as a topic for further discussion and evaluation during the next five year review period.	Section 9.0 includes a recommendation to evaluate the updated VIP guidance as they relate to site conditions. This evaluation may lead to a field investigation to collect soil vapor data, which in turn would be used to evaluate VIP risk. The recalculated VIP risk using soil vapor data would be used to determine whether or not the LUC compliance standards need to be modified to include risk-based levels for VIP in addition to MCLs.
Joe Healy	Specific	Page 7-12, Section 7.2.4, last sentence. Because of the	Concern regarding the issue is expressed in Table 9.1 in the

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(EPA)	Comment 13	uncertainty you express in this section and indicate in the current final sentence, I think you need to add a conclusion that you are definitely concerned about future residential and sensitive uses for the vapor intrusion pathway. Thus, add "Future Residential" as a column next to "Current Industrial" in your Figures 7-1, 7-2, and 7-3.	section for Recommendations and Follow-Up Actions, which presents the issue of changes in VIP risk assessment methodology and proposes an evaluation of the updated VIP guidance methodologies as they relate to site conditions. As noted in the response to General Comment 2, future residential/sensitive use receptors will also be added to the exposure pathway figures. No changes will be made to Section 7.2.4.
Joe Healy (EPA)	Specific Comment 14	Page 7-13, Section 7.4, Summary of Technical Assessment, 3rd paragraph. State how the lack of soil vapor data near buildings might affect the protectiveness of the remedy. Presumably, you would include some discussion as to whether the MCL concentration in groundwater is protective as a LUC compliance level based on possible validation of the J&E modeling assumptions about the concentrations of VOCs in soil vapor that might arise near the foundation of buildings and that could subsequently find its way indoors.	Please see responses to Specific Comments 10 and 11, which indicate that the five-year review has been revised to include information on which buildings are routinely occupied. This information has been used to determine whether the VIP is complete at any of the sites in question, and help indicate whether additional information, such as collecting current soil vapor data, is necessary to update the VIP risk assessment or to determine if subsurface VOCs pose an imminent risk to workers via the VIP.
Joe Healy (EPA)	Specific Comment 15	Page 8-1, Section 8.2, Leading Edge Data Gap, last sentence. Change the second half of the sentence to now read " and the plume migrates significantly towards the groundwater subbasin, future protectiveness would be threatened." The ROD'S selected remedy section has specific language that defines what would represent a significant threat such that the plume migration would no longer be sufficiently protective. This would definitely	The referenced sentence has been revised as follows to address comments by several reviewers: “If ISCO treatment is unsuccessful in reducing TCE concentrations at Site N4 and if the recommended Site N1 and Site N4 characterization indicates that the plume is migrating significantly towards the groundwater subbasin, future protectiveness could be threatened as the subbasin

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		occur prior to the plume actually reaching the subbasin, a point at which the remedy would have lost its protectiveness and actually would represent remedy failure. Instead, the ROD specifically requires the inclusion of a contingency plan in the event that the plume migrates significantly towards the subbasin, but long before it actually reaches the subbasin.	contains drinking water supply wells." In the event that future protectiveness is threatened, the remedy would be evaluated and modified, as necessary, to remain protective.
Joe Healy (EPA)	Specific Comment 16	Page 9-1, Table 9-1, Recommendations and Follow-up Actions. Unless you have clear evidence that that the volume of ISCO injection fluids are not contributing to the migration of the plume (e.g., via preferential pathways that might cause the leading edge downgradient to have moved since 2006), you should add this as an issue that needs to be resolved during the next five years by a more careful evaluation of the possibility.	Table 9-1 has been revised to include the following for "Remedy operation and maintenance": "Update LUC boundary in the GIS as necessary. Continue adherence to review and approval procedures for construction and ground-disturbing activities. Perform well maintenance including well completion repairs and well labeling with identification tags. Continue ISCO in the areas of highest VOC concentrations at Sites N3, N4, and N7 and groundwater monitoring for NDMA, metals (including total and hexavalent chromium), and VOCs are recommended. Conduct tracer testing with ISCO injections."
Joe Healy (EPA)	Specific Comment 17	Page 9-1, Table 9-1, Plume Delineation Data Gap. You state that additional ISCO treatment may be required at the leading edge. I don't recall seeing a more detailed explanation of why this remedy component would be activated in a dilute area of the plume. I believe ISCO was only to be applied to high concentration areas. Are you expecting the possibility of finding some additional	Section 4.2.3 has been revised to explain the rationale for implementing ISCO at Site N4. "The RAWP (Earth Tech, 2008) provided details regarding the injection events to be performed following the signing of the ROD as part of Phase II of the RA. Injection wells for Phase II Injection Event I (March 2005) were selected

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		high concentration areas? If not, what would be the basis for implementing ISCO in a low concentration area since the remedy allows for natural attenuation and recognizes that some plume migration could occur before the amount of migration would become a significant enough threat to the sub-basin as to no longer be considered sufficiently protective.	based upon historical laboratory analytical results for samples collected from wells located in areas of highest TCE concentrations at Sites N3 and N7. Injection well selection for subsequent events was based on the following criteria: ▪ injection wells utilized during the previous injection event where TCE concentrations above 5 μg/L are present in groundwater ▪ any wells where TCE concentrations above 300 μg/L are present in groundwater The second criterion of targeting locations with TCE concentrations above 300 μg/L resulted in a modification to the ISCO implementation as envisioned in the ROD. As shown on Figure 4-1, the ISCO component of the RA selected in the ROD was to be implemented at Sites N3 and N7, which represented the highest concentration areas of the commingled chlorinated hydrocarbon plume. The RAWP further defined the high concentration areas as areas with TCE concentrations above 300 μg/L. At the time Phase II Injection Event I (March 2008) was implemented, TCE concentrations above 300 μg/L were limited to the Sites N3 and N7 areas. However, prior to Phase II Injection Event II (August 2010), TCE concentrations exceeding 300 μg/L were detected in the Site N4 area and therefore the ISCO component of the RA was implemented

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			at Site N4 in addition to Sites N3 and N7 during the August 2010 injection event (Figure 4-1)"
Joe Healy (EPA)	Specific Comment 18	Page 9-2, Table 9-2, Summary of Anticipated Remedial Action Activities. Contrary to the statement on page 9-1 about document submittals for the next five years, this table does not provide estimated target dates for the actual report on the activities. For example, it appears that a VIP evaluation will occur between September 2011 and August 2012. It is not at all clear what date during or after this time period will be the estimated target date for the regulators to see a draft report and then for the report to go final. Add a Gantt Chart figure that shows the estimated dates and durations of these activities and their reports. Show crucial linkages, if any. Discuss the necessary sequence of events that you anticipate for the support of the next Five Year Review Report (e.g., some key supporting monitoring or evaluation reports would likely need to be completed prior to the submittal of the Five Year Review report for regulatory review).	As agreed to during the 20 July 2011 technical RPM meeting, Table 9-2 has been revised to include "Projected Document Submittal Dates". The dates are provided in quarter and calendar year format.
Joe Healy (EPA)	Specific Comment 19	Page 9-2, Table 9-2, Summary of Anticipated Remedial Action Activities. In the text on page 9-1 or in expanded footnotes for Table 9-2, add a clear commitment to evaluate the monitoring data that you will be periodically collecting. Typical evaluations of data would include a Discussion of the Results (i.e., what do they mean in	As part of the 5-year review process, the Air Force will evaluate monitoring data as appropriate; however, the AF does not agree to include a "commitment clarification".

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		terms of remedy progress and plume stability), *Conclusions*, and Next Steps (e.g., any recommendations for modifications to the sampling program). For example, TechLaw has noted a potential problem and commented on the possibility that the injection fluids for ISCO might be pushing the plume downgradient and contributing to some of the observed plume instability. Such a topic should be part of the discussion of results and progress of the remedy. If this, in fact, is found to be occurring, your periodic reports should be making recommendations that let the readers know what adjustments to the remedy operations you are considering. By doing this level of evaluation in your periodic reports, you will be much better prepared to summarize the cumulative progress in the next Five Year Review Report. I think you must include this commitment clarification as a noted follow-up action in Section 9 of this current Five Year Review Report.	
Joe Healy (EPA)	Specific Comment 20	Page 9-2, Table 9-2, Summary of Anticipated Remedial Action Activities. You need to clearly point out where you will present sampling and analysis plan information. I strongly suggest that you issue addenda to the RAWP, which normally includes O&M Plans. I believe this is a functional expectation of the FFA. It would be an ideal document location for you to present an updated schedule once you build your plans based on budgets and	An RAWP addenda will be added to Table 92.

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		contracting. Thus, this Five Year Review Report would provide an estimated schedule for activities and documents, and then the actual addenda or new O&M Plan for the next five years would present the actual planned schedule.	
Joe Healy (EPA)	Specific Comment 20	Appendix D, Interview Report. The interviews are inadequate in terms of scope (constellations of types of site personnel and other representatives that should be included in the interviews) and content (questions do not discuss conceptual site model nor evaluate the remedy relative to protectiveness). Nor is the content of the interviews summarized in the text as required by the EPA guidance. Interviewees should include the Air Force Project Manager, at least one representative from each of the Regulatory Agencies, and members of the public. An example interview form is attached to these comments (See Section 3.0 "Components of a Five Year Review Process" and Appendix C, "Five-Year Review Interviews.").	Supplemental interviews were conducted with Mr. Dan Morgan (NASA DFRC Environmental Manager), Mr. Phil Saxton (Operation and Maintenance Site Manager), Mr. Joseph Healy (USEPA RPM), Mr. Kevin Depies (California DTSC RPM), Mr. John Steude (CRWQCB RPM), and Mr. Stephen Watts (Edwards AFB GIS manager) during the July-August 2011 time period. The example interview form referenced in the comment was utilized during the supplemental interviews. Section 6.6 has been updated to include an interview summary.
Karla Brasaemle (Techlaw, Inc., EPA contractor)	General Comment 1	The information presented in the text, tables, and figures of the Draft Final First Five-Year Review Report, OU6, NASA DFRC, Edwards Air Force Base, California, dated June 2011 (Five-Year Review) is not consistent. For example, a. Lines 24-26 on Page 4-5 indicate that injection was completed at 12 wells as part of the pre-Record of	a. Section 4.0 text and Tables 4-1 and 4-2 have been reviewed and revised to ensure that the number of injection wells used during each injection event have been accurately and consistently reported. b. The reference text has been revised as follows: "The greatest increases in TCE concentrations were

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		Decision (ROD) injection event. Similarly, Section 4.3.2.1 (Phase I Injection Event) indicates that injection was completed at 12 wells. However, Table 4-1 (Summary of Remedial Action Activities) indicates that injection was completed at 13 wells as part of the pre-ROD injection event. b. Lines 3-6 on Page 6-7 state that, "A comparison of TCE results from the 2008 to 2010 monitoring events indicated an increase in TCE concentrations at wells N3-MW07, N3-MW12, N3-MW15, N3-MW21, N7-MW10, and N7-MWl1, and therefore these wells were selected for injection during Injection Event II." However, Table 6-7 (TCE Concentration Variations) indicates an increase in TCE concentrations at wells N3-MW03, N3-MW12, N3-MW16, N3-MW21, N3-NW03, N4-MW06, N7-DEW01, N7-MW02, N7-MW03, N7-MW04, N7-MWl0, N7-MW11, N7-MW 15, and N7-MW16. Please revise the Five-Year Review to clarify why the increases in TCE concentrations at wells N3-MW03, N3-MWl6, N3-NW03, N4-MW06, M7-DEW01, N7-MW02, N7-MW03, N7-MW04, N7-MW15, and N7-MW16 are not discussed in Section 6-7 and clarify why injections during Injection Event II did not occur at these wells.	observed at wells N3-MW15 and N3-MW21 and therefore, these wells were among the wells selected for injection during Phase II Injection Event II (August 2010). Results from the 2008 and 2010 monitoring events showed continued increase in TCE concentrations at well N4-MW06 (Figure 6-2), which indicates possible plume instability in the vicinity of this well. Wells N4-MW07, N4-MW08, and N4-MW09 were selected for injection during Phase II Injection Event II to address increasing TCE concentrations near well N4-MW06. Post-injection sampling results for Phase II Injection Event II were not available within this five-year review period." c. Figures 7-1 to 7-3 have been revised to clearly indicate which exposure pathways are being addressed by the remedy. The document has been revised to consistently present that complete exposure pathways are controlled through institutional controls that are preventing exposure to, and the ingestion of, contaminated groundwater.

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		c. Lines 8-10 on Page 7-13 state that, "No complete pathways to potential human receptors were identified and no ecological targets were identified during the previous risk assessments. No new pathways or receptors were identified during the five-year review and no weather-related events have affected the protectiveness of the remedy." Similarly, Lines 15-16 on Page 8-1 states that no exposure pathways exist. However, Figures 7-1 (Site N2 - Exposure Pathways) and 7-3 (Site N7 - Exposure Pathways) show complete pathways for the current industrial worker exposure route for groundwater inhalation. Please revise the Five-Year Review to ensure information is consistently presented.	
Karla Brasaemle (Techlaw, Inc., EPA contractor)	General Comment 2	Page 6-7 indicates that performance monitoring results associated with the Phase II - Injection Event II (i.e., June-July 2010) were not available within this review period; however, Table 6-3 includes TCE Concentrations from several wells sampled during the June-July 2010 performance monitoring event. As such, it is unclear if the information presented in the Five-Year Review is up-to-date. For example, it is unclear if the land use control (LUC) boundary, presented in Figure 4-1 (Land Control Boundary), represents the 5-μg/L	Please note, Phase II Injection Event II occurred in August 2010 not June-July 2010. Post-injection sampling results for Phase II Injection Event II were not available within this five-year review period Figure 4-1 (now Figure 4-2 due to document reorganization) includes the LUC boundary based on the June-July 2010 monitoring results. The following note has been added to the figure: "Land use control boundary based on 2010 contaminant concentrations"

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		isoconcentration contour from the June-July 2010 monitoring event. Please ensure that the final Five-Year Review includes information from reports that are submitted in late 2010/early 2011.	
Karla Brasaemle (Techlaw, Inc., EPA contractor)	General Comment 3	The excavations that occurred within and outside the LUC boundaries are not discussed with sufficient detail. Lines 25-26 of Page 7-1 indicate that eight digging activities were conducted outside the LUC boundaries and one digging activity was within the LUC boundaries; however, further details are not provided. For example, the locations of the excavations relative to the LUC boundaries and plumes, the purpose/objectives for each of the excavations, and the dimensions of the excavations are unclear. Further, it is unclear if the excavations impacted the RAs at OU6. Please revise the Five-Year Review to provide sufficient detail regarding the excavations at OU6. In addition, please revise the Five-Year Review to include the locations of the excavations on a figure which includes the plume extent. Additionally, please clarify if the excavations have impacted or will impact the RAs at OU6	Section 6.4.1 has been added to the document and includes Table 6-2 which indicates whether excavations are within the LUC boundary, the purpose/objectives for each of the excavations, and the excavation depths. Section 6.4.1 includes the following discussion regarding digging activities: "As discussed in Section 4.3.1, the LUC boundary is revised in the GIS as necessary based on the most-recent, vetted, and available sampling results. The LUC boundary was most-recently revised to coincide with the 5-µg/L TCE and 1-µg/L benzene isoconcentration contours based on the June-July 2010 monitoring results (Figure 4-2). TCE and benzene concentrations in groundwater are used to define the LUC boundary because, based on MCL exceedances, these two plumes exhibit the largest aerial extent. The LUC boundary as defined in the ROD (Figure 4-1) was implemented during all excavations performed within this review period (the activities are presented in Table 6-2). Based on June-July 2010 monitoring results, the LUC boundary was revised and expanded to the east, encroaching upon Rogers Dry Lake (Figure 4-1). All mission-related excavations within this review period occurred on the

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			western portion of the facility where the plume footprints/LUC boundary has remained relatively constant. No mission-related excavations occurred in the eastern portion of the LUC boundary area where the expansion occurred. Because there are no utilities or buildings in the eastern portion of the plume, and since Rogers Dry Lake is considered part of the flightline, it is also unlikely that any future mission-related excavations will be performed in the LUC boundary expansion area. Remedy-related excavations did occur inside the LUC boundary expansion area, however, personal protective equipment (PPE) was employed during the efforts."
Karla Brasaemle (Techlaw, Inc., EPA contractor)	General Comment 4	Based on Figures 2- 1 (TCE Groundwater Concentration Contours - 2010) and 6-2 (Approximate Extent of TCE in Groundwater), it does not appear that the current extent of groundwater contamination at OU6 is sufficiently delineated. For example, no monitoring wells exist north of N3-MW03, N2-MW07, N1-MW05 or N1-MW11; west of N1-MW11, N1-MW08, N1-MWl0, or N4-MW13; or south of N7-MWl3, N4-MW05, N4-MW04, N4-MW11, N4-MW12, or N4-MW13. In addition, the Implementation of the Remedy subsection of Section XI (Overall Observations) of Appendix C (Site Inspection Report) indicates that groundwater sampling of newly installed wells along the plume's leading edge indicate that the plume is larger	Section 6.4.3 "Recommendations" has been added to the document and includes: Installation of monitoring wells downgradient of Sites N1, N4, and N7 (locations to be presented in a future work plan), and groundwater modeling is recommended in Section 9.0 to delineate the plume's downgradient extent and to determine future compliance as it relates to the possible migration of the plume toward the groundwater subbasin (location indicated on Figure 6-3). Additionally, Section 9.0 has been revised to include the following "Recommendations and Follow-up Actions": "Additional monitoring wells will be installed and modeling

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		than predicted. While additional monitoring wells are proposed to delineate the leading edge of the groundwater plume, additional step-out monitoring wells may be necessary to address data gaps associated with the current extent of the plume. Sufficient wells should be installed to fully delineate the extent of the plume and monitor plume expansion or migration. Please revise the Five-Year Review to recommend additional monitoring wells to determine the current extent of the groundwater plume so that data from existing monitoring wells and proposed leading edge monitoring wells can be used to determine how fast the groundwater plume is expanding.	performed to completely delineate the leading edge of the plume and monitor cleanup progress. Additional ISCO treatment may be required at the leading edge. Recommended future locations of step-out monitoring wells include locations south of existing monitoring wells N4-MW04, N4-MW05, N4-MW11, N4-MW12, N4-MW13, and N7-MW13, Other recommended monitoring well locations include locations west of N1-MW08 and N1-MW10."
Karla Brasaemle (Techlaw, Inc., EPA contractor)	General Comment 5	The potential expansion of the groundwater plume is not discussed with sufficient detail. Based on the Implementation of the Remedy subsection of Section XI (Overall Observations) of Appendix C (Site Inspection Report), groundwater sampling of newly installed wells along the plume's leading edge indicate that the plume is larger than predicted. Similarly, Section 6.4 (Data Review) indicates that the plume configuration along the east/southeastern leading edge indicates a change has occurred. As such, it is unclear if the groundwater plume is expanding as a result of ISCO injections due to the limited volume of-the bedrock fractures. Including a tracer in future ISCO injections would help evaluate whether the injections are causing plume expansion. If	Section 6.4.2.4 "Leading Edge TCE Concentration Variations" has been added to the document and includes: TCE concentrations at newly installed wells N1-MW10 (130 µg/L), N4-MW07 (94 µg/L), N4-MW11 (470 µg/L), N4-MW12 (160 µg/L), and N4-MW13 (140 µg/L) indicate that the commingled plume extends further downgradient than the plume delineation based on previous monitoring events. Well locations and associated 2003 and 2010 TCE concentrations are shown on Figures 3-4 and 3-5, respectively. Figure 6-3 presents the extent of the TCE plume delineated in 2003 (at the time of remedy development in the FS [Earth Tech, 2004]), in 2004 as presented in the ROD (Earth Tech, 2006), and in 2010. The area in blue indicates the change in estimated plume

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		additional ISCO injections are conducted, please recommend including a tracer in the injectant to help evaluate whether the groundwater plume is expanding.	configuration along the east/southeastern leading edge as a result of TCE concentrations detected in newly installed wells N1-MW10, N4-MW07, N4-MW11, N4-MW12, and N4-MW13. Trend graphs for wells with an adequate number of data points are included on Figure 6-4, and indicate that the extent of leading edge plume instability appears to be limited to the southern portion of Site N1 and the northern portion of Site N4 as indicated by increasing TCE concentrations at monitoring well N4-MW06. TCE concentrations in samples collected from monitoring well N4-MW06 have consistently increased since its initial sampling in 2005. Additionally, analytical results from the 2010 monitoring event indicate that an area of relatively high TCE concentrations, ranging from 21 to 560 μg/L (Figure 3-5), exists in the Site N4 area. To address this high concentration area and apparent plume instability in the vicinity of monitoring well N4-MW06, Site N4 area injection wells (N4-MW07, N4-MW08, and N4-MW09) were included in the Phase II Injection Event II. Though performance monitoring results associated with the Phase II Injection Event II are not available within this review period, continued sodium permanganate solution injections at the Site N4 area will likely be required." Section 6.4.3 "Recommendations" has been added to the document and includes:

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			"Inclusion of a tracer in future ISCO injections is recommended to evaluate whether injections are displacing the plume."
Karla Brasaemle (Techlaw, Inc., EPA contractor)	General Comment 6	Occupied buildings have not been distinguished from unoccupied buildings in the Five-Year Review. As a result, it is unclear if occupied buildings are located above the groundwater plume. Further, it is unclear if workers have been relocated to areas outside the portions of OU6 where groundwater is impacted or anticipated to be impacted in the future, as indicated in Lines 7-9 on Page 7-5. Please revise Figure 2-1 (TCE Groundwater Concentration Contours - 2010) to indicate which buildings are occupied relative to monitoring wells and the groundwater plume. If occupied buildings exist above the groundwater plume, please provide monitoring well or soil vapor data to substantiate that the inhalation exposure pathway is not important for current or future workers.	Due to security concerns it was agreed at the 20 July 2011 RPM technical meeting that a figure indicating occupied buildings need not be presented. The relevant text in Section 7.2.5.1 has been revised to discuss building occupancy and includes: "These changes in groundwater concentrations imply that the location of the plumes relative to buildings currently occupied on a routine basis may have also changed. This issue was brought up during a review of a draft version of this report where a concern for the health of current indoor workers was raised. To address this concern, a list of routinely occupied buildings over and adjacent to groundwater plumes was generated. These plumes are presented on Figures 3-5 and 3-7 showing the current extent of TCE and benzene at OU6. These chemicals were selected since they represent the primary constituents of the impacted groundwater and the primary risk drivers previously identified for the VIP. These figures represent the most current information of the extent of groundwater impact as of 2010. Six buildings were identified above or near these plumes; Buildings 4803, 4805, 4806, 4807, 4810, and 4827. Of these, only three buildings were identified as being occupied on a routine basis; Buildings

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			4806, 4807, and 4810. Site personnel familiar with the activity patterns for this OU verified that these buildings were occupied daily throughout the work week. Occupancy at a lower frequency would make it highly unlikely that exposure would lead to adverse health effects; especially considering the fact that these buildings are located only on the margins of the plumes."
Karla Brasaemle (Techlaw, Inc., EPA contractor)	General Comment 7	Detections of hexavalent chromium in six monitoring wells are not discussed in the Five-Year Review. Based on Section 7.3.3 (Other Potential Impacts to Protectiveness), "No unforeseen byproducts have resulted from the injection process." However, oxidizing conditions, induced by the application of ISCO reagents, may have resulted in the dissolution and migration of metals, but monitoring or addressing metals was not included in the recommendations. Please revise the Five-Year Review to discuss the detections of hexavalent chromium in monitoring wells. In addition, please clarify why monitoring or addressing metals was not included in Section 9.0 (Recommendations and Follow-Up Actions).	The chromium discussion has been added to the document as Section 6.4.2.5 Chromium Concentration Variations. Table 9-1 has been revised to include the following for "Remedy operation and maintenance": "Update LUC boundary in the GIS as necessary. Continue adherence to review and approval procedures for construction and ground-disturbing activities. Perform well maintenance including well completion repairs and well labeling with identification tags. Continue ISCO in the areas of highest VOC concentrations at Sites N3, N4, and N7 and groundwater monitoring for NDMA, metals (including total and hexavalent chromium), and VOCs are recommended. Conduct tracer testing with ISCO injections."
Karla Brasaemle (Techlaw, Inc., EPA	General Comment 8	Section 7.1.3 (In Situ Chemical Oxidation and Groundwater Monitoring Remedial Action Component Performance) and Table 7-2 (Plume Mass and Volume Summary) present conflicting information. For example,	Sections 6 and 7 have been amended to reiterate that ISCO component of the RA is intended to only treat the areas of highest contaminant concentrations and that the wells in those area show nearly 100% reduction in TCE

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contractor)		Lines 15-16 on Page 7-3 indicate that the ISCO RA appears to be functioning as anticipated (implying reductions in mass and contaminant concentrations); however, Table 7-2 indicates that the OU6 plume mass and volume are increasing. Similarly, Lines 14-15 and Table 7-2 indicate that mass destruction is occurring while Table 6-3 (TCE Concentration Variations) indicates that concentrations are increasing and new hot spot areas exist which implies that the OU6 plume is expanding and mass is increasing. As such, it is unclear if the ISCO RA is functioning as anticipated and mass destruction is occurring. Please revise the Five-Year Review to clarify how the ISCO RA is functioning as anticipated when concentrations are increasing and new hot spot areas imply that the OU6 plume is expanding. Further, please clarify how mass destruction can be evaluated when the OU6 plume is expanding and concentrations are increasing.	concentrations since 2003.
Karla Brasaemle (Techlaw, Inc., EPA contractor)	General Comment 9	Section 7.1. (Question A: Is the Remedy functioning as Intended by the Decision Documents?) does not assess several aspects of the remedy implementation, as outlined in Sections 4.1.2 through 4.3 of the Comprehensive Five-Year Review Guidance, EPA 540-R-01-007, dated June 2001 (the Guidance). The following aspects of the remedy implementation are not assessed consistently:	The Question A elements are addressed as follows: a. Remedial Action Performance – Currently addressed in Section 7.1.3. b. Costs of System Operations – Currently addressed in Section 7.1 with reference to Section 4.3.3. c. Monitoring Activities – The text has been revised to mention performance monitoring data as the vehicle

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		Question A: Is the remedy functioning as intended by the decision documents? a. Remedial Action Performance b. Costs of System Operations c. Monitoring Activities d. Opportunities for Optimization e. Early Indicators of Potential Remedy Problems Please revise to include an assessment of these aspects of the remedy implementation.	for evaluating RA performance. d. Opportunities for Optimization - An opportunity for optimization is currently presented in Section 7.1. e. Early Indicators of Potential Remedy Problems – The last sentence of Section 7.1 has been revised to clarify that it is an early indicator of a potential problem. : Elevated TCE concentrations at Site N4 are possible early indicators of plume instability (a potential problem) as further discussed in Section 7.1.4.
Karla Brasaemle (Techlaw, Inc., EPA contractor)	General Comment 10	Due to the increased concentrations of TCE and benzene and the potential for vapor intrusion, it is unclear if RAOs presented in Section 4.1 (Remedy Selection) and LUCs presented in Section 4.1.1 (Land Use Controls) are protective. For example, Table 6-3 (TCE Concentration Variations) indicates that TCE concentrations have increased from a maximum concentration of 2,000 μg/L during the 2008 monitoring event to a maximum concentration of 20,000 μg/L during the 2010 monitoring event. Further, Table 9-1 (Recommendations and Follow-Up Actions) indicates that the methodologies for determining risk to indoor air from subsurface contaminants have been revised since the ROD was signed and an evaluation of the updated	Section 6.4.2.3 Overall TCE Concentration Variations (2003 to 2010) has been added to the document and includes: "The data collected during the 2003 monitoring event were the basis for the remedies developed in the FS (Earth Tech, 2004) and the final remedy selection in the ROD (Earth Tech, 2006) and the data collected during the 2010 monitoring event represent the most-recent results available within this five-year review period. Comparing the TCE data from the 2003 and 2010 monitoring events provides a means of evaluating the overall performance of the remedy. Of the 23 wells sampled during both of the 2003 and 2010 monitoring events, 20 wells exhibited an overall decrease in

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		vapor intrusion pathway guidance methodologies as they relate to site conditions is necessary. Please revise the Five-Year Review to clarify how the RAOs and LUCs presented in Sections 4.1 and 4.1.1 are protective.	TCE concentrations and 18 of those wells showed significant (greater than 50 percent) decreases (Table 6-7). TCE concentrations increased in samples collected from two wells during that timeframe, N3-MW15 and N1-MW08, and were not detected in the samples from well REPA-MW01. The increase at well N1-MW08 is not statistically significant because of the relatively low TCE concentrations detected in both samples, less than 1.5 µg/L (which is below the 5-µg/L cleanup goal [MCL]). The increase in TCE concentrations detected in samples from well N3-MW15 (from 4,600 µg/L in 2003 to 20,000 µg/L in 2010) may be attributable to rebounding as this well was treated with a Fenton-based reagent in 2003 as part of an ISCO treatability study. The 2010 concentration is a significant decrease from the historical high TCE concentration (45,000 µg/L) at N3-MW15, detected in 2002. The 2003 groundwater monitoring data for samples collected from wells N3-DEW02, N3-MW06, N3-MW07, N3-MW15, and N3-NW05 at Site N3 and wells N7-MW01 and N7-MW12 at Site N7 indicated that the wells were located in the areas of highest TCE concentrations at the respective sites. Trend graphs for TCE concentrations for these wells and N7-MW02, a deep well near N7-MW01, are presented in Appendix A. The percent decrease in TCE

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			concentrations from the 2003 to 2010 timeframe were at, or near, 100 percent at these wells with the exception of N3-MW15 (Table 6-7). As described above, the TCE concentrations in samples collected from N3-MW15 have likely rebounded from reductions realized during a previous treatability study. The significant decreases in TCE at the highest concentration area wells indicate that the ISCO component of the RA is progressing successfully. A review of Table 3-1 in Section 3.3, indicates a decreasing trend in concentrations of 15 of the 17 COCs, including TCE and further indicates that the ISCO component of the RA is progressing successfully."
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 1	Section 1.2.5, Operable Unit 5/10 - North Base, Page 1-5. The text indicates that operations at OU5/10 included aircraft repair and cleaning, rocket testing, photographic laboratory operations, painting, and fluid replacement; however, the text does not indicate that OU5/10 was also used to manufacture and machine perchlorate. Please revise Section 1.2.5 to clarify that OU5/10 was also used to manufacture and machine perchlorate.	The following sentence has been added to Section 1.2.5: "Rocket testing activities included processing perchlorate for use in rocket motors." The text now reads "The operations included aircraft repair and cleaning, rocket testing, photographic laboratory operations, painting, and fluid replacement. Rocket testing activities included processing perchlorate for use in rocket motors."
Karla Brasaemle (Techlaw,	Specific Comment 2	Section 3.1, Physical Characteristics, Page 3-1. Section 3.1 does not clarify whether the site is located in a populated area or whether the site is located in an	Section 3.1 has been revised to include the following: "The population density of Edwards AFB is approximately 120 people per square mile. The nearest population center

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Inc., EPA contractor)		environmentally sensitive area, as required by Page E-22 of the Guidance. However, Section 3.2 (Land and Resource Use) indicates that, "OU6 provides low quality ecological habitat due to proximity to these industrial processes and related development; no threatened or endangered plants, invertebrates, birds, reptiles, or mammals have been reported." Please revise Section 3.1 to include the information included in Section 3.2. In addition, please provide and/or reference information to support this statement.	to OU6 is North Edwards, which is approximately 6 miles north with a population of less than 1,500 people. The nearest city is Lancaster, which is approximately 15 miles southwest with a population of approximately 160,000 people. OU6 is not an environmentally sensitive area and provides low quality ecological habitat due to proximity to industrial processes and related development, i.e., paved ground surface with relatively dense traffic patterns (Tetra Tech, 2003). No threatened or endangered plants, invertebrates, birds, reptiles, or mammals have been reported."
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 3	Section 3.2, Land and Resource Use, Page 3-1. Section 3.2 does not clarify the current and projected land uses for the area surrounding the OU6 at the time of the five-year review or the human and ecological past, present and known future use of resources and any other current uses of the site not already addressed, as required by Page E-22 of the Guidance. Please revise Section 3.2 to clarify the current and projected and uses for the area surrounding OU6 at the time of the five-year review and the human and ecological past, present and known future use of resources and any other current uses	Section 3.2 has been revised to include the following: "The Base General Plan (GP) (Edwards AFB, 2009) and the NASA DFRC Master Plan (MP) (Development One, Inc. [Development One], 2009) specify that NASA DFRC will continue to be used for industrial purposes. No residential uses, including day care facilities or other sensitive uses that would result in higher exposure amounts beyond worker exposures, within any portion of OU6 are anticipated as the Air Force will continue to occupy the Base indefinitely. The area surrounding OU6 has been, and

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		of the site not already addressed.	will continue to be, industrial use for military research and development. Because the surrounding area will continue as industrial use, ecological habitat will likely continue to be low quality."
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 4	Section 3.5, Summary of Basis for Taking Action, Pages 3-7 to 3-8. The Basis for Taking Action section of the Background Information tables (e.g., Table A-1) does not discuss contaminants present. Based on Page E-23 of the Guidance, the Basis for Taking Action section should "Describe the contaminants found at the site by appropriate media type (soil, groundwater, surface water, air). Note the effect or potential effect of the contamination on people, resources they use, or the environment. Examples of elements of this discussion include the following: (1) Contaminated media and structures (summary of remedial investigation) and (2) Resources/targets that have been or could potentially be affected, results of risk assessments, determination of primary health threat." Specifically, the Basis for Taking Action section should include COCs, media, and concentrations. In addition, figures depicting current and former plume extents, current concentrations, and trend graphs should be provided. Please revise the Basis for Taking Action section to provide a sufficient discussion of the COCs, media, and concentrations. In addition for each site, please ensure a figure is provided which	Section 3.3 has been revised to reference trend graphs and current and former plume extents. Section 3.5 has been revised as follows: "Historical chemical usage within OU6 resulted in a groundwater plume that encompasses multiple source areas. Locations of former releases to the environment in OU6 have been designated as Sites N1, N2, N3, N4, and N7. The location and nature of these releases contributed to a single commingled VOC groundwater plume that encompasses all of the source areas and extends from the Site N3 area in the west, east beneath Sites N1, N2, N4, and N7, and eventually reaches Rogers Dry Lake (Figure 3-2). Risk assessments (Earth Tech, 2003) performed prior to the signing of the ROD did not identify significant risks to human health or the environment under current land use scenarios and only groundwater was considered a medium of concern for future human exposure. Groundwater at OU6 is not currently used for drinking water; thus, potential risks associated with ingestion of COCs in

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		depicts current and former plume extents, current concentrations, and trend graphs.	groundwater are reduced by the lack of complete exposure pathways for current land use scenarios. Although there are no current impacts to humans and resources that humans use, or impacts to the environment anticipated, an RA was warranted in order to prevent future human exposure to groundwater contaminant concentrations exceeding regulatory thresholds and to restore the groundwater to its designated beneficial use as drinking water. COCs and cleanup goals (MCLs) were identified in the ROD (Earth Tech, 2006), and include 17 VOCs. These COCs and their respective historical concentration ranges present at OU6, and respective cleanup goals are presented in Table 3-1 and discussed on a site by site basis in Section 3.3 with figures providing the estimated commingled plume extent (Figures 3-2 and 3-3). The primary target compounds are benzene and TCE, trend graphs for which are presented in Appendix A. The estimated TCE plume extents in 2003 and 2010 are provided on Figures 3-4 and 3-5, respectively. The estimated benzene plume extents in 2003 and 2010 are provided on Figures 3-6 and 3-7, respectively. TCE and benzene concentration variations are further discussed in Section 6.4."
Karla Brasaemle	Specific Comment 5	Figure 4-1, Land Use Control Boundary, Page 4-2 and Figure 4-2, Well Location Map, Page 4-6. The	Figure 3-2 has been added to the document and includes the commingled plume boundary location based on the most-

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(Techlaw, Inc., EPA contractor)		boundary of the commingled plumes is not presented on Figure 4-2 and well locations are not included on Figure 4-1. As a result, it is unclear if the LUC boundary sufficiently restricts residential development where contamination is at levels that do not allow for unlimited use and unrestricted exposure. Please revise Figure 4-2 to include the commingled plume boundary location based on the most recent monitoring results.	recent monitoring results and well locations.
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 6	Table 4-3, Summary of Remedial Action Operational Costs, Page 4-12 Table 4-3 does not indicate the specific calendar or fiscal years that correspond to Years 1 through 5; however, several tables and figures in the Five-Year Review only refer to specific years. To ensure the years are consistently represented, please revise Table 4-3 to include the specific year associated with Years 1 through 5.	Table 4-3 has been revised to indicate the fiscal year.
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 7	Section 6.1, Administrative Components, Page 6-1: The specific names of members of the review team are not provided. Lines 4-6 on Page 6-1 states that, "Members of the review team include NASA DFRC, Air Force, and AECOM staff with expertise in hydrology, geology, risk assessment, and in situ remediation technology." Please revise Section 6.1 to identify the members of the review team.	Section 6.1 has been revised to include: “The U.S. Air Force is the lead agency. Members of the five-year review team include the Air Force, NASA DFRC, CRWQCB, and support contractors. Members of the U.S. Air Force involved in the review include Mr. Ai Duong (RPM) and Mr. Tom Merendini (OU6 project manager). Mr. Dan Morgan (NASA DFRC Environmental Manager) conducted the site inspection. Mr. Tim Post (CRWQCB RPM) participated in the site inspection. Mr. Albert Chang

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			(TYBRIN Corporation [Air Force contractor]) conducted the inspection of the GIS. Ms. Jennifer Martin (MECx [NASA contractor]) performed data review of the dig permits. AECOM (NASA contractor) staff that participated in the site inspection, conducted interviews, and provided data review include Mr. Todd Battey, Ms. Kimberly Coleman, Mr. Phil Saxton, Mr. Mark Jackson, and Mr. Ray Kaminsky."
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 8	Table 6-3, TCE Concentration Variations, Page 6-5. The TCE concentration variations between 2003 and 2007 have not been presented in Table 6-3. While the approximate decrease between 2003 and 2010 is presented, the approximate decrease between 2003 and 2007 has not. Please revise Table 6-3 to provide the approximate decrease between 2003 and 2007.	Table 6-3 has been added and presents the TCE concentration variances between the 2003 and 2007 sampling events. Table 6-6 has been added and presents the TCE concentration variances between the 2003 and 2010 sampling events.
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 9	Section 6.4, Data Review, Page 6-7. Lines 14-15 state that the TCE concentrations at N1-MW10, N4-MW07, N4-MWl1, N4-MW12, and N4-MW13 indicate that the commingled plume extends farther downgradient than the previously defined plume delineation indicated; however, Figure 2-1 (TCE Groundwater Concentration Contours - 2010) which includes the TCE concentrations at the newly installed wells is not referenced. Since Figure 2-1 provides justification for statements that the plume extends farther downgradient, it should be referenced. Please revise Section 6.4 to include a	The paragraph has been revised to include the TCE concentrations detected in samples collected from each of the five wells noted. Only one sampling event has been performed at each of the new wells so a comparison between events is not possible. A reference to Figure 3-5 (which is a new figure presenting the TCE Groundwater Concentration Contours -2010) will also be added to the paragraph.

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		comparison of analytical detections to determine whether the commingled plume extends further downgradient than the previously defined plume delineation indicated.	
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 10	Section 6.4, Data Review, Page 6-7. Lines 24-26 indicate that continued sodium permanganate solution injections in the Site N4 area will likely be required; however, the text does not specifically indicate that additional sodium permanganate solution injections are necessary due to the detections of TCE which ranged from 130 to 560 μg/L, as shown on Figure 2-1 (TCE Groundwater Concentration Contours - 2010). Please revise Section 6.4 to clarify why additional sodium permanganate solution injections are necessary.	The text has been revised to read: "Additionally, analytical results from the 2010 monitoring event indicate that an area of relatively high TCE concentrations, ranging from 21 to 560 μg/L (Figure 3-5), exists in the Site N4 area. To address this high concentration area and apparent plume instability in the vicinity of monitoring well N4-MW06, Site N4 area injection wells (N4-MW07, N4-MW08, and N4-MW09) were included in the Phase II Injection Event II. Though performance monitoring results associated with the Phase II Injection Event II are not available within this review period, continued sodium permanganate solution injections at the Site N4 area will likely be required."
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 11	Section 6.4, Data Review, Pages 6-10 and 6-13. Section 6.4 references the Final Interim Remedial Action Completion Report for Phase II Injection Event II of III and Associated Activities, September 2008 - October 2010, NASA Dryden Flight Research Center, Operable Unit 6, Edwards Air Force Base, California, May 2011 (IRACR) trend graphs; however, these graphs are not provided in the Five-Year Review. As the trend graphs contribute to the understanding of the data and concentrations, please revise the Five-Year Review to include trends graphs for TCE, benzene, and NDMA	Trend graphs have been added to the report as Appendix A. Trend graphs where enough data points exist and are relevant to the understanding of the contaminant concentrations are presented.

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		with updated analytical data, if applicable.	
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 12	Section 6.5, Site Inspection, Page 6-13. The Monitored Natural Attenuation subsection of Section IX (Groundwater/Surface Water Remedies) of Appendix C (Site Inspection Report) indicate that some well completions require repair and brass well ID tags have not been affixed to all routinely sampled monitoring wells; however, these issues are not discussed in Sections 6.5 (Site Inspection) or 9.0 (Recommendations and Follow-Up Actions). As such, it does not appear that Sections 6.5 or 9.0 are comprehensive. Please revise Sections 6.5 and 9.0 to include the results from the site inspection and recommendations for follow-up actions to address these issues, respectively.	Section 6.5 has been revised to include: "Issues regarding the well conditions included damaged well completions and the lack of proper identification tags at routinely sampled wells." Table 9-1 has been revised to include the following for "Remedy operation and maintenance": "Update LUC boundary in the GIS as necessary. Continue adherence to review and approval procedures for construction and ground-disturbing activities. Perform well maintenance including well completion repairs and well labeling with identification tags. Continue ISCO in the areas of highest VOC concentrations at Sites N3, N4, and N7 and groundwater monitoring for NDMA, metals (including total and hexavalent chromium), and VOCs are recommended. Conduct tracer testing with ISCO injections."
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 13	Section 6.5, Site Inspection, Page 6-13. Signage locations have not been provided on a site map. As a result, it is unclear if signage is present or if it has been vandalized or removed. Please ensure that future site inspections list signage locations so that the number and placement of signage can be included on site maps and maintained.	Section 6.5 has been revised to include the following: "The LUCs employed under the RA include prohibitions on the use or disturbance of groundwater until cleanup levels are achieved. No activities were observed that violate the institutional controls. Due to the mobile nature of the ISCO treatment systems, lack of a permanent treatment

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			compound, and potential impact to mission-critical activities such as aircraft movement, permanent treatment-related signage and fencing are not used. LUCs such as the security gate house and perimeter fencing shown on Figure 4-2 are intrinsic to the NASA DRFC operations. Perimeter fencing and security measures appeared to be maintained and consistent with the ROD at the time of the site inspection."
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 14	Section 6.6, Interviews, Page 6-13. Section 6.6 does not summarize the interviews conducted. While the interview records and documentation forms are provided in Appendix D (Interview Report), please revise Section 6.6 to include summaries of the individual interviews and clarify successes/problems with the implementation of access and institutional controls, construction of the remedy and any unusual situations or problems at the site.	Section 6.6 has been revised to include: "None of the interviewees were aware of any LUC violations or of any community concerns related to the remedy. No concerns regarding the protectiveness of the remedy or accessibility of remedy information were voiced by Edwards AFB, NASA, and AECOM personnel interviewed. Common concerns among the RPMs were the lack of plume delineation in the Site N1 and Site N4 areas as discussed in Section 6.4.2.4 and the protectiveness of the remedy for the VIP (further discussed in Section 7.2). Regarding accessibility of remedy information, Mr. Depies noted that Edwards AFB is no longer maintaining the ERP information exchange webpage (BSX), which was used to obtain and exchange critical information. Mr. Depies recommended that the webpage be reinstated or a new webpage be established. The establishment of an information exchange webpage is identified as a program-

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			wide issue in Section 8.0."
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 15	Section 6.6, Interviews, Page 6-13. An insufficient number of interviews was conducted. Interviewees should include, at a minimum, the Edwards AFB Project Manager, a representative from each of the Regulatory Agencies, and the AECOM project manager. Please revise the Five-Year Review to include information obtained during interviews with the aforementioned interviewees. In addition, please ensure all interview records and documentation are include.	Please see response to Mr. Healy's Specific Comment 20.
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 16	Table 7-1, Summary of Injection Event Characteristics, Page 7-2. The variation in injection event characteristics presented in Table 7-1 is not discussed. While Lines 6-8 on Page 7-2 indicate that the number of injection wells decreased from the first injection event to the second injection event due to the persistence of permanganate in candidate wells, the text does not discuss the changes in solution concentration or average volume injected per well. Please revise Section 7.1.2 (Injection Operations) to include a detailed discussion regarding the changes made to the injection operations from the Remedial Design and March 2008 injection event.	Section 7.1.2 has been revised to include the following: "The number of wells utilized for injection decreased from 21 wells used during Injection Event I to 10 wells used during Injection Event II due to the persistence of permanganate (as evidenced by purple groundwater) in candidate wells. The solution concentration percentage was adjusted up to 4 percent for ease of mixing the sodium permanganate solution in the field as the product is purchased at 40 percent solution. The remedial design specified a minimum injection volume of 57 gallons per injection well. Approximately 70 percent of the injection wells in Phase II Injection Events I and II accepted at least 57 gallons of sodium permanganate solution. In general, if a well did not accept at least 57 gallons of sodium permanganate solution during Injection Event I it was not used for injection during Injection Event II. Exceptions

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			include wells N3-MW07 and N7-MW10. Wells N3-MW07 and N7-MW10 performed poorly during Injection Event I, however injection at these two wells was again attempted during Injection Event II, due to relatively high TCE concentrations. Prior to Injection Event II, TCE was detected in groundwater samples collected from wells N3-MW07 and N7-MW10 at concentrations of 220 and 130 μg/L, respectively (Table 6-6). These concentrations represent a 21,900 percent increase in well N3-MW07 and a 8,567 percent increase in well N7-MW10 following Injection Event I. Post-injection sampling results for Injection Event II are not available within this review period."
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 17	Section 7.1.3, In Situ Chemical Oxidation and Groundwater Monitoring Remedial Action Component Performance, Page 7-3. Lines 19-23 indicate that benzene concentrations have significantly increased since 2003; however, the cause of this increase has not been discussed. As such, it is unclear if the increased concentrations are associated with a new spill or contaminant migration. Further, it is unclear if additional wells are needed to monitor areas with increasing benzene concentrations. Please revise Section 7.1.3 to discuss the cause of increased benzene concentrations and clarify whether additional monitoring wells are necessary to monitoring potential migration.	The text will be revised to indicate that the elevated benzene concentrations were detected in new wells and that additional releases or migration are not occurring. Additionally, the text will indicate that no new wells are warranted based upon the benzene detections. Section 7.1.3 (renamed "Bioremediation" due to report reorganization) has been revised to include the following discussion: "The delineated benzene mass has increased by 954% since 2003 (Table 7-2). Because ISCO is not expected to address the presence of aromatic hydrocarbons (such as benzene), and because the bioremediation remedy component to address benzene has not yet been implemented, the increase in benzene mass is not an indication of remedy failure. The

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			increase in mass is not a result of an ongoing source, but a result of further delineation of the benzene plume. The estimated benzene plume configuration was extended to the south due to benzene concentrations detected in well N3-MW20, installed in July 2004 (Section 6.4.2.6). Additionally, a review of Table 3-1 in Section 3.3, indicates a decreasing trend in benzene concentrations. The highest historical benzene concentration at OU6 (19,000 μg/L) was detected in the sample collected from monitoring well N3-MW14 in 2002. The maximum benzene concentration detected in the most-recent groundwater sampling event (2010) was also collected from monitoring well N3-MW14 and was 7,000 μg/L. The bioremediation component to address benzene and other aromatic hydrocarbons will be implemented after the completion of the ISCO component (Earth Tech, 2008) and outside the five-review period presented in this report. Further delineation of the benzene plume may be warranted prior to or during bioremediation implementation."
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 18	Table 7-2, Plume Mass and Volume Summary, Page 7-3. Table 7-2 includes a summary of the plume mass and volume; however, it is unclear whether the table includes the 20,000 μg/L detection of TCE at N3-MW15 referenced in Table 6-2 (Maximum Organic Analyte Concentrations Detected in Groundwater Compared to Cleanup Goals - Second Performance	Notes have been added to Table 7-2. For example, the note for the 2010 OU6 Plume trichloroethene volume of 51.31 gallons is "Based on concentration range and contour areas shown on Figure B-6 in Appendix B." Figure B-6 includes well N3-MW15 with a concentration of 20,000 μg/L. The text on page 7-3, first full paragraph, third sentence has

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		Monitoring Event - June-July 2010). Please revise Table 7-2 to clarify whether the 20,000 μg/L detection of TCE at N3-MW15 referenced in Table 6-2 is included.	been revised to read: "Based upon estimates calculated for the entire plume from all TCE concentration data available from the 2003 and 2010 monitoring events, the mass of TCE has increased by approximately 6 percent (Table 7-2), possibly due to the identification of a high concentration area at Site N4."
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 19	Section 7.2.1, Changes in Standards, Page 7-4. While an MCL for NDMA does not currently exist, Section 7.2.1 does not discuss the CDPH goal for NDMA of 0.003 μg/L. Please revise Section 7.2.1 to include the CDPH goal for NDMA. Further, since NDMA was not included in the ROD list of contaminants, it appears that an ESD is needed. Due to the detections of NDMA discussed in Section 6.4 (Data Review), please discuss the need for an ESD to document the addition of this risk-based cleanup goal.	The value referred to in the comment is the Public Health Goal (PHG). Like a Notification Level, the PHG is not equivalent to an MCL in that it is not promulgated, and thus does not qualify as an ARAR. For this reason, it should not be discussed in Section 7.2.1 which is focused on changes in cleanup standards used in the ROD. However, the development of a PHG is the first step in the process that may lead to the establishment of an MCL. Therefore, as discussed in the 20 July 2011 RPM meeting, the next five-year review will review the regulations to determine if an MCL for NDMA has been developed. It was also agreed that an ESD was not required to address this issue.
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 20	Section 7.2.2, Changes in Exposure Pathways, Page 7-5. The first paragraph on page 7-5 indicates that while Buildings 4886 and 4889 were removed from Site N3, and that other buildings remain at the site; however, this section states that office activity at these other buildings will be relocated to areas outside the portions of OU6 where groundwater is impacted or anticipated to be impacted in the future. There is an immediate concern	Please see response to General Comment 6. Supplemental risk assessment references have been added.

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		that this area may present a potential vapor intrusion risk due to high levels of TCE detected at the site at concentrations that may be indicative of DNAPL [see Table 6-2 (Maximum Organic Analyte Concentrations Detected in Groundwater Compared to Cleanup Goals - Second Performance Monitoring Event - June-July 2010), where the maximum concentration of TCE at 20,000 μg/L exceeds 1 percent of TCE solubility]. Since the relocation of office activity is only proposed and no date was specified, there is a concern that there is current ongoing exposure of workers as a result of vapor intrusion from high concentration groundwater. To ensure protection of current workers, clarification is warranted regarding the location of existing and occupied buildings relative to the TCE plume, otherwise current worker safety must be demonstrated with indoor air monitoring. Please provide a list of all buildings in OU6, indicating whether they are occupied and the type of activities that occur in these buildings. Also, please provide a figure that depicts occupied buildings and with the 2010 TCE and benzene plume concentration contours. Finally, please include vapor monitoring in the recommendations or provide a date when office workers will be relocated. Further, the third paragraph on Page 7-5 references	

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		results of the OU6 HHRA performed by Earth Tech in 2003 and the predictive ecological risk assessment performed by Tetra Tech in 2003; however, supplemental risk assessments are also mentioned but the specific documents were not cited in the text. To promote clarity in this section, please include the citations for the supplemental risk assessments.	
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 21	Section 7.2.2, Changes in Exposure Pathways, Page 7-5. Due to the increased concentrations of TCE and benzene, it is unclear how Lines 10-11 can indicate that, "Conditions at the site addressed in the OU6 ROD are essentially unchanged since the signing of the ROD, and no change is anticipated." Please revise Section 7.2.2 to acknowledge that conditions at the site have changed (e.g., increased concentrations of TCE and benzene, installation of additional monitoring wells, expanded plume) since the signing of the OU6 ROD.	Section 7.2.2 has been revised to acknowledge that conditions at the site have changed (e.g., increased concentrations of TCE and benzene, installation of additional monitoring wells, expanded plume) since the signing of the OU6 ROD.
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 22	Section 7.2.3, Changes in Toxicity and Other Contaminant Characteristics, Page 7-10. The third paragraph states that the "cancer risk associated with groundwater in the Site N3 area increased from 0.628 to 1.18" due to the reclassification of naphthalene as a carcinogen in 2005 and concludes that since a cleanup level for naphthalene was not proposed in the ROD, it is unlikely that this change in toxicity would have dictated a cleanup level as no MCL has been promulgated. The	In Section 7.2.3, naphthalene is discussed in the second full paragraph on page 7-10. The discussion in this section indicates that if the current Regional Screening Level (the equivalent of the PRGs that were used to calculate the risks presented in the report) were used to calculate groundwater risk from the maximum detected groundwater concentration, the potential cancer risk would have increased as specified in the comment. However, the subject of Section 7.2.3 was to assess the effects, if any,

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		basis for this conclusion is unsupported as the absence of a promulgated MCL does not preclude the need to develop a cleanup goal for naphthalene. In the absence of an MCL for naphthalene, a risk-based tap-water value should be developed to ensure that the remedy is protective for all groundwater risk drivers. Please provide additional information to support why a cleanup goal does not need to be developed for a new risk driver in groundwater, otherwise naphthalene should be included as a final groundwater chemical of concern that should be addressed by the remedy.	that changes in toxicity criteria would have if cleanup levels were determined today. The discussion indicates that even though there have been changes in the toxicity criteria for naphthalene, these changes would not have been reflected in revised cleanup goals since these goals were based on MCLs (which are not available for naphthalene) rather than risk. As discussed in the 20 July RPM meeting, we will check to see if we have enough current data to re-assess risk for those groundwater chemicals whose toxicity criteria have changed– including naphthalene. This information will be used as part of the next five-year review as the basis for considering if a new RAO is required.
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 23	Section 7.2, Question B. Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of the Remedy Still Valid?, Pages 7-4 to 7-12. Section 7.2 does not discuss new contaminants or contaminant sources. Based on Exhibit 4-1 (Three Questions Used to Determine Whether a Remedy is Protective) of the Guidance, new contaminants or contaminant source should be identified. For example, the detections of NDMA are not discussed in Section 7.2. Similarly, it is unclear if the detections of benzene, discussed on Lines 19-23 on Page 7-3, are	NDMA and benzene do not represent new contaminant sources. A discussion of NDMA is included as Section 6.4.2.7. Section 7.1.3 includes a discussion of benzene concentration increases. Please see response to Specific Comment 17 for an excerpt of relevant text addressing benzene concentrations.

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		related to a new contaminant source. Please revise Section 7.2 to discuss new contaminants and/or contaminant sources.	
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 24	Section 7.2.4, Changes in Risk Assessment, Page 7-11. This section concludes that the total cancer risks and HIs) for Sites N2, N3, and N7 were significantly below 1 x 10^{-6} and an HI of 1 for the vapor intrusion pathway and that it is "unlikely that repeating the VIP assessments at these sites using current methodology would alter the conclusions;" however, the basis of this conclusion is not supported. The risks were calculated in 2003 yet the groundwater data presented in Table 6-2 (Maximum Organic Analyte Concentrations Detected in Groundwater Compared to Cleanup Goals - Second Performance Monitoring Event - June-July 2010) indicate significant increases in the TCE concentrations, indicating that the risk has also increased. As a result, it appears that the EPCs used in 2003 may not be representative and that the risks based on 2010 data would be higher. In addition, the text also states that benzene concentrations have increased. The Five-Year Review should provide supporting information to discuss how recent data would impact the 2003 risk calculations to support such a conclusion.	The maximum detected TCE concentration listed for the entire OU in Table 6-3 (20,000 ug/L) is for a well in Site N3. The maximum groundwater TCE concentration used for the HHRA in 2003 was 65,000 ug/L (also from Site N3); which was the highest level detected at OU6 in 2003. Therefore, the results presented in Table 6-3 indicate a significant reduction in TCE groundwater concentrations used to calculate groundwater and VIP risk. The cancer risk and non-cancer hazard for the VIP at Site N3 presented in the HHRA were 9E-09 and <0.001, respectively. Given the reduction in TCE (the primary risk driver) at this site, these risks can be expected to be lower today than they were calculated in 2003. The risks and hazards for sites N2 and N7 were approximately 8.8E-11 and 6.3E-11, and 0.001 and less than 0.001, respectively. However, since these risks were also driven almost entirely by TCE, and since TCE has generally decreased over time (as shown in Table 3-1 of the report) it is reasonable to conclude that the low risks reported in 2003 have probably decreased to even lower levels – as the report states The report will be revised to include graphs showing changes in groundwater VOC concentrations over time. These graphs will support the general decreases in VOC

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			levels at OU6.
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 25	Section 7.2.4, Changes in Risk Assessment, Page 7-12. The first paragraph on Page 7-12 indicates that the VIP risks for Site N1 were close to the upper end of EPA's risk management range and an HI of 1 and further states that these results were based on soil data which "makes it difficult to predict whether the conclusion would be different using current methodology." This conclusion reinforces the need for collection of vapor data and LUCs for occupied buildings within Site N1 due to the high level of uncertainty associated with the risk and HIs. Please add a sentence to the end of this discussion stating that the high level of uncertainty associated with VIP exposure at Site N1 further supports the need for LUCs at this area to ensure protection of workers via the VIP. In addition, please recommend collection of vapor intrusion data.	In accordance with the discussions during the 20 July 2011 RPM meeting, the report will be revised to add a discussion of uncertainty. This section will discuss that only soil and groundwater data were available for the evaluation of the VIP at Site N1. The cancer risk based on the maximum detected soil concentrations was approximately 1E-05 and the risk based on groundwater data was approximately 4E-06. The new Uncertainty section will discuss the uncertainties associated with using soil and groundwater as a basis for the VIP assessment, and will recommend, if necessary, measures that will reduce this uncertainty.
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 26	Section 7.4, Summary of Technical Assessment, Page 7-13. The second paragraph of this section states that none of the MCLs used as cleanup levels have changed since the ROD was signed; however, the risk associated with naphthalene indicate that it should be considered an additional COC and a risk-based cleanup goal should be included in the ROD to ensure that the remedy is protective of all risk drivers regardless if an	As discussed in the 20 July 2011 RPM meeting, the following has been added as a follow-up action in Section 9.0: "Because of the changes in the toxicity criteria (e.g. naphthalene and ethylbenzene), recalculate the residential health risk and assess the need to take additional action to meet RAOs."

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		MCL is available or not for the compound. In addition, please discuss the need for an ESD to document the addition of this risk-based cleanup goal.	
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 27	Section 7.4, Summary of Technical Assessment, Page 7-14. This section concludes that there is "no information that indicates that the protectiveness of the remedy is inadequate" but the word "inadequate" should not be used to describe protectiveness. The remedy is either protective, protectiveness is undetermined, or the remedy is not protective. Please revise the quoted statement to state whether the remedy is protective, protectiveness is undetermined, or it is unprotective. Also, the last sentence on Page 7-13 indicates that there is information that is "possibly affecting the protectiveness of the remedy." Further, the top of Page 7-12 indicates that if "the use of DTSC or USEPA guidance methodologies for determining risk to indoor air from subsurface contaminants may yield different results." Based on these statements, the conclusion in Section 7.4 should provide additional information to demonstrate that there is no other information that indicates that the protectiveness of the remedy is inadequate. For example, clarify what part of the remedy may protect human receptors despite the uncertainties associated with the historical risk results relative to new guidance and toxicity information.	Section 7.4 has been revised to clarify the part of the remedy may protect human receptors despite the uncertainties associated with the historical risk results relative to new guidance and toxicity information.

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Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 28	Section 9.0, Recommendations and Follow-Up Actions, Pages 9-1 to 9-2. Section 9.0 does not clearly indicate the agency with oversight authority, as outlined in the Guidance. Please revise Section 9.0 to clearly indicate the agency with oversight authority.	The second sentence of the first paragraph of Section 9.0 has been revised to include the following: "The Air Force and NASA will be responsible for any follow-up actions, with the regulatory oversight by the USEPA, DTSC, and CRWQCB."
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 29	Section 9.0, Recommendations and Follow-Up Actions, Page 9-1. Given the increased concentrations of TCE and benzene and the potential for vapor intrusion, it is unclear why collection of vapor data and updating the risk assessment have not been recommended as follow-up actions. Table 9-1 (Recommendations and Follow-Up Actions) indicates that, "Methodologies for determining risk to indoor air from subsurface contaminants has been revised since the ROD was signed. An evaluation of the updated VIP guidance methodologies as they relate to site conditions will be performed [in 2013]. The evaluation may result in a field investigation." Since the risk assessment did not consider preferential pathways for vapor intrusion and the assumption that the buildings were too distant from portions of the plume with higher concentrations, please revise Section 9.0 to recommend updating the risk assessment and collecting vapor data from occupied buildings as follow-up actions.	The comment states that concentrations of TCE and benzene have increased since the original VIP assessment was conducted. However, the five-year review has been revised to include a discussion of concentration changes over time for TCE and benzene and a discussion of the uncertainties associated with the VIP assessment. This is important because the groundwater is the potential source of VOCs such as TCE and benzene to indoor air via the VIP. The new information in the five-year review will show that, in general, concentrations of TCE and benzene have decreased or remained unchanged in the last five years or more. In the few wells where concentrations have increased, this is shown to be attributable to the advancement of the plumes. However, the current concentrations of TCE and benzene in the OU6 plumes are lower than those used in 2002 and 2003 to perform the original VIP assessments. The results of those assessments, which were presented in the HHRA and ROD, showed that the VIP cancer risks and hazards were well below the points of departure (i.e., a cancer risk of 1 E-04 and an HI of 1) for Sites N2, N3, and N7. The

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			VIP total cancer risk for Site N1 (based on groundwater data rather than the soil vapor data used for Sites N2, N3, and N7) was 4E-06 and the HI was 0.004. These results suggest that the VIP risk to these sites are less now than the low levels reported previously. This information indicates that there is no imminent threat to human health via the VIP at OU6. For this reason, the need for a recommendation to update the VIP risk assessment is not apparent. However, in recognition of the changes in VIP assessment methodology, Table 9-1 of the Five-Year Review (Recommendations and Follow-up Actions) states that an evaluation of the VIP situation will be conducted, and that an additional VIP assessment may be performed if warranted.
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 30	Appendix C, Site Inspection Report, Section XI, Overall Observations, Page C-13. The Implementation of the Remedy subsection of Section XI (Overall Observations) of Appendix C (Site Inspection Report) indicates that, "Mass removal has been demonstrated." While TCE mass has been reduced in the Site N3 and Site N7 treatment areas, Table 7-2 (Plume Mass and Volume Summary) shows that TCE mass in the OU6 Plume and benzene mass in the Site N3 treatment area have increased. Please revise the Implementation of the Remedy subsection of Section XI of Appendix C to clarify that while mass removal has been demonstrated,	Revision has been made as specified.

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		mass has increased within the timeframe of the five-year review.	
Karla Brasaemle (Techlaw, Inc., EPA contractor)	Specific Comment 31	Appendix C, Site Inspection Report, Photos Documenting the Site Conditions, Pages C-17 to C-18. Only three photographs were provided in the Five-Year Review to document site conditions. According to Section 3.1 (Physical Characteristics), OU6 is comprised of 838-acres. As such, it is unclear how three photographs sufficiently document site conditions at OU6. Please revise the Five-Year Review to include additional photographs or clarify how three photographs sufficiently document site conditions. In addition, please ensure that future five-year review submittals include photographs which sufficiently characterize site conditions (e.g., fencing, signage).	As discussed at the 20 July 2011 technical RPM meeting, ISCO treatment systems are mobile. The remedy does not include a permanent treatment compound. At the time of the site inspection, injections were not occurring and treatment equipment was not present. Photos of signage and fencing related to the NASA DFRC complex are included in the site photographs presented in the report.

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RESPONSES TO COMMENTS

Environmental Restoration Program
First Five-Year Review Report
Operable Unit 6
Edwards Air Force Base, California
Draft Final, June 2011

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Kevin Depies (DTSC)	General Comment 1	As we requested in the EAFB 20 July 2011 technical workgroup meeting, please ensure that DTSC be included in the resolution process for U.S. Environmental Protection Agency's Review comments.	Comment noted.
Kevin Depies (DTSC)	General Comment 2	The OU 6 Record of Decision (ROD) concluded that the vapor intrusion pathway (VIP) did not pose a human health risk resulting in no OU 6 Record of Decision (ROD) Remedial Action Objectives specific to this potential risk. Since the ROD, and as discussed in the Review, VIP assessment methodology (and for some compounds, toxicity criteria) has changed. This issue was extensively discussed in the 20 July 2011 EAFB technical workgroup meeting where DTSC expressed concern that the ROD may underestimate the OU 6 VIP risk. The Review also discusses the need for reassessing the VIP risk and DTSC looks forward to this reassessment. However, we noted that the Review Table 9-1 states that the issue does not affect current site "protectiveness". The Review needs to provide substantiation for this conclusion as at this point it appears protectiveness is uncertain for occupants of buildings located above the groundwater plumes and near/in VOC contaminant source areas.	During the 20 July 2011 technical RPM meeting, the topic of whether occupants of site buildings might be exposed to imminent risk due to changes in site conditions, or to the means by which VIP is assessed (e.g., sampling, testing, modeling, or changes in toxicity criteria) was discussed. The Air Force agreed to revise the five-year review report by including a discussion of the uncertainties which may be associated with this conclusion (i.e.,, that the VIP does not pose a threat to human health) as a result of these changes).

Reviewer	Comment #	Comment	Response
Kevin Depies (DTSC)	General Comment 3	Related to General Comment 2, the Exposure Pathways shown on Figures 7-1, 7-2, and 7-3 should be updated to identify potential VIP risk to building occupants. This should also be discussed in the second paragraph of Section 7.2.2.	The VIP exposure pathway has been added to Figures 7-1, 7-2, and 7-3. The figures have been revised to include the following note: "In 2006 when the Record of Decision was signed documenting the CERCLA response (RA), the inhalation pathway of concern did not include VIP. However, due to changing toxicity criteria and risk assessment methodologies (see Sections 7.2.3 and 7.2.4), the reassessment of the VIP to verify protectiveness is included as a recommendation (Section 9.0)"
Kevin Depies (DTSC)	General Comment 4	Since the ROD was signed, the State of California has determined that naphthalene and ethylbenzene are cancer-causing substances. These compounds are present in soil and/or groundwater at OU 6. Although the Review discusses this, it erroneously concludes no cleanup levels are required for these compounds. As discussed in the 20 July 2011 TWG meeting, we anticipate the draft final Review document will include a discussion of the nature and distribution of these compounds and the steps that will be taken to determine resulting human health risk from potential exposure to these compounds. Of note, the ROD remedy includes components that break potential exposure routes to these contaminants in groundwater. We anticipate the Review evaluation will lead towards developing risk-based cleanup levels for these compounds before the next five-	As discussed in the 20 July 2011 RPM meeting, the following has been added as a follow-up action in Section 9.0: "Because of the changes in the toxicity criteria (e.g. naphthalene and ethylbenzene) and the determination by the state of CA that these two compounds are carcinogens, recalculate the residential health risk and assess the need to take additional action to meet RAOs." Additionally, Sections 8.4.1 and 8.4.2 have been added to the document as follows: **"Section 8.4.1 Naphthalene and Ethylbenzene Risk in Groundwater** In Section 7.2.3 (Changes in Toxicity and Other Contaminant Characteristics), it was noted that the assessment of potential risk of groundwater COPCs to

Reviewer	Comment #	Comment	Response
		year review.	future hypothetical residential receptors that was presented in the HHRA and the ROD was based on the toxicological information available at the time. Since then, various changes in toxicity criteria have occurred, as were noted in the report. Among these changes was the re-assignment of naphthalene from a non-carcinogen to a carcinogen. The discussion in Section 7.2.3 noted the difference this change would make if the assessment were conducted today. As a result of the discussion this topic generated during the 20 July 2011 technical RPM meeting, it was agreed that the potential cancer risk presented by naphthalene and any other chemical that was evaluated as a non-carcinogen but is currently considered a carcinogen (e.g., ethylbenzene) would be evaluated. The first step in this assessment is to determine if sufficient analytical data are available to characterize current concentrations of these chemicals in the groundwater at OU6. If they are, then a decision will be made as to whether an updated assessment of the potential risk to future hypothetical receptors should be conducted. **Section 8.4.2 Naphthalene and Ethylbenzene VIP Risk** One of the issues raised during the 20 July 2011 technical RPM meeting was the fact that when the VIP risks were assessed in the HHRA, the toxicity criteria used for risk calculations were different for a number of the VOCs included in the assessment. Although it is possible for these differences to both over-estimate and under-estimate the potential cancer risks were they to be evaluated today, it

Reviewer	Comment #	Comment	Response
			was agreed that the changes likely to have the greatest impact would be for those chemicals originally evaluated as non-carcinogens that would be evaluated as carcinogens today. The two VOCs that fall into this category are naphthalene and ethylbenzene. To estimate the magnitude of these possible impacts, the calculated concentrations of the indoor air levels of naphthalene and ethylbenzene at Site N3 (where the highest soil vapor levels of these VOCs were detected) was examined. Using the estimated indoor air concentrations reported in the HHRA for these chemicals, and the current industrial air Regional Screening Levels (USEPA, June 2011), their contribution to the total VIP cancer risk of 9×10^{-9} would have been only an additional 3×10^{-10}. These results suggest that the changes in their toxicity assessments at the other sites where they were detected at lower levels are not likely to have altered the general results of the VIP assessments presented in the HHRA and the ROD."
Kevin Depies (DTSC)	General Comment 5	Based on text at the end of the fifth paragraph in Section 7.2.3, the updated risk assessment appears to have ignored California-derived toxicity criteria. For DTSC to concur with the Review, the assessment needs to apply these criteria consistent with what was previously done for OU 6 and DTSC policy which has been explained in comments on several recent EAFB primary documents. Please notify DTSC if the Air Force is unclear on how the risk assessment should be performed.	Use of California-derived toxicity criteria are not applicable to the screening-level assessment conducted for the OU6 5-year review. If a baseline risk assessment is warranted in the future, the AF will follow the established EPA hierarchy of toxicity values; however, the AF will calculate risk for both the hierarchy-based toxicity criteria and the most conservative (i.e., Cal-derived) toxicity criteria.

Reviewer	Comment #	Comment	Response
Kevin Depies (DTSC)	Specific Comment 1	Section 4.3. The text should discuss operations and management costs that are expended to ensure monitoring well integrity. This includes costs associated with periodic well rehabilitation/development which is a necessary component for ensuring wells provide reliable samples for assessment.	Section 4.3.3 has been revised as follows: "Within the five-year review period, well maintenance consisted of removing plant roots from several lakebed monitoring wells, installing several dedicated low-flow pumps, and repairs to well monuments. These activities were conducted in the fourth and fifth years (FY 2010 and FY 2011) with approximately $26,000 in incurred cost."
Kevin Depies (DTSC)	Specific Comment 2	Section 4.3.1, Second Paragraph. Because of the inherent uncertainty in defining specific concentration contour locations, rather than make the LUC boundary coincide with the five microgram per liter (μg/L) contour, add a buffer zone (extend the LUC boundary) beyond the five μg/L contour. The buffer zone extent may vary depending upon proximity to monitoring well and based upon data uncertainty (essentially, be the buffer should be larger at further distances from monitoring wells), or a more simple approach using a "fixed" buffer zone distance should be applied. If utilizing a single fixed value, DTSC recommends the buffer distance be on the order of 100-feet beyond the five μg/L TCE contour line.	As discussed in newly added Section 6.4.1, although the LUC boundary has been extended to the east, the LUC boundary is relatively well established on its western edge where mission-related excavations are focused. Further elaboration is provided below in an excerpt from Section 6.4.1: "Based on June-July 2010 monitoring results, the LUC boundary was revised and expanded to the east, encroaching upon Rogers Dry Lake (Figure 4-1). All mission-related excavations within this review period occurred on the western portion of the facility where the plume footprints/LUC boundary has remained relatively constant. No mission-related excavations occurred in the eastern portion of the LUC boundary area where the expansion occurred. Because there are no utilities or buildings in the eastern portion of the plume, and since Rogers Dry Lake is considered part of the flightline, it is also unlikely that any future mission-related excavations will be performed in the

Reviewer	Comment #	Comment	Response
			LUC boundary expansion area. Remedy-related excavations did occur inside the LUC boundary expansion area, however, personal protective equipment (PPE) was employed during the efforts." Because the LUC boundary is well defined to the west where excavation activities are focused and excavation activities are unlikely to occur on the lakebed where the LUC boundary is not fully defined, the current boundary appears to be effective without the addition of a buffer zone.
Kevin Depies (DTSC)	Specific Comment 3	Section 4.3.2. Please provide a means for the reader to identify injection versus monitoring wells as part of the various injection events. Figures are recommended for ease of conveying the information, but alternately provide this information in a new table or in Table 4-2.	Injection wells are identified on new Figure 4-3 and Table 4-2 identifies injection versus monitoring wells as part of the various injection events.
Kevin Depies (DTSC)	Specific Comment 4	Section 6.1, First Sentence. Please identify what Remedial Project Managers are and their role in the project.	Section 6.1 has been revised to include: "The remedial project managers (RPMs) were notified of the initiation of the five-year review process during the 18 November 2010 Restoration Advisory Board (RAB) meeting. The RPMs are representatives of the U.S. Air Force, USEPA, California DTSC, and CRWQCB that manage response actions at Edwards AFB in accordance with CERCLA."
Kevin	Specific	Section 6.4, Tenth Paragraph, Last Sentence. Instead of	Comment has been incorporated as specified.

Reviewer	Comment #	Comment	Response
Depies (DTSC)	Comment 5	*"Enhanced natural attenuation"*, we recommend you use a more clearly defined term such as "Bioremediation".	
Kevin Depies (DTSC)	Specific Comment 6	Section 6.6. Indicate whether public input was provided and summarize any concerns voiced by the public.	Section 6.6 has been revised to include: "No public input was generated as a result of May 2011 "Dryden X-Press" newsletter announcement."
Kevin Depies (DTSC)	Specific Comment 7	Section 7.1.3, Fourth Paragraph. The Review notes significant increases in benzene concentrations in groundwater indicating a potential continuing source. Please identify what steps are being taken to assess this source and how it may impact the remedy. Last, identify any potential increased VIP issues related to these increasing benzene concentrations.	Section 7.1.3 (renamed "Bioremediation" due to report reorganization) has been revised to include the following discussion: "The delineated benzene mass has increased by 954% since 2003 (Table 7-2). Because ISCO is not expected to address the presence of aromatic hydrocarbons (such as benzene), and because the bioremediation remedy component to address benzene has not yet been implemented, the increase in benzene mass is not an indication of remedy failure. The increase in mass is not a result of an ongoing source, but a result of further delineation of the benzene plume. The estimated benzene plume configuration was extended to the south due to benzene concentrations detected in well N3-MW20, installed in July 2004 (Section 6.4.2.6). Additionally, a review of Table 3-1 in Section 3.3, indicates a decreasing trend in benzene concentrations. The highest historical benzene concentration at OU6 (19,000 μg/L) was detected in the sample collected from monitoring well N3-MW14 in 2002. The maximum benzene concentration

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			detected in the most-recent groundwater sampling event (2010) was also collected from monitoring well N3-MW14 and was 7,000 μg/L. The bioremediation component to address benzene and other aromatic hydrocarbons will be implemented after the completion of the ISCO component (Earth Tech, 2008) and outside the five-review period presented in this report. Further delineation of the benzene plume may be warranted prior to or during bioremediation implementation, and to address the VIP."
Kevin Depies (DTSC)	Specific Comment 8	Section 7.2.2, Second and Third Paragraphs. Please explain why NASA plans to relocate offices to areas outside the VOC groundwater plume. Also, please explain how the relocation will *"reduce the potential exposure to site-related chemicals"*, but also *"will not significantly change exposure pathways…"*.	Referenced text has been revised to include: "The proposed relocation of office activity to areas outside the groundwater plume are expected to reduce the potential exposure to site-related chemicals, but are not a ROD requirement and will not significantly change exposure pathways for either human or ecological receptors. Although not strictly related to changes in site use, the position of the constituents in the plumes have changed in the 5 years since the ROD was signed. These changes were discussed in Section 3.3. While concentrations of plume constituents have decreased in some areas, they have increased in others. Although some of these increases have resulted in higher groundwater concentrations near some buildings to levels that are higher than have been detected in the past, they have not resulted in higher concentrations than have been detected historically at this OU. The implication of these changes as they pertain to this five-year

Reviewer	Comment #	Comment	Response
			review is evaluated in more detail in Section 7.2.6, and the outcome of these changes is found not to result in an imminent risk to indoor workers."
Kevin Depies (DTSC)	Specific Comment 9	Section , Fourth Paragraph, Seventh Sentence. DTSC does not agree with the following statement in the text *"…process used was extremely conservative…"* (underline added by DTSC for emphasis). This phrase is "extremely" subjective. While the initial risk screening could be construed as conservative, the risk assessment was following standard protocols for assessing likely risk to potentially exposed humans and biota. Accordingly, please delete this portion of sentence from the Review.	The term "extremely" was deleted.
Kevin Depies (DTSC)	Specific Comment 10	Section 7.2.3. This section presents what appear to be updated risks based on more recent VOC detections in groundwater. For example, in the fifth paragraph, the text states that *"…a review was conducted"*. Please provide the details of the review so DTSC is able to understand the process used by the Air Force.	The study referred to in Section 7.2.3 was part of the discussion of the impact that changes in toxicity criteria may have on the soil and groundwater assessment presented in the HHRA and the ROD if these assessments were to be performed today. These changes were not the result of updated VOC data. This discussion was presented as partial fulfillment of the requirement to assess changes in procedures and criteria since the ROD was signed. The report has been revised to clarify what this study consisted of and present additional details of the results of this study.
Kevin Depies (DTSC)	Specific Comment 11	Section 7.2.3. The updated risk assessment appears to be missing naphthalene although naphthalene has been detected at OU 6 and California has listed this chemical as cancer causing. Please clarify this apparent omission.	Naphthalene is discussed in Section 7.2.3. This discussion considers the results of using the current toxicity criteria for naphthalene on the assessment of the potential risk for groundwater at Site N3. The report has been revised to

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			expand upon this discussion to include other sites, and to discuss the impact of the revised toxicity criteria of naphthalene and ethylbenzene on the VIP risk in the new section which discusses uncertainties associated with changes in the assessment of the VIP since the ROD was signed.
Kevin Depies (DTSC)	Specific Comment 12	Section 7.2.3, Sixth Paragraph, Last Sentence. The statement is erroneous, or simply unclear. Explain what MCLs has to do with the potential need for a cleanup level for naphthalene. Note that the change in the naphthalene toxicity criteria might result a significant risk for receptors indicating a need for a cleanup level.	This statement has been deleted.
Kevin Depies (DTSC)	Specific Comment 13	Section 7.2.3, First Paragraph, Last Sentence. This sentence is erroneous; a review of toxicity criteria for all compounds potentially impacting human and ecological health is required.	The statement was revised as follows: "However, the OU6 cleanup levels are based on promulgated standards (MCLs)."
Kevin Depies (DTSC)	Specific Comment 14	Section 7.2.4, Second Paragraph, Last Sentence. The Review indicates that the proposed VIP assessment will include areas where VOCs are suspected/present in the subsurface, but also have no buildings (Sites N4 and N14). Please note that DTSC doesn't require a VIP assessment be made for these areas as long as there are no potential current or future risks (e.g., occupied buildings).	Comment noted.
Kevin	Specific	Section 7.3.1, Second Paragraph. Please provide an	Section will be revised to include an estimate when the Site

Reviewer	Comment #	Comment	Response
Depies (DTSC)	Comment 15	estimate (presumably via modeling) when the Site 25 groundwater plume is projected to intersect with the OU 6 plume.	25 groundwater plume is projected to intersect with the OU6 plume.
Kevin Depies (DTSC)	Specific Comment 16	Section 7.3.2. Please add a discussion (and/or figures) of NDMA trends in groundwater.	Per discussions at the 20 July 2011 RPM technical meeting, Section 7.3.2 has been removed. However, an NDMA discussion including a figure with references to trend graphs has been added as Section 6.4.2.7.
Kevin Depies (DTSC)	Specific Comment 17	Section 8.3, Second Sentence. The Review provides insufficient support for the conclusion that the VIP reassessment will not likely result in a risk level that may require a change in the ROD remedy. Either provide supporting information or delete this statement.	Section 8.3 has been extensively revised to support for the conclusion that the VIP reassessment will not likely result in a risk level that may require a change in the ROD remedy.
Kevin Depies (DTSC)	Specific Comment 18	Section 9.0 (and Table 9-1). Consistent with comments above, add a recommendation to evaluate the cumulative and specific risks due to ethylbenzene and naphthalene present in soil and groundwater. Please also note that this assessment may result in selecting cleanup levels for these compounds.	As discussed in the 20 July 2011 RPM meeting, the following has been added as a follow-up action in Section 9.0: "Because of the changes in the toxicity criteria (e.g. naphthalene and ethylbenzene), recalculate the residential health risk and assess the need to take additional action to meet RAOs."
Kevin Depies (DTSC)	Specific Comment 19	Section 10.0, First Sentence. The sentence is unclear and inaccurate as the remedy is believed to currently be protective, not only after cleanup levels are attained more than 100 years from now. Suggest replacing *"upon attainment of"* with "and attain", and *", which are expected to require more than 100"* with "in	The referenced text has been extensively revised based on comments from several reviewers and currently reads "The remedy is expected to be protective of human health and the environment in the long term upon attainment of groundwater cleanup goals, which are expected to require more than 100 years to achieve, through a combination of

Reviewer	Comment #	Comment	Response
		approximately _____". In the latter replacement text, please fill in the appropriate number of years until cleanup goals are anticipated to be attained (based on the original text in the Review, this value should be 'more than 100 years').	*in situ* treatment (chemical oxidation and bioremediation) and natural attenuation. Exposure pathways that could result in unacceptable risks in the short term are being controlled through institutional controls that are preventing exposure to, and the ingestion of, contaminated groundwater. All current threats at the site have been addressed by the implementation of LUCs."

RESPONSES TO COMMENTS

Environmental Restoration Program
First Five-Year Review Report
Operable Unit 6
Edwards Air Force Base, California
Draft Final, June 2011

Reviewer	Comment #	Comment	Response
John Steude (CRWQCB)	General Comment 1	Please provide a graphic conceptual site model showing the horizontal and vertical extent of contamination and the location and depth of In Situ Chemical Oxidation (ISCO) injections. Please provide figures such as vertical cross sections and associated sites maps that depict injection locations and other key site features.	Graphical conceptual site models showing the horizontal and vertical extent of contamination are not currently available, however, a recommendations section has been added as Section 6.4.3 and includes the following text: "Installation of monitoring wells downgradient of Sites N1, N4, and N7 (locations to be presented in a future work plan), and groundwater modeling is recommended in Section 9.0 to delineate the plume's downgradient extent and to determine future compliance as it relates to the possible migration of the plume toward the groundwater subbasin (location indicated on Figure 6-3). Generation of graphic conceptual site models showing the horizontal and vertical extent of the plume is recommended."
John Steude (CRWQCB)	General Comment 2	The Record of Decision (ROD) for OU 6 is based on evidence of stable plumes that are not migrating. Trichloroethylene (TCE) has been used as an indicator contaminant to estimate plume configuration, migration, and mass reduction of time. Section 7 .1.3 states: "Since the implementation of the remedy, an area of elevated TCE concentrations has been identified at Site N4, plume expansion has occurred at the leading edge of the plume (southern portion of Site N1 and Site N4), and containment has not been achieved." Section 7.1.3 further states: "To address this significant plume expansion, the ISCO RA component was implemented at Site N4 in August 2010. Additional monitoring wells	For clarity regarding the contingency plan, Section 7.1.4 has been revised to include: "TCE concentrations in samples collected from monitoring well N4-MW06 have consistently increased since its initial sampling in 2005. Per the ROD, if any unexpected behavior was observed during the groundwater monitoring, the five-year review would include a contingency plan to capture anomalous migration of contaminants. To address this possible plume expansion in the vicinity of monitoring well N4-MW06, the ISCO RA component was implemented at Site N4 in August 2010."

Reviewer	Comment #	Comment	Response
		will be installed, and complete delineation and modeling of the leading edge of the plume will allow for greater accuracy in plume estimation and ISCO performance." Please explain how implementation of ISCO at Site N4 will address possible expansion at Site N1. Please provide more information on the contingency plan to determine whether plume migration or contaminant rebounding are occurring and actions that are planned to control the migration of contaminants. Please explain how the establishment of artificial plume boundaries at Sites N3 and N7 will allow for consistent future mass estimates in the treatment zones as stated in the third sentence on page 7-3. Please explain how the plan for additional monitoring and more accurate modeling will affect the contingency plan if more accurate estimates confirm the plume is expanding. Please provide historic and current plume delineation maps for comparison of contaminant concentrations and location over time.	Section 3.3 has been revised to include historic and current plume delineation maps for comparison of contaminant concentrations and location over time.
John Steude (CRWQCB)	General Comment 3	Naphthalene and nitrosodimethylamine (NDMA) are not listed as Constituents of Concern (COC) in the ROD. These constituents are emerging contaminants that can contribute to human health risks, but do not currently have Maximum Contaminant Levels (MCLs). Please consider the need to develop protective clean up standards for these constituents. A Technical and Economic Feasibility Analysis may be necessary.	Please see response to General Comment 4 below regarding naphthalene. As discussed in the 20 July 2011 RPM meeting, NDMA discussion has been restricted to Section 6.4.2.7: "Hydrazine fuels are used for rocket propellants by the Air Force and NASA. Hydrazines are unstable in the natural environment and rapidly decompose when exposed to the atmosphere. NDMA is a decomposition product.

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			NDMA is present in groundwater at Site N3 (Figure 6-6) in the area of the benzene plume. Of the trend graphs presented in the IRACR (AECOM, 2011b) only wells N3-MW06 and N3-MW07 have an adequate number of data points since 2003 to provide relevant trend graphs (Appendix A). Although no trends are apparent, concentration decreases in injection well N3-MW06 have been observed following injection events. Following the Phase I Injection Event, NDMA decreased from a preinjection concentration of 0.14 to 0.07 μg/L in groundwater samples collected from well N3-MW06. NDMA was not detected above the reporting limit in groundwater samples collected from well N3-MW06 following the Phase II Injection Event I. Because NDMA is similar to benzene in that it is not amenable to ISCO treatment, reductions are likely the result of dilution by reagent solution. NDMA was not identified as a COC in the ROD, a cleanup goal (MCL) has not been promulgated, and it does not present an indoor air risk and LUCs at OU6 protect from exposure. However, NDMA will continue to be included in the monitoring program to evaluate treatment by bioremediation in the event that a cleanup goal (MCL) is promulgated or a formally issued toxicity value exists for NDMA."
John Steude (CRWQCB)	General Comment 4	Ethylbenzene is a COC that has an MCL that is reported as not protective. Please evaluate the need to develop a more protective clean up standard for this constituent of	As discussed in the 20 July 2011 RPM meeting, the following has been added as a follow-up action in Section 9.0: "Because of the changes in the toxicity criteria (e.g.

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		concern and provide the results of the evaluation.	naphthalene and ethylbenzene), recalculate the residential health risk and assess the need to take additional action to meet RAOs."
John Steude (CRWQCB)	General Comment 5	In addition to providing arrows indicating groundwater directions, as shown in Figure 4-2, please provide groundwater elevation contours.	Figure 3-1 "Groundwater Elevation Contours – October 2010" has been added to the document.

APPENDIX C
HUMAN HEALTH RISK ASSESSMENT ADDENDUM

ENVIRONMENTAL RESTORATION PROGRAM

HUMAN HEALTH RISK ASSESSMENT ADDENDUM
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ARMSTRONG FLIGHT RESEARCH CENTER
OPERABLE UNIT 6

EDWARDS AIR FORCE BASE
CALIFORNIA

FINAL

APRIL 2015

Prepared for:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ARMSTRONG FLIGHT RESEARCH CENTER
SAFETY, HEALTH, AND ENVIRONMENTAL OFFICE
EDWARDS AIR FORCE BASE, CA 93523-0273

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UNITED STATES AIR FORCE CIVIL ENGINEER CENTER
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ATTACHMENTS

ATTACHMENT A HUMAN HEALTH RISK SCREENING - DIRECT CONTACT (TAPWATER) PATHWAY (HYPOTHETICAL FUTURE RESIDENTIAL), DTSC-PREFERRED APPROACH, SITES N3 AND N4
ATTACHMENT B VAPOR INTRUSION INVESTIGATION REPORT (ON CD)

LIST OF ABBREVIATIONS AND ACRONYMS

μg/L	micrograms per liter
AECOM	AECOM Technical Services, Inc.
Cal EPA	California Environmental Protection Agency
COC	chemical of concern
Conc.	concentration
COPC	chemical of potential concern
DCE	dichloroethene
DTSC	Department of Toxic Substances Control
Earth Tech	Earth Tech, Inc.
HERO	Human and Ecological Risk Office
HHRA	human health risk assessment
HI	Hazard Index
HQ	Hazard Quotient
IASL	indoor air screening level
IRIS	Integrated Risk Information System
IUR	inhalation unit risk
LUC	land use control
OEHHA	Office of Environmental Health Hazard Assessment
OU	Operable Unit
PCE	tetrachloroethene
PRG	Preliminary Remediation Goal
ROD	Record of Decision
RSL	Regional Screening Level
TCE	trichloroethene
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
VIP	vapor intrusion pathway
VOC	volatile organic compound

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1.0 INTRODUCTION

The purpose of this human health risk assessment (HHRA) addendum is to provide an updated assessment of risks posed by groundwater contamination at Operable Unit (OU) 6 in support of the Addendum to First Five-Year Review Report. The focus of this document is the risks associated with the potential use of groundwater for beneficial purposes and potential indoor air risks associated with the vapor intrusion pathway (VIP) as outlined in the *Vapor Intrusion Sampling Plan and Risk Assessment Work Plan* (AECOM Technical Services, Inc. [AECOM] 2013). No Further Action was selected in the Record of Decision (ROD) (United States Air Force [USAF] 2006b) for soil based on the results of the baseline OU 6 HHRA (Earth Tech, Inc. [Earth Tech] 2003) and therefore soil risk was not reassessed. Additionally, metals in groundwater were determined to be at, or below, background levels (Earth Tech 2004) and, therefore, not identified as chemicals of concern in the ROD and not reassessed as part of this five-year review. Exposure pathways are presented on Figure 1. This HHRA addendum updates the groundwater risk assessment for the industrial inhalation (via the VIP) and for residential ingestion, inhalation (direct via groundwater use and indirect via the VIP), and dermal exposure routes. As shown on Figure 1, the remaining groundwater exposure routes are incomplete or currently incomplete due to the implementation of land use controls as part of the remedial action.

Consistent with the United States Environmental Protection Agency (USEPA) *Comprehensive Five-Year Review Guidance* (USEPA 2001), the *First Five-Year Review Report* (AECOM 2011) identified differences in risk-related elements that occurred since the baseline HHRA was completed in 2003. Those differences included variations in contaminant concentrations, changes in soil vapor sampling methodology, and changes in toxicity values for several of the site-related chemicals. Per guidance, if changes in toxicity and other contaminant characteristics are identified then the risk should be re-calculated. This document fulfills the next step in this evaluation.

The following components comprise the current HHRA effort:

- Identify chemicals of potential concern (COPCs) in groundwater based on laboratory analytical results using the most recent groundwater data (2012 groundwater monitoring event)
- Determine groundwater-related cancer risks and non-cancer hazards (using May 2014 USEPA tapwater Regional Screening Levels [RSLS] and Department of Toxic Substances Control [DTSC] publication *HERO Note 3* [DTSC 2013]) under the residential scenario considering dermal exposure, ingestion, and inhalation

- Determine VIP-related cancer risks and non-cancer hazards for Buildings 4806, 4807, and 4810 under the residential scenario using indoor air sample results (the same results utilized for the industrial scenario risk/hazard calculations presented in the *Vapor Intrusion Investigation Report* [AECOM 2014])

2.0 GROUNDWATER RISK ASSESSMENT

COPCs related to site activities that have impacted groundwater include chlorinated and fuel-related volatile organic compounds (VOCs). The most current data available characterizing the OU 6 groundwater were collected in May and June of 2012. These data were presented in the *Remedy Performance and Groundwater Monitoring Report, 2011 – 2012* (AECOM 2012).

Potential groundwater risks were calculated consistent with the approach used in the baseline HHRA. This involved the quantitative comparison of the maximum concentration of VOCs detected in groundwater on a per-site basis (Sites N1, N2, N3, N4, and N7) to risk-based concentrations. With the exceptions noted below, the risk-based concentrations used for this assessment are the May 2014 USEPA tapwater RSLs. Both incremental lifetime cancer risks (cancer risks) and non-cancer Hazard Quotients (HQs) were calculated. These risks and hazards were calculated using the following equations:

Equation A for individual and total cancer risks:

$$\text{Cancer Risk} = \left[\left(\frac{\text{Conc. chemical a}}{\text{RSL a}} \right) + \left(\frac{\text{Conc. chemical b}}{\text{RSL b}} \right) + \cdots \left(\frac{\text{Conc. chemical z}}{\text{RSL z}} \right) \right] \text{x } 10^{-6}$$

Where:

Conc. = concentration

RSL = Regional Screening Level

Equation B was used to calculate the total non-cancer hazard, which is expressed as a Hazard Index (HI). The HI is the sum of the HQs for all pertinent chemicals and exposure routes:

$$\text{Hazard Index} = \left[\left(\frac{\text{Conc. chemical a}}{\text{RSL a}} \right) + \left(\frac{\text{Conc. chemical b}}{\text{RSL b}} \right) + \cdots \left(\frac{\text{Conc. chemical z}}{\text{RSL z}} \right) \right]$$

The May 2014 RSLs (USEPA 2014) used for these calculations were the most current RSLs available at the time of this assessment. Prior to the RSLs, Preliminary Remediation Goals (PRGs) were the

risk-based concentrations used to calculate potential risks and hazards. The RSLs are a compilation/harmonization of USEPA Region 9 PRGs and similar risk-based screening levels used in USEPA Regions 3 and 6. The November 2000 PRGs (USEPA 2000) were used in the 2003 baseline HHRA. Non-cancer hazards (Equation B) for carcinogens were not assessed in the baseline HHRA in accordance with the Basewide HHRA Work Plan for Edwards Air Force Base (Earth Tech 2001).

The RSLs, like the PRGs used in the baseline HHRA, pertain to the domestic use of groundwater (residential exposure scenario), accounting for ingestion, dermal, and inhalation exposure routes. There are no plans to develop any area of OU 6 for residential use, and thus the groundwater risks calculated using these RSLs are used to represent a purely hypothetical future exposure scenario. Although tapwater RSLs account for the inhalation pathway such as inhalation exposure while showering, tapwater RSLs have not been developed for the VIP (subsurface source contributing to indoor air exposure). The hypothetical future residential VIP is assessed in Section 3.0, and the current industrial VIP was assessed in the *Vapor Intrusion Investigation Report* (AECOM 2014).

The USEPA RSLs rely on toxicity values for both carcinogens and non-carcinogens. These values are available from a number of sources and can differ significantly according to the source selected. Accordingly, the toxicity values used by the USEPA were selected according to a hierarchy of sources as shown below:

Tier 1 USEPA Integrated Risk Information System (IRIS)

Tier 2 USEPA Provisional Peer Reviewed Toxicity Values

Tier 3 Toxicity values from other USEPA or non-USEPA sources, including the California Environmental Protection Agency (Cal EPA) Office of Environmental Health Hazard Assessment (OEHHA), USEPA Agency for Toxicity Substance and Disease Registry, and the USEPA Health Effects Assessment Summary Tables.

The USAF approach utilizes Tier 1 values first, Tier 2 values where Tier 1 values are not available for a compound, and Tier 3 values where Tier 1 and Tier 2 values are unavailable. The exception to this approach would be if a value is available from a Tier 1 source but a newer value is available from a Tier 2 or 3 source that is considered to represent a more scientifically defensible value. For instance, the current USEPA position on ethylbenzene is that it is a Class D carcinogen (i.e., not likely to cause cancer). However, this assessment was last revised in 1991. Since then, Cal EPA reviewed more recent studies, and determined that ethylbenzene should be considered a human carcinogen, and

provided an inhalation unit risk (IUR) factor for ethylbenzene. The Cal EPA assessment has been peer-reviewed, and was adopted by OEHHA in 2007. For this reason, the Cal EPA IUR factor for ethylbenzene meets the criteria for selection even though it is a Tier 3 source value and is also considered a non-carcinogen by the Tier 1 source. At OU 6, ethylbenzene was only detected in Site N3 groundwater in 2012 and was not detected in Sites N1, N2, N4, or N7 groundwater (see Tables 1 through 5).

The DTSC uses the toxicity values developed by OEHHA. Thus, while the DTSC agrees with the use of most of the RSLs, they prefer the use of alternative RSLs for other chemicals. These alternative RSLs are listed in the DTSC publication *HERO Note 3* (DTSC 2013). Although it is not consistent with USAF policy to use alternative RSLs (USAF 2006a), these alternative RSLs were used to calculate alternative risks and hazards for the hypothetical future residential tapwater scenario (see Section 2.2) and for the VIP (Section 3.0).

2.1 HUMAN HEALTH RISK SCREENING - HYPOTHETICAL FUTURE RESIDENTIAL DERMAL, INGESTION, AND DIRECT INHALATION EXPOSURE ROUTES

The approach described above was used to calculate the potential hypothetical future residential risks and hazards for the groundwater COPCs at each of Sites N1, N2, N3, N4, and N7. A comparison of baseline (2003) and current (2012) risks and hazards are tabulated in Tables 1 through 5 and discussed below.

For Site N1, the total hypothetical future tapwater-derived residential cancer risk decreased from 7×10^{-4} to 2×10^{-4} as shown in Table 1. This decrease is primarily the result of concentration changes for the primary risk drivers chloroform (which decreased from 18 to 0.37 micrograms per liter [μg/L]) and trichloroethene (TCE) (which decreased from 810 to 110 μg/L). The HI increased from 2 to 40. This is primarily because the non-cancer hazard of TCE was not accounted for in the 2003 baseline HHRA as no Tier 1 oral reference dose or inhalation reference concentration for TCE existed before the USEPA finalized the September 2011 IRIS non-cancer toxicity values. Since the OU 6 remedy includes land use controls (LUCs) prohibiting residential redevelopment and use of the groundwater for drinking, no actual Site N1 residential exposures are occurring.

For Site N2, the total hypothetical future tapwater-derived residential cancer risk decreased from 3×10^{-3} to 2×10^{-5}. Although (as shown in Table 2) there were many changes from the 2003 baseline

HHRA (including fewer VOCs detected during the most recent sampling event), this is primarily the result of the decrease in the maximum concentration of the primary risk driver TCE, which decreased from 4,100 to 11 μg/L. The HI decreased from 20 to 4. This is due primarily to the decrease in concentration of *cis*-1,2-dichloroethene (DCE), the primary risk driver, from 890 to 1.5 μg/L (far below the May 2014 USEPA RSL of 40 μg/L). TCE is now the primary driver for the HI, since non-cancer oral reference dose and inhalation reference concentrations were developed in IRIS in 2011. Since the OU 6 remedy includes LUCs prohibiting residential redevelopment and use of the groundwater for drinking, no actual Site N2 residential exposures are occurring.

For Site N3, the total hypothetical future tapwater-derived residential cancer risk decreased from 6×10^{-1} to 2×10^{-1}. Although (as shown in Table 3) there were many changes from 2003 (including fewer VOCs during the most recent sampling event), the most significant reason for the decreased risk was the decrease in the maximum concentration of ethylene dibromide, the primary risk driver, from 330 to 12 μg/L and its increased risk-based concentration from 0.00076 to 0.008 μg/L. The HI increased slightly from 23,511 to 24,159 (HIs are the same [20,000] when reported to one significant figure). This is largely the result of counterbalancing changes in the maximum concentrations of naphthalene (the primary driver of the baseline HI) and TCE (the primary driver of the current HI). The maximum concentration of naphthalene decreased from 140,000 to 420 μg/L, while the maximum concentration of TCE remained approximately the same. However, since the non-cancer hazard of TCE was not included in the 2003 baseline HHRA (due to toxicity values only becoming available in IRIS in 2011), its contribution to the HI essentially countered the decrease in the contribution from naphthalene. Since the OU 6 remedy includes LUCs prohibiting residential redevelopment and use of the groundwater for drinking, no actual Site N3 residential exposures are occurring.

For Site N4, the total hypothetical future tapwater-derived residential cancer increased slightly from 1×10^{-3} to 2×10^{-3}. The baseline risk was driven by a combination of the maximum concentrations of four chemicals; bromodichloromethane, carbon tetrachloride, chloroform, and TCE. While the maximum concentration of carbon tetrachloride, chloroform, and TCE increased, the risk-based values of carbon tetrachloride and chloroform also increased; somewhat off-setting the concentration changes (refer to Equation B). However the increase in the concentration of TCE and the decrease in its risk-based concentration accounts for most of the increase in total risk. The hypothetical future residential tapwater HI increased from 1 to 200. This is due primarily to the increase in maximum concentrations

of the primary drivers for the HI (TCE contributed 97 percent of the HI and carbon tetrachloride contributed 3 percent) and because the non-cancer hazard of neither of these chemicals were accounted for in the 2003 baseline HHRA as no Tier 1 USEPA IRIS non-cancer toxicity criteria were released until 2010 and 2011 for carbon tetrachloride and TCE, respectively. Since the OU 6 remedy includes LUCs prohibiting residential redevelopment and use of the groundwater for drinking, no actual Site N4 residential exposures are occurring.

For Site N7, the total hypothetical future tapwater-derived residential cancer risk decreased from 6×10^{-3} to 2×10^{-3}. This is primarily the result of concentration changes of the primary risk drivers TCE (which decreased from 6,800 to 880 μg/L), and 1,2-dichloroethane (which decreased from 130 μg/L to below the reporting limit). The HI increased from 80 to 300. Although the maximum concentration of the risk driver from the previous assessment (*cis*-1,2-DCE) decreased from 3,700 to 920 μg/L, the hazard increased due to the TCE contribution which was not accounted for in the 2003 baseline HHRA given that no non-cancer toxicity values for TCE were released until 2011. Since the OU 6 remedy includes LUCs prohibiting residential redevelopment and use of the groundwater for drinking, no actual Site N7 residential exposures are occurring.

The total hypothetical future tapwater-derived residential cancer risks decreased at Sites N1, N2, N3, and N7 and slightly increased at Site N4. The increase at Site N4 is partially due to a slight increase in TCE concentration discovered during post-ROD supplemental plume delineation efforts in the Site N4 area, and not to a new or continued release. For perspective, the TCE concentrations at Site N4 are two orders of magnitude lower than TCE concentrations detected at Site N3. With the exception of Site N2, the non-cancer hazards at OU 6 increased due to the inclusion of TCE in the reassessed hazard. Changes in TCE concentrations and toxicity values are the primary contributing factors to the slight cancer risk increase at Site N4 and the non-cancer hazard increases at Sites N1, N3, N4, and N7. TCE is identified as a chemical of concern (COC) in the ROD with a cleanup goal of 5 μg/L. Additionally, the remedy includes LUCs at OU 6 preventing residential development. Given that the reassessment using current toxicity values, risk assessment methodologies, and chemical concentrations resulted in decreased cancer risks at a majority of the sites, and that the increases in non-cancer hazards are attributable to TCE (which is already identified as a COC in the ROD) and LUCs are in place preventing residential exposure, the remedy is protective and modifications are not proposed to address the hypothetical future residential dermal, ingestion, and direct inhalation exposure routes.

2.2 HYPOTHETICAL FUTURE RESIDENTIAL DERMAL, INGESTION, AND DIRECT INHALATION EXPOSURE UNCERTAINTY ANALYSIS

This section discusses major uncertainties as they relate to risk assessment. Although the groundwater plume is not fully delineated at the leading edge and it is not yet known if the plume is migrating, the undelineated portion is not expected to yield higher concentrations or new COCs than those already captured in the Sites N1 and N4 risk assessments (Site N1 and N4 are along the leading edge of the plume).

Understanding the major uncertainties in a health risk assessment assists with the interpretation of the risk characterization results. In general, the risk assessment process operates in a "cascade" fashion, whereby each phase relies on information generated in the previous phase. If uncertainty is introduced, for example, during the data collection phase, it will be carried through each successive risk assessment phase. When successive uncertainties introduce health-protective biases (e.g., health-protective assumptions are typically recommended for estimating receptor exposure levels), the final risk estimates are likely to be amplified, resulting in a significant overestimate of actual risks and hazards.

One of the major sources of uncertainty in the groundwater assessment presented in Section 2.1 is the use of the maximum detected concentrations of each chemical detected in site groundwater. The risks calculated using these concentrations over-estimate those that a typical receptor is likely to receive, even in the purely hypothetical residential exposure scenario. Another source of uncertainty is the risk-based values used to calculate risks and hazards (i.e., the RSLs). Aside from the upper-bound values used to estimate groundwater exposure from ingestion and during bathing, there is also some uncertainty associated with the toxicity values used to calculate the RSLs. Some of that uncertainty is reflected in the fact that the California DTSC prefers different risk-based screening levels (calculated using different toxicity values) than the USEPA RSLs for some chemicals. For comparison purposes only, the assessment of the 2012 groundwater results presented in Section 2.1 was repeated using the risk-based values recommended by the DTSC. The first step was to determine if any of the detected groundwater chemicals had DTSC-recommended risk-based values that differed from the USEPA RSLs used in Tables 1 through 5. The source of the DTSC-recommended values was the Human and Ecological Risk Office Note 3 (HERO Note 3) (DTSC 2013). The comparison showed that none of the chemicals detected at Sites N1, N2, and N7 had alternate risk-based tapwater values. Five chemicals detected at Site N3 and one chemical from Site N4 had alternate risk-based values. Risks and hazards

were therefore recalculated for these sites using the DTSC-recommended values. These results are presented in Attachment A and are discussed below.

Of the five chemicals in Site N3 groundwater, two are carcinogens (methylene chloride and tetrachloroethene [PCE]) and it is the cancer endpoint that DTSC recommends alternate risk-based values. The use of these values increases the calculated risk for methylene chloride from 2×10^{-6} using the USEPA RSL (Table 3) to 5×10^{-6} (Table A-1) and increases the PCE risk from 5×10^{-8} using the USEPA RSL (Table 3) to 5×10^{-6} (Table A-1). However, these increases are small compared to the total cancer risk of 2×10^{-1} (Tables 3 and A-1) and therefore do not significantly impact the overall risk result. Similarly, the DTSC-recommended values for the non-carcinogens increase the HQs for these chemicals, but to such a small degree compared to the original HI of 20,000 (Tables 3 and A-1), that the use of the DTSC-recommended values has no significant impact on the overall non-cancer result.

The results in Attachment A Table A-2 show that the only chemical detected in Site N4 groundwater with an alternate DTSC-recommended value was PCE. As with Site N3, the use of the DTSC-recommended alternate value increases the risk for PCE (from 3×10^{-7} [using the USEPA RSL] to 3×10^{-5}), however the increase does not result in an increase in the overall risk result (2×10^{-3}) (Table 4).

Although the California DTSC prefers different risk-based screening levels than the May 2014 RSLs used in the tapwater (future hypothetical residential risk) screening presented in Section 2.1, the remedy includes LUCs prohibiting residential redevelopment and use of the groundwater for drinking and no significant difference results between the Section 2.1 results and that preferred by DTSC (given that the only detected 2012 groundwater analytes for OU 6 that DTSC has a different toxicity criterion are methylene chloride and PCE).

Thus, the conclusion that the OU 6 remedy is protective for the future resident still relies on the continued implementation of LUCs as a remedy component to prohibit future residential land use, which will continue into the foreseeable future at this active military installation.

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3.0 VAPOR INTRUSION RISK ASSESSMENT

As discussed in the 2003 HHRA (Earth Tech 2003), potential indoor air risks from subsurface VOCs volatilizing into indoor air via the VIP were assessed for OU 6 where buildings exist in the vicinity of the VOC plume. The focus of the 2003 HHRA was based primarily on current and anticipated future site use, which does not include site activities involving the residential exposure scenario. Thus, in 2003 the VIP was assessed at Sites N2, N3, and N7 using soil vapor data and for Site N1 using soil and groundwater data and was not assessed at Sites N4 and N14 because no buildings were present on these sites. The 2003 VIP assessment results showed that the risks were below 1×10^{-6} and total non-cancer hazards (HIs) were below 1 for the sites assessed using soil gas data (i.e., N2, N3, and N7). The cancer risk for Site N1 using soil data was approximately 1×10^{-5}, while the HI was approximately 0.4.

Since the completion of the 2003 HHRA, several changes have occurred which were noted in the *First Five-Year Review Report*. These included changes to the methods by which soil vapor data are collected, the model used to predict indoor air concentrations from subsurface data, and the toxicity for several of the COPCs assessed to evaluate the VIP. To address these changes, co-located sub-slab soil gas and indoor air samples were collected in three buildings in 2013, along with outdoor air samples at each building. The collection, chemical analysis, and evaluation of these samples are documented in the *Vapor Intrusion Investigation Report* (AECOM 2014) (Attachment B).

3.1 VAPOR INTRUSION INVESTIGATION - 2013

Three buildings were included in the vapor intrusion investigation: Buildings 4806, 4807, and 4810. These buildings were selected as representative of the greatest potential risks from exposure via the VIP based on two criteria: 1) the buildings were all occupied and 2) the buildings are located close to the areas of high TCE and benzene concentrations in the OU 6 comingled plume. Although other COPCs were present in the groundwater, TCE and benzene were considered to pose the greatest potential threat to human health based on toxicity and their presence at higher concentrations than the other COPCs. Sub-slab and indoor air samples were collected at locations that were selected based on several criteria. Among them were the requirements that they represented portions of the buildings that were routinely and frequently occupied, and that they were near where subsurface sources of COPCs may be present.

Soil vapor and indoor air samples were collected twice during 2013 (March and August) at all three buildings in order to assess possible changes under different heating, ventilation, and air conditioning system usage conditions. Potential indoor air risks were calculated using the results from the indoor air samples. Potential risks and hazards were calculated for both the hypothetical future residential scenario and the industrial scenario.

Potential risks and hazards were calculated on a sample-by-sample basis using an approach similar to that described above for groundwater risks. In this case, indoor air screening levels (IASLs) were used as the risk-based screening levels equivalent to the RSLs described above. IASLs for the residential and industrial exposure scenarios were calculated for each COPC using the same process used to calculate the USEPA air RSLs. VIP risks and hazards were calculated using both USAF and DTSC approaches. In accordance with the *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual* (USEPA 1989), the calculated cancer risks were reported to one significant digit. The guidance recommends summing the individual HQs, with the assumption that if the total HI exceeds 1 there may be concern for potential health effects. Because the summation of HQs resulted in HIs of less than, or near 1, HQs were not expressed on a target organ basis and the non-cancer risks are likely over-estimated.

The results of the industrial use indoor air risks calculated from the indoor air samples collected in March and August 2013 are presented in the *Vapor Intrusion Investigation Report* (AECOM 2014) and included as Attachment B to this report. Those results are summarized in Table 6 of this document along with the risks under the future hypothetical residential use scenario. Detected analytes and related hypothetical future residential risks are summarized in Tables 7 through 26 of this document.

The indoor air risks and hazard results presented in Tables 7 through 14 were based on the concentrations of every VOC detected in each indoor air sample. However, it is possible that VOCs detected indoors originated from non-subsurface sources and were not VIP-related. To estimate the potential indoor air risk associated only with VIP-related COPCs, it was necessary to identify those COPCs that were likely to have entered the indoors from the subsurface. The details of the identification process are presented in the *Vapor Intrusion Investigation Report*. It is these VIP-related subset of chemicals (summarized in Table 6 and Tables 15 through 26) which are of most interest for assessing future hypothetical land reuse and long-term protectiveness.

Seasonal trends, as evidenced by the results of samples collected in March compared to those collected in August, were mixed. In general, indoor air concentration decreased seasonally in Building 4806, but increased seasonally in Buildings 4807 and 4810. The magnitude of the seasonal variation was relatively small (approximately a factor of 2) in Buildings 4806 and 4807, but larger (factors of between 5 and 20) in Building 4810.

The results (summarized in Table 6) indicate that the cancer risks for VIP-related COPCs under the current industrial scenario were less than 1×10^{-4}(the highest cancer risk using the USAF-preferred IASLs was 5×10^{-6} and 2×10^{-5} using the DTSC-preferred IASLs) and the HIs were less than 1. Although the estimated risk results for VIP-related COPCs under the hypothetical future residential scenario were slightly higher than the industrial scenario risks (the highest hypothetical future residential cancer risk was 9×10^{-5}), all cancer risks were less than 1×10^{-4}. None of the non-cancer HIs for the hypothetical future residential scenario calculated using the USAF-preferred IASLs exceeded 1. The only hypothetical future HI that exceeded 1 using the DTSC-preferred IASLs was based on the results for sample N3-4807IA3 (Table 22), and relates to benzene in only one Building 4807 location, and is therefore likely over estimated given it is unlikely a future residence would be built exactly at this Building 4807 location without degradation of benzene in the future. While the hypothetical future residential risks and hazards calculated using the DTSC-preferred IASLs were slightly higher or the same as those calculated using the USAF-preferred IASLs, the risks were still less than 1×10^{-4} and the HIs were less than 1 (with one exception using the DTSC-preferred IASLs).

The USEPA has provided Five-Year Review guidance for interpreting these risk results within the CERCLA framework (USEPA 2001):

> Generally, your human health determination should be based on whether the cancer risk could now be greater than 10^{-4} and/or the hazard index could be greater than 1 for non-carcinogenic effects.

As this HHRA addendum was prepared in support of the Addendum to First-Five Year Review Report and reassessed VIP results for the current industrial and hypothetical future residential exposure scenarios are within the acceptable ranges cited in USEPA's Five-Year Review guidance, no further actions beyond the selected remedy need to be taken to achieve an acceptable risk level (i.e., the remedy is protective).

The OU 6 remedy is protective for the future resident as it includes the continued implementation of LUCs as a remedy component to prohibit future residential land use, which will continue into the foreseeable future at this active military installation.

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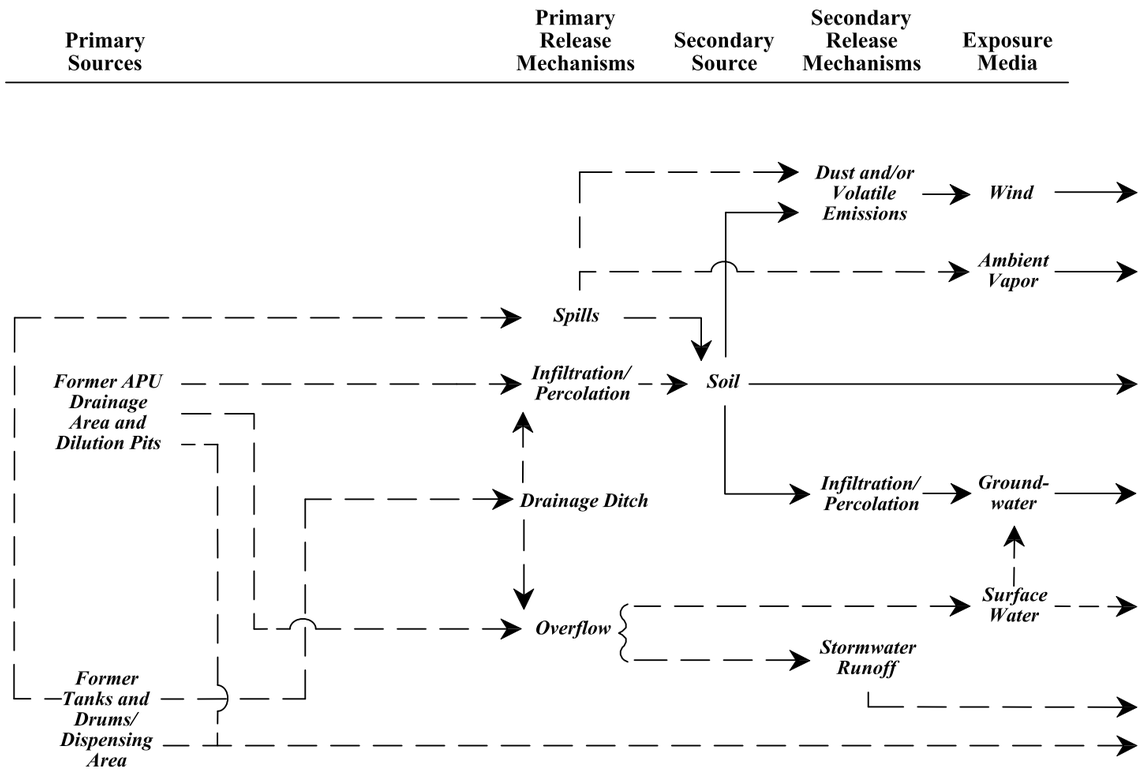
FIGURE

- 1 Operable Unit 6 Exposure Pathways

1



	Receptor						
	Human					Ecological	
Exposure Route	Current Industrial	Future Industrial	Future Construction	Future Res	Risk Mgt. Decisions/RA	Terrestrial	Aquatic
Inhalation	Yes[1]	Yes[2]	Yes[2]	Yes[2]	a	No[3]	No[3]
Inhalation	No[4]	No[4]	No[4]	No[4]		No[4]	No[4]
Ingestion	Yes[1]	Yes[2]	Yes[2]	Yes[2]	a	No[3]	No[3]
Dermal Contact	Yes[1]	Yes[2]	Yes[2]	Yes[2]	a	No[3]	No[3]
Ingestion	No[3]	No[3]	No[3]	Yes[2]	b	No[3]	No[3]
Inhalation-DIR	No[3]	No[3]	No[3]	Yes[2]	b	No[3]	No[3]
Inhalation-VIP	Yes[1]	Yes[2]	Yes[2]	Yes[2]	b	No[3]	No[3]
Dermal Contact	No[3]	No[3]	No[3]	Yes[2]	b	No[3]	No[3]
Ingestion	No[4]	No[4]	No[4]	No[4]		No[4]	No[4]
Inhalation	No[4]	No[4]	No[4]	No[4]		No[4]	No[4]
Dermal Contact	No[4]	No[4]	No[4]	No[4]		No[4]	No[4]
Ingestion	No[4]	No[4]	No[4]	No[4]		No[4]	No[4]
Inhalation	No[4]	No[4]	No[4]	No[4]		No[4]	No[4]
Dermal Contact	No[4]	No[4]	No[4]	No[4]		No[4]	No[4]

EXPLANATION

- YELLOW HIGHLIGHTS INDICATE PATHWAY RETAINED FOR A CERCLA RESPONSE
- GRAY SHADING INDICATES PATHWAYS NOT RETAINED EITHER BECAUSE PATHWAY DOES NOT EXIST OR RISKS ARE WITHIN ACCEPTABLE LIMITS
- PATHWAY NO LONGER EXISTS

ABBREVIATIONS

Amb	AMBIENT AIR
APU	AUXILIARY PROPULSION UNIT
CERCLA	COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT
DIR	DIRECT
MGT.	MANAGEMENT
RA	REMEDIAL ACTION
Res	RESIDENTIAL USE
VIP	VAPOR INSTRUSION PATHWAY

NOTES

[1] COMPLETE PATHWAY
[2] POTENTIAL PATHWAY, CURRENTLY INCOMPLETE
[3] INCOMPLETE PATHWAY, LAND USE CONTROLS IN PLACE
[4] INCOMPLETE, NOT APPLICABLE BECAUSE PATHWAY NO LONGER EXISTS

RISK MGT. DECISIONS/RA:

a. NO FURTHER ACTION SELECTED FOR SOIL.
b. ADDRESSED BY RA: TREATMENT, LAND USE CONTROL.

Operable Unit 6 Exposure Pathways

Date 09-2014	HHRA Addendum	Figure
Project No. 60277061	Operable Unit 6 Edwards AFB	1

File:\\usscr1fs001\prod\Projects\ENV\Edwards AFB\60318504 – TO 0287 NASA OU6 5YR Review Add\7.0 Deliverables\7.2 CADD\First Five Yr Review_September 2014\Appendix\Figure 1 OU 6 Exposure Pathways.dwg
Date: Wednesday, September 10, 2014

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TABLE 1. HUMAN HEALTH RISK SCREENING - DIRECT CONTACT (TAPWATER) PATHWAY (HYPOTHETICAL FUTURE RESIDENTIAL)
SITE N1

			2003 HHRA Hypothetical Future Residential Risk Results [1]					2012 Hypothetical Future Residential Risk Results [2]	
Analyte	2003 HHRA Maximum Detected Concentration (μg/L)	Tapwater PRG (μg/L)	Cancer Risk	Hazard Quotient	2012 Maximum Detected Concentration (μg/L)	Cancer RSL (μg/L)	Non-cancer RSL (μg/L)	Cancer Risk	Hazard Quotient
1,1-dichloroethene	1.10	0.05	2E-05	NA	0.38	NA	280	NA	<0.01
1,1,2-trichloroethane	0.22	0.20	1E-06	NA	---	---	---	---	---
1,1,2,2-tetrachloroethane	1.30	0.06	2E-05	NA	---	---	---	---	---
1,2,4-trimethylbenzene	7.40	12.3	NA	0.6	---	---	---	---	---
2-butanone (MEK)	3.70	1,904	NA	<0.01	---	---	---	---	---
2-hexanone	13	158	NA	0.08	---	---	---	---	---
acetone	9.70	608	NA	0.02	---	---	---	---	---
bromodichloromethane	4.50	0.18	2E-05	NA	---	---	---	---	---
carbon disulfide	2.50	1,043	NA	<0.01	---	---	---	---	---
chloroform	18	0.16	1E-04	NA	0.37	0.22	97	2E-06	<0.01
cis-1,2-dichloroethene	50	60.8	NA	0.8	8.3	NA	36	NA	0.23
ethylbenzene	3.00	1,340	NA	<0.01	---	---	---	---	---
methylene chloride	0.47	4.3	1E-07	NA	---	---	---	---	---
naphthalene	0.56	6.2	NA	0.09	---	---	---	---	---
N-nitrosodimethylamine (NDMA)	0.03	0.001	2E-05	NA	---	---	---	---	---
tetrachloroethene (PCE)	0.32	1.1	3E-07	NA	---	---	---	---	---
toluene	0.24	723	NA	<0.01	---	---	---	---	---
trans-1,2-dichloroethene	3.30	122	NA	0.03	0.49	NA	360	NA	<0.01
trichloroethene (TCE)	810	1.6	5E-04	NA	110	0.49	2.8	2E-04	39.3
xylenes, total	6.60	1,400	NA	<0.01	---	---	---	---	---
		Total :	7E-04	2			Total :	2E-04	40

Notes:

[1]Calculated as the ratio of the maximum detected concentration to the PRG for noncarcinogens. This ratio is multiplied by 1×10^{-6} for carcinogens (Earth Tech 2001).

[2] Calculated as the ratio of the maximum detected concentration to the RSL for noncarcinogens. This ratio is multipied by 1×10^{-6} for carcinogens.

--- not detected above reporting limit, therefore RSLs and/or PRGs are not indicated and risk and hazards are not calculated.
μg/L micrograms per liter
HHRA human health risk assessment
NA not applicable/available, toxicity values were not available in 2003 and/or toxicity values are not currently available.
PRG Preliminary Remediation Goal (USEPA 2000)
RSL USEPA Regional Screening Levels for tapwater (May 2014)
USEPA United States Environmental Protection Agency

The PRG for n-hexane was used for 2-hexanone.

TABLE 2. HUMAN HEALTH RISK SCREENING - DIRECT CONTACT (TAPWATER) PATHWAY (HYPOTHETICAL FUTURE RESIDENTIAL)
SITE N2
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Analyte	2003 HHRA Maximum Detected Concentration (µg/L)	Tapwater PRG (µg/L)	2003 HHRA Hypothetical Future Residential Risk Results [1]		2012 Maximum Detected Concentration (µg/L)	Cancer RSL (µg/L)	Non-cancer RSL (µg/L)	2012 Hypothetical Future Residential Risk Results[2]	
			Cancer risk	Hazard Quotient				Cancer Risk	Hazard Quotient
1,1-dichloroethene	0.68	0.05	1E-05	NA	---	---	---	---	---
1,1,2-trichlorotrifluoroethane	---	---	---	---	0.27	NA	55,000	NA	<0.01
1,2-dichloropropane	3.60	0.16	2E-05	NA	---	---	---	---	---
1,2,4-trimethylbenzene	0.61	12.3	NA	0.05	---	---	---	---	---
1,3,5-trimethylbenzene	0.24	12.3	NA	0.02	---	---	---	---	---
1,4-dioxane	1.70	6.1	3E-07	NA	---	---	---	---	---
2-butanone (MEK)	5.00	1,904	NA	<0.01	0.57	NA	5,600	NA	<0.01
4-methyl-2-pentanone (MIBK)	0.68	158	NA	<0.01	---	---	---	---	---
acetone	980	608	NA	1.61	---	---	---	---	---
benzene	0.28	0.35	8E-07	NA	---	---	---	---	---
bromodichloromethane	0.72	0.18	4E-06	NA	---	---	---	---	---
carbon disulfide	1.30	1,043	NA	<0.01	---	---	---	---	---
chloroform	5.60	0.16	3E-05	NA	0.34	0.22	97	2E-06	<0.01
cis-1,2-dichloroethene	890	60.8	NA	15	1.5	NA	36	NA	0.04
dibromochloromethane	1.90	0.13	1E-05	NA	---	---	---	---	---
methylene chloride	76	4.3	2E-05	NA	---	---	---	---	---
naphthalene	9.50	6.2	NA	1.53	---	---	---	---	---
N-nitrosodimethylamine (NDMA)	0.005	0.001	3E-06	NA	---	---	---	---	---
p-cymene (p-isopropyltoluene)	0.14	658	NA	<0.01	---	---	---	---	---
sec-butylbenzene	0.11	60.8	NA	<0.01	---	---	---	---	---
tetrachloroethene (PCE)	5.80	1.1	5E-06	NA	---	---	---	---	---
toluene	48	723	NA	0.07	---	---	---	---	---
trans-1,2-dichloroethene	1.40	122	NA	0.01	---	---	---	---	---
trichloroethene (TCE)	4,100	1.6	3E-03	NA	11	0.49	2.8	2E-05	4
xylene (m,p)	13	1,400	NA	<0.01	---	---	---	---	---
xylene (o)	6.80	1,400	NA	<0.01	---	---	---	---	---
		Total:	3E-03	20			Total :	2E-05	4

TABLE 2. HUMAN HEALTH RISK SCREENING - DIRECT CONTACT (TAPWATER) PATHWAY (HYPOTHETICAL FUTURE RESIDENTIAL)
SITE N2
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Notes:

[1] Calculated as the ratio of the maximum detected concentration to the PRG for noncarcinogens. This ratio is multiplied by 1×10^{-6} for carcinogens (Earth Tech 2001).

[2] Calculated as the ratio of the maximum detected concentration to the RSL for noncarcinogens. This ratio is multipied by 1×10^{-6} for carcinogens.

--- not detected above reporting limit, therefore RSLs and/or PRGs are not indicated and risk and hazards are not calculated.
µg/L micrograms per liter
HHRA human health risk assessment
NA not applicable/available, toxicity values were not available in 2003 and/or toxicity values are not currently available.
PRG Preliminary Remediation Goal (USEPA 2000)
RSL USEPA Regional Screening Levels for tapwater (May 2014)
USEPA United States Environmental Protection Agency
The PRG for isopropylbenzene (cumene) was used for p-isopropyltoluene (p-cymene).

TABLE 3. HUMAN HEALTH RISK SCREENING - DIRECT CONTACT (TAPWATER) PATHWAY (HYPOTHETICAL FUTURE RESIDENTIAL)
SITE N3

			2003 HHRA Hypothetical Future Residential Risk Results [1]					2012 Hypothetical Future Residential Risk Results[2]	
Analyte	2003 HHRA Maximum Detected Concentration (μg/L)	Tapwater PRG (μg/L)	Cancer risk	Hazard Quotient	2012 Maximum Detected Concentration (μg/L)	Cancer RSL (μg/L)	Non-cancer RSL (μg/L)	Cancer Risk	Hazard Quotient
1,1,2-trichloroethane	1.4	0.20	7E-06	NA	---	---	---	---	---
1,1-dichloroethene	3.9	0.05	9E-05	NA	0.61	NA	280	NA	<0.01
1,2,3-trichlorobenzene	660	194	NA	3.39	---	---	---	---	---
1,2,4-trimethylbenzene	4,400	12.3	NA	356.96	980	NA	15	NA	65
1,2-dichlorobenzene	9.60	370	NA	0.03	0.16	NA	300	NA	<0.01
1,2-dichloroethane	860	0.12	7E-03	NA	67	0.17	13	4E-04	5
1,2-dichloropropane	7.70	0.16	5E-05	NA	---	---	---	---	---
1,3,5-trimethylbenzene	1,200	12.3	NA	97.35	730	NA	120	NA	6
1-methylnaphthalene	200	6.2	NA	32.26	---	---	---	---	---
2-butanone (MEK)	1,700	1,904	NA	0.89	57	NA	5,600	NA	0.01
2-hexanone	62	158	NA	0.39	110	NA	38	NA	3
2-methylnaphthalene	190	6.2	NA	30.65	---	---	---	---	---
2-methylphenol	46	1,825	NA	0.03	---	---	---	---	---
4-chlorotoluene	110	122	NA	0.90	---	---	---	---	---
4-methyl-2-pentanone (MIBK)	28	158	NA	0.18	---	---	---	---	---
4-methylphenol	18	182	NA	0.10	---	---	---	---	---
acetone	9,800	608	NA	16.11	31	NA	14,000	NA	<0.01
benzene	13,000	0.35	4E-02	NA	3,900	0.45	33	9E-03	118
bromobenzene	---	---	---	---	0.41	NA	62	NA	<0.01
bromochloromethane	1.2	0.18	NA	6.64	4.7	NA	83	NA	0.06
bromodichloromethane	47	0.18	3E-04	NA	---	---	---	---	---
bromoform	---	---	---	---	3.6	9.2	380	4E-07	<0.01
carbon disulfide	410	1,043	NA	0.39	0.7	NA	810	NA	<0.01
carbon tetrachloride	14,000	0.17	8E-02	NA	7,400	0.45	49	2E-02	151
chloroform	4,200	0.16	3E-02	NA	1,100	0.22	97	5E-03	11
chloromethane	23	1.5	2E-05	NA	0.65	NA	190	NA	<0.01
cis-1,2-dichloroethene	1,800	60.8	NA	29.59	5100	NA	36	NA	142
dibromochloromethane	---	---	---	---	0.26	0.17	380	2E-06	<0.01
dibromomethane	13	60.8	NA	0.21	---	---	---	---	---
dichlorofluoromethane (Freon 21)	2	395	NA	<0.01	---	---	---	---	---
ethylbenzene	2,600	1,340	NA	1.94	1,200	1.5	810	8E-04	1
ethylene dibromide	330	0.0008	4E-01	NA	12	0.0075	17	2E-03	0.7
isopropylbenzene (cumene)	210	658	NA	0.32	100	NA	660	NA	0.2
methylene chloride	4,000	4.3	9E-04	NA	23	11	110	2E-06	0.2
naphthalene	140,000	6.2	NA	22,569.94	420	0.17	6.1	2E-03	69
n-butylbenzene	140	60.8	NA	2.30	21	NA	1,000	NA	0.02
N-nitrosodimethylamine (NDMA)	0.17	0.001	1E-04	NA	0.091	0.00049	0.16	2E-04	1
n-propylbenzene	470	60.8	NA	7.73	270	NA	660	NA	0.4
organic lead	0.94	0.004	NA	261.11	14	NA	190	NA	0.07
p-cymene (p-isopropyltoluene)	78	658	NA	0.12	---	---	---	---	---
phenol	45	21,900	NA	<0.01	---	---	---	---	---
sec-butylbenzene	40	60.8	NA	0.66	23	NA	2,000	NA	0.01
styrene	100	1,641	NA	0.06	---	---	---	---	---
tert-butylbenzene	700	60.8	NA	11.51	0.63	NA	690	NA	<0.01
tetrachloroethene (PCE)	4.70	1.1	4E-06	NA	0.495	11	41	5E-08	0.01
toluene	31,000	723	NA	42.85	1,400	NA	1,100	NA	1
t-butyl alcohol	---	---	---	---	120	NA	40,000	NA	<0.01
trans-1,2-dichloroethene	0.75	122	NA	<0.01	0.95	NA	360	NA	<0.01
trans-1,3-dichloropropene	8.50	0.40	NA	21.25	---	---	---	---	---
trichloroethene (TCE)	65,000	1.6	4E-02	NA	66,000	0.49	2.8	1E-01	23,571
vinyl acetate	10	412	NA	0.02	---	---	---	---	---
vinyl chloride	2.60	0.04	6E-05	NA	---	---	---	---	---
xylene (m,p)	17,000	1,400	NA	12.14	---	---	---	---	---
xylene (o)	8,400	1,400	NA	6.00	---	---	---	---	---
xylenes, total	---	---	---	---	2,220	NA	190	NA	12
		Total:	6E-01	20,000				Total : 2E-01	20,000

Notes:

[1] Calculated as the ratio of the maximum detected concentration to the PRG for noncarcinogens. This ratio is multiplied by 1 x 10^{-6} for carcinogens (Earth Tech 2001).

[2] Calculated as the ratio of the maximum detected concentration to the RSL for noncarcinogens. This ratio is multipied by 1 x 10^{-6} for carcinogens.

--- not detected above reporting limit, therefore RSLs and/or PRGs are not indicated and risk and hazards are not calculated.
μg/L micrograms per liter
HHRA human health risk assessment
NA not applicable/available, toxicity values were not available in 2003 and/or toxicity values are not currently available.
PRG Preliminary Remediation Goal (USEPA 2000)
RSL USEPA Regional Screening Levels for tapwater (May 2014)
USEPA United States Environmental Protection Agency

The PRG for 1,2,4-trichlorobenzene was used for 1,2,3-trichlorobenzene.

The PRG for napthalene was used for 1-methylnapthalene and 2-methylnaphthalene.

The PRG for n-hexane was used for 2-hexanone.

The PRG for 2-chlorotoluene was used for 4-chlorotoluene.

The PRG for bromodichloromethane was used for bromochloromethane.

The PRG for dichlorodifluoromethane was used for dichlorofluoromethane.

The PRG for isopropylbenzene (cumene) was used for p-isopropyltoluene (p-cymene).

The PRG for 1,3-dichloropropene was used for trans-1,3-dichloropropene.

n-propylbenzene used as a surrogate for isopropylbenzene.

TABLE 4. HUMAN HEALTH RISK SCREENING - DIRECT CONTACT (TAPWATER) PATHWAY (HYPOTHETICAL FUTURE RESIDENTIAL)
SITE N4

			2003 HHRA Hypothetical Future Residential Risk Results [1]					2012 Hypothetical Future Residential Risk Results [2]	
Analyte	2003 HHRA Maximum Detected Concentration (μg/L)	Tapwater PRG (μg/L)	Cancer Risk	Hazard Quotient	2012 Maximum Detected Concentration (μg/L)	Cancer RSL (μg/L)	Non-cancer RSL (μg/L)	Cancer Risk	Hazard Quotient
1,2-dichloroethane	6.4	0.12	5E-05	NA	3.1	0.17	13	2E-05	0.2
1,1,2-trichlorotrifluoroethane	---	---	---	---	1.2	NA	55,000	NA	<0.01
acetone	1.1	608	NA	<0.01	---	---	---	---	---
bromochloromethane	0.24	0.18	1E-06	NA	---	---	---	---	---
bromodichloromethane	13	0.18	7E-05	NA	1.4	0.13	380	1E-05	<0.01
bromoform	---	---	---	---	0.32	9.2	380	3E-08	<0.01
benzene	32	0.35	9E-05	NA	---	---	---	---	---
carbon disulfide	0.43	1,043	NA	<0.01	---	---	---	---	---
carbon tetrachloride	74	0.17	4E-04	NA	370	0.45	49	8E-04	8
chloroform	39	0.16	2E-04	NA	68	0.22	97	3E-04	0.7
chloromethane	---	---	---	---	0.26	NA	190	NA	<0.01
cis-1,2-dichloroethene	24	60.8		0.39	14	NA	36	NA	0.4
dibromochloromethane	3.00	0.13	2E-05	NA	0.26	0.17	380	2E-06	<0.01
methylene chloride	0.28	4.3	7E-08	NA	---	---	---	---	---
naphthalene	3.7	6.2	NA	0.60	0.2	0.17	6.1	1E-06	0.03
N-nitrosodimethylamine (NDMA)	---	---	---	---	0.0029	0.00049	0.16	6E-06	0.0
tetrachloroethene (PCE)	10	1.1	9E-06	NA	3.2	11	41	3E-07	0.08
trans-1,2-dichloroethene	1.7	122	NA	0.01	0.26	NA	360	NA	<0.01
trichloroethene (TCE)	350	1.6	2E-04	NA	580	0.49	2.8	1E-03	207
xylene (o)	1.6	1,400	NA	<0.01	---	---	---	---	---
		Total:	1E-03	1			Total :	2E-03	200

Notes:

[1] Calculated as the ratio of the maximum detected concentration to the PRG for noncarcinogens. This ratio is multiplied by 1×10^{-6} for carcinogens (Earth Tech 2001).

[2] Calculated as the ratio of the maximum detected concentration to the RSL for noncarcinogens. This ratio is multipied by 1×10^{-6} for carcinogens.

--- not detected above reporting limit, therefore RSLs and/or PRGs are not indicated and risk and hazards are not calculated.
μg/L micrograms per liter
HHRA human health risk assessment
NA not applicable/available, toxicity values were not available in 2003 and/or toxicity values are not currently available.
PRG Preliminary Remediation Goal (USEPA 2000)
RSL USEPA Regional Screening Levels for tapwater (May 2014)
USEPA United States Environmental Protection Agency

TABLE 5. HUMAN HEALTH RISK SCREENING - DIRECT CONTACT (TAPWATER) PATHWAY (HYPOTHETICAL FUTURE RESIDENTIAL)
SITE N7
(Page 1 of 2)

			2003 HHRA Hypothetical Future Residential Risk Results [1]					2012 Hypothetical Future Residential Risk Results [2]	
Analyte	Maximum Detected Concentration (µg/L)	Tapwater PRG (µg/L)	Cancer Risk	Hazard Quotient	2012 Maximum Detected Concentration (µg/L)	Cancer RSL (µg/L)	Non-cancer RSL (µg/L)	Cancer Risk	Hazard Quotient
1,1,2,2-tetrachloroethane	1.10	0.06	2.E-05	NA	---	---	---	---	---
1,1,2-trichloroethane	0.87	0.20	4.E-06	NA	---	---	---	---	---
1,1-dichloroethene	7.90	0.05	2.E-04	NA	---	---	---	---	---
1,2,3-trichlorobenzene	14	194	NA	0.07	---	---	---	---	---
1,2,3-trichloropropane	0.45	0.002	3.E-04	NA	---	---	---	---	---
1,2,4-trichlorobenzene	0.57	194	NA	<0.01	---	---	---	---	---
1,2,4-trimethylbenzene	100	12.3	NA	8.11	---	---	---	---	---
1,2-dibromo-3-chloropropane	1.40	0.005	3.E-04	NA	---	---	---	---	---
1,2-dichlorobenzene	0.24	370	NA	<0.01	---	---	---	---	---
1,2-dichloroethane	130	0.12	1.E-03	NA	---	---	---	---	---
1,2-dichloropropane	7.60	0.16	5.E-05	NA	---	---	---	---	---
1,3,5-trimethylbenzene	0.38	12.3	NA	0.03	---	---	---	---	---
2-butanone (MEK)	52	1,904	NA	0.03	0.81	NA	5,600	NA	<0.01
4-methyl-2-pentanone (MIBK)	0.79	158	NA	<0.01	---	---	---	---	---
acetone	680	608	NA	1.12	---	---	---	---	---
benzene	2.70	0.35	8.E-06	NA	---	---	---	---	---
bromodichloromethane	4.20	0.18	2.E-05	NA	---	---	---	---	---
bromoform	---	---	---	---	1.1	9.2	380	1E-07	<0.01
carbon disulfide	0.75	1,043	NA	<0.01	---	---	---	---	---
carbon tetrachloride	20	0.17	1.E-04	NA	---	---	---	---	---
chloroform	12	0.16	7.E-05	NA	1.6	0.22	97	7E-06	0.02
cis-1,2-dichloroethene	3,700	60.8	NA	60.82	920	NA	36	NA	26
dibromochloromethane	0.32	0.13	2.E-06	NA	0.5	0.17	380	3E-06	<0.01
dichlorodifluoromethane (Freon 12)	5	395	NA	0.01	---	---	---	---	---
dichloroiodomethane	4	0.18	2.E-05	NA	---	---	---	---	---
ethylbenzene	50	1,340	NA	0.04	---	---	---	---	---
Freon 113	0.33	59,180	NA	<0.01	---	---	---	---	---
methylene chloride	84	4.3	2.E-05	NA	---	---	---	---	---
naphthalene	30	6.2	NA	4.84	---	---	---	---	---
N-nitrosodimethylamine (NDMA)	0.01	0.001	1.E-05	NA	---	---	---	---	---
n-propylbenzene	0.30	60.8	NA	<0.01	---	---	---	---	---
sec-butylbenzene	0.49	60.8	NA	<0.01	---	---	---	---	---

TABLE 5. HUMAN HEALTH RISK SCREENING - DIRECT CONTACT (TAPWATER) PATHWAY (HYPOTHETICAL FUTURE RESIDENTIAL)
SITE N7
(Page 2 of 2)

			2003 HHRA Hypothetical Future Residential Risk Results [1]					2012 Hypothetical Future Residential Risk Results [2]	
Analyte	Maximum Detected Concentration (µg/L)	Tapwater PRG (µg/L)	Cancer Risk	Hazard Quotient	2012 Maximum Detected Concentration (µg/L)	Cancer RSL (µg/L)	Non-cancer RSL (µg/L)	Cancer Risk	Hazard Quotient
tetrachloroethene (PCE)	4.10	1.1	4.E-06	NA	---	---	---	---	---
toluene	460	723	NA	0.64	---	---	---	---	---
trans-1,2-dichloroethene	12	122	NA	0.10	8.2	NA	360	NA	0.02
trichloroethene (TCE)	6,800	1.6	4.E-03	NA	880	0.49	2.8	2E-03	314
vinyl chloride	2.40	0.04	6.E-05	NA	---	---	---	---	---
xylene (m,p)	340	1,400	NA	0.24	---	---	---	---	---
xylene (o)	200	1,400	NA	0.14	---	---	---	---	---
		Total:	6E-03	80			Total :	2E-03	300

Notes:

[1] Calculated as the ratio of the maximum detected concentration to the PRG for noncarcinogens. This ratio is multiplied by 1 x 10^{-6} for carcinogens (Earth Tech 2001).

[2] Calculated as the ratio of the maximum detected concentration to the RSL for noncarcinogens. This ratio is multipied by 1 x 10^{-6} for carcinogens.

--- not detected above reporting limit, therefore RSLs and/or PRGs are not indicated and risk and hazards are not calculated.
µg/L micrograms per liter
HHRA human health risk assessment
NA not applicable/available, toxicity values were not available in 2003 and/or toxicity values are not currently available.
PRG Preliminary Remediation Goal (USEPA 2000)
RSL USEPA Regional Screening Levels for tapwater (May 2014)
USEPA United States Environmental Protection Agency
The PRG for 1,2,4-trichlorobenzene was used for 1,2,3-trichlorobenzene.
The PRG for bromodichloromethane was used for dichloroiodomethane.

TABLE 6. HUMAN HEALTH RISKS AND HAZARDS FOR INDOOR AIR VAPOR INTRUSION - RELATED COMPOUNDS

	March 2013				August 2013			
	Hypothetical Future Residential Scenario		Industrial Scenario		Hypothetical Future Residential Scenario		Industrial Scenario	
Building 4806	Risk Range	Reference[a]	Risk Range	Reference[a]	Risk Range	Reference[a]	Risk Range	Reference[a]
CERCLA IASLs								
Cancer Risk	3E-06 to 5E-06	This Document: Table 15	7E-07 to 1E-06	Attachment B: Table 17	3E-06 to 1E-05	This Document: Table 17	1E-06 to 3E-06	Attachment B: Table 19
HI	0.04 to 0.08	This Document: Table 15	0.01 to 0.02	Attachment B: Table 17	0.2 to 0.7	This Document: Table 17	0.04 to 0.2	Attachment B: Table 19
DTSC IASLs								
Cancer Risk	1E-05 to 2E-05	This Document: Table 16	3E-06 to 4E-06	Attachment B: Table 18	1E-05 to 2E-05	This Document: Table 18	3E-06 to 5E-06	Attachment B: Table 20
HI	0.4 to 0.6	This Document: Table 16	0.09 to 0.1	Attachment B: Table 18	0.4 to 1	This Document: Table 18	0.1 to 0.2	Attachment B: Table 20
Building 4807								
CERCLA IASLs								
Cancer Risk	---	This Document: Table 19	---	Attachment B: Table 21	3E-06 to 2E-05	This Document: Table 21	6E-07 to 5E-06	Attachment B: Table 23
HI	<0.01	This Document: Table 19	<0.01	Attachment B: Table 21	0.07 to 0.4	This Document: Table 21	0.02 to 0.1	Attachment B: Table 23
DTSC IASLs								
Cancer Risk	---	This Document: Table 20	---	Attachment B: Table 22	1E-05 to 9E-05	This Document: Table 22	2E-06 to 2E-05	Attachment B: Table 24
HI	<0.01	This Document: Table 20	<0.01	Attachment B: Table 22	0.3 to 2[b]	This Document: Table 22	0.08 to 0.6	Attachment B: Table 24
Building 4810								
CERCLA IASLs								
Cancer Risk	1E-06 to 5E-06	This Document: Table 23	3E-07 to 1E-06	Attachment B: Table 25	2E-06 to 2E-05	This Document: Table 25	4E-07 to 4E-06	Attachment B: Table 27
HI	0.08 to 0.3	This Document: Table 23	0.02 to 0.06	Attachment B: Table 25	0.1 to 1	This Document: Table 25	0.03 to 0.3	Attachment B: Table 27
DTSC IASLs								
Cancer Risk	5E-06 to 2E-05	This Document: Table 24	9E-07 to 3E-06	Attachment B: Table 26	2E-06 to 2E-05	This Document: Table 26	4E-07 to 4E-06	Attachment B: Table 28
HI	0.2 to 0.6	This Document: Table 24	0.05 to 0.2	Attachment B: Table 26	0.1 to 1	This Document: Table 26	0.03 to 0.3	Attachment B: Table 28

Notes:

[a] Location of detailed risk data.

[b] Not expressed on a target organ basis and therefore the non-cancer risks are likely over estimated. Primary hazard driver is benzene which affects the hematopoietic system (specifically blood cell formation). Secondary hazard drivers include carbon disulfide (affecting the nervous system) and dichlorodifluoromethane.

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
DTSC California Department of Toxic Substances Control
HI Hazard Index
IASL indoor air screening level

TABLE 7. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDINGS 4806/07 (USAF/CERCLA APPROACH) - MARCH 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		5,214															
1,1,1,2-tetrachloroethane	0.38																
1,1,2,2-tetrachlorethane	0.05																
1,1,2-trichoroethane	0.18	0.2															
1,1,2-trichlorotrifluoroethane		31,286	0.56		<0.01	0.6		<0.01	0.56		<0.01	0.57		<0.01	0.57		<0.01
1,1-dichloroethane	1.80																
1,1-dichloroethene		209															
1,2,4-trichlorobenzene		2.1															
1,2,4-trimethylbenzene		7	1.7		0.2	2.7		0.4	3.4		0.5	3.9		0.5	3.8		0.5
1,2-dichlorobenzene		209															
1,2-dichloroethane	0.11	7.3															
1,2-dichloropropane	0.28	4.2															
1,2-dichlorotetrafluoroethane		31,286															
1,3,5-trimethylbenzene		7.3	0.54		0.07	0.75		0.1	0.92		0.1	1.1		0.2	1		0.1
1,3-butadiene	0.09	2.1															
1,3-dichlorobenzene		209															
1,4-dichlorobenzene	0.26	834	0.14	5E-07	<0.01												
2-butanone (MEK)		5,214	6.5		<0.01	2.8		<0.01	2.5		<0.01	2.6		<0.01	2.8		<0.01
2-hexanone		31															
4-ethyltoluene		104	1.7		0.02	2.4		0.02	3.0		0.03	3.3		0.03	3.2		0.03
4-methyl-2-pentanone (MIBK)		3,129															
acetone		32,329	18		<0.01	17		<0.01	17		<0.01	19		<0.01	12		<0.01
acrylonitrile	0.04	2.1															
benzene	0.36	31	1.1	3E-06	0.04	1.3	4E-06	0.04	1.5	4E-06	0.05	1.8	5E-06	0.06	1.8	5E-06	0.06
benzyl chloride	0.06	1.0															
bromodichloromethane	0.08																
bromoform	2.60																
bromomethane		5.2	0.17		0.03	0.19		0.04	0.18		0.03	0.22		0.04	0.21		0.04
carbon disulfide		730	2.2		<0.01	0.69		<0.01	0.46		<0.01	0.28		<0.01	1.5		<0.01
carbon tetrachloride	0.47	104	0.46	1E-06	<0.01	0.42	9E-07	<0.01	0.43	9E-07	<0.01	0.44	9E-07	<0.01	0.41	9E-07	<0.01
chlorobenzene		52															
chloroethane		10,429															
chloroform	0.12	313										20	2E-04	0.06			
chloromethane		94	1.3		0.01	1.3		0.01	1.3		0.01	1.4		0.01	1.2		0.01
cis-1,2-dichloroethene		7.3															
cis-1,3-dichloropropene	0.70	21	0.28	4E-07	0.01	0.077	1E-07	<0.01	0.06	9E-08	<0.01	0.071	1E-07	<0.01			
cyclohexane		6,257	0.64		<0.01	1.2		<0.01	1.4		<0.01	1.6		<0.01	1.3		<0.01
dibromochloromethane	0.10																
dichlorodifluoromethane		104	2.5		0.02	2.7		0.03	2.7		0.03	2.8		0.03	2.8		0.03
ethanol		7,300	37		<0.01	21		<0.01	23		<0.01	30		<0.01	27		<0.01
ethyl acetate		73				0.69		<0.01	0.9			0.9			1.1		
ethylbenzene	1.10	1,043	1.9	2E-06	<0.01	1.6	1E-06	<0.01	2.0	2E-06	<0.01	2.2	2E-06	<0.01	2.0	2E-06	<0.01
ethylene dibromide (EDB)	0.005	9.4															
hexachlorobutadiene	0.13																
isopropanol		7,300	4		<0.01	2		<0.01	2.6			11			3.9		
isopropylbenzene		1,043	0.56		<0.01				0.14		<0.01	0.17		<0.01	0.14		<0.01
m- & *p*-xylene		104	5.1		0.05	6.7		0.06	8.1		0.08	9.0		0.09	8.7		0.08
methyl tert-butyl ether (MTBE)	11	3,129															

TABLE 7. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDINGS 4806/07 (USAF/CERCLA APPROACH) - MARCH 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methylene chloride	100	626															
naphthalene	0.08	3.1				0.63	8E-06	0.20	0.83	1E-05	0.3	0.94	1E-05	0.3	0.89	1E-05	0.28
n-butyl benzene		1,043	0.36		<0.01	0.35		<0.01	0.45		<0.01	0.72		<0.01	0.52		<0.01
n-heptane		730	1.2		<0.01	1.8		<0.01	2		<0.01	2.1		<0.01	2		<0.01
n-hexane		730	2.1		<0.01	4.0		<0.01	5.4		<0.01	8.2		0.01	10		0.01
o-xylene		104	1.9		0.02	2.5		0.02	3.0		0.03	3.3		0.03	3.1		0.03
p-isopropyltoluene		1,043	0.87		<0.01				0.55		<0.01	0.16		<0.01	0.42		<0.01
propene		3,129															
sec-butyl benzene		1,043															
styrene		1,043	0.22		<0.01	0.15		<0.01	0.15		<0.01	0.19		<0.01	0.21		<0.01
tetrachloroethene (PCE)	11.00	42															
tetrahydrofuran		2,100	0.56		<0.01	0.28		<0.01	0.18		<0.01	0.19		<0.01	0.53		<0.01
toluene		5,214	6		<0.01	8.5		<0.01	9.3		<0.01	10		<0.01	10		<0.01
trans-1,2-dichloroethene		210															
trans-1,3-dichloropropene	0.70	21															
trichloroethene (TCE)	0.48	2.1															
trichlorofluoromethane		730	2.5		<0.01	1.7		<0.01	1.8		<0.01	1.5		<0.01	1.3		<0.01
vinyl chloride	0.17	104															
Cumulative Risks and Hazard Indices:				7E-06	0.5		1E-05	0.9		2E-05	1		2E-04	1		2E-05	1

TABLE 7. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDINGS 4806/07 (USAF/CERCLA APPROACH) - MARCH 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		5,214												
1,1,1,2-tetrachloroethane	0.38													
1,1,2,2-tetrachlorethane	0.05													
1,1,2-trichoroethane	0.18	0.2												
1,1,2-trichlorotrifluoroethane		31,286	0.64		<0.01	0.59		<0.01	0.6		<0.01	0.6		<0.01
1,1-dichloroethane	1.80													
1,1-dichloroethene		209												
1,2,4-trichlorobenzene		2.1												
1,2,4-trimethylbenzene		7.3	2.0		0.3	2.4		0.3	8.2		1	8.2		1
1,2-dichlorobenzene		209												
1,2-dichloroethane	0.11	7.3												
1,2-dichloropropane	0.28	4.2												
1,2-dichlorotetrafluoroethane		31,286						<0.01						
1,3,5-trimethylbenzene		7.3	0.59		0.08	0.7		0.1	2.5		0.3	2.5		0.3
1,3-butadiene	0.09	2.1												
1,3-dichlorobenzene		209												
1,4-dichlorobenzene	0.26	834												
2-butanone (MEK)		5,214	3.0		<0.01	2.3		<0.01	2.6		<0.01	2.6		<0.01
2-hexanone		31												
4-ethyltoluene		104	1.7		0.02	2.1		0.02	6.5		0.06	6.5		0.06
4-methyl-2-pentanone (MIBK)		3,129												
acetone		32,329	18		<0.01	16		<0.01	19		<0.01	19		<0.01
acrylonitrile	0.04	63												
benzene	0.36	31	1.7	5E-06	0.05	2.0	6E-06	0.06	8.3	2E-05	0.3	4.8	1E-05	0.2
benzyl chloride	0.06	1.0												
bromodichloromethane	0.08													
bromoform	2.60													
bromomethane		5.2	0.2		0.04	0.21		0.04	0.17		0.03	0.17		0.03
carbon disulfide		730	0.75		<0.01	2.1		<0.01	1.1		<0.01	1.1		<0.01
carbon tetrachloride	0.47	104	0.42	9E-07	<0.01	0.42	9E-07	<0.01	0.39	8E-07	<0.01	0.39	8E-07	<0.01
chlorobenzene		52												
chloroethane		10,429												
chloroform	0.12	313							0.18	2E-06	<0.01			
chloromethane		94	1.5		0.02	1.3		0.01	1.3		0.01	1.3		0.01
cis-1,2-dichloroethene		7.3												
cis-1,3-dichloropropene	0.70	21	0.11	2E-07	<0.01	0.056	8E-08	<0.01						
cyclohexane		6,257	1.3		<0.01	1.6		<0.01	3.7		<0.01	3.7		<0.01
dibromochloromethane	0.10													
dichlorodifluoromethane		104	2.7		0.03	2.7		0.03	2.7		0.03	2.7		0.03
ethanol		7,300	25		<0.01	23		<0.01	47		<0.01	47		<0.01
ethyl acetate		73	1.2		0.02	0.86		<0.01	1.9			1.9		
ethylbenzene	1.10	1,043	1.4	1E-06	<0.01	1.6	1E-06	<0.01	4.3	4E-06	<0.01	4.3	4E-06	<0.01
ethylene dibromide (EDB)	0.005	9.4												
hexachlorobutadiene	0.13													
isopropanol		7,300	240		0.03	38		<0.01	5.3			5.3		
isopropylbenzene		1,043							0.39		<0.01	0.39		<0.01
m- & *p*-xylene		104	5.3		0.05	6.5		0.06	18		0.2	18		0.2
methyl tert-butyl ether (MTBE)	11	3,129												

TABLE 7. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDINGS 4806/07 (USAF/CERCLA APPROACH) - MARCH 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methylene chloride	100	626												
naphthalene	0.08	3.1							1.5	2E-05	0.5	1.5	2E-05	0.5
n -butyl benzene		1,043	0.33		<0.01	0.26		<0.01	1.4		<0.01	1.4		<0.01
n -heptane		730	1.8		<0.01	2.1		<0.01	4.9		<0.01	4.9		<0.01
n -hexane		730	3.7		<0.01	4.3		<0.01	11		0.02	11		0.02
o -xylene		104	1.9		0.02	2.4		0.02	6.4		0.06	6.4		0.06
p -isopropyltoluene		1,043				0.17		<0.01	0.61		<0.01	0.61		<0.01
propene		3,129												
sec -butyl benzene		1,043							0.35		<0.01	0.35		<0.01
styrene		1,043	0.23		<0.01	0.26		<0.01	0.62		<0.01	0.62		<0.01
tetrachloroethene (PCE)	11.00	42												
tetrahydrofuran		2,100	1.7		<0.01				0.24		<0.01	0.24		<0.01
toluene		5,214	7.6		<0.01	8.9		<0.01	24		<0.01	24		<0.01
trans -1,2-dichloroethene		210												
trans -1,3-dichloropropene	0.70	21												
trichloroethene (TCE)	0.48	2.1												
trichlorofluoromethane		730	2.8		<0.01	3.4		<0.01	3.2		<0.01	3.2		<0.01
vinyl chloride	0.17	104						<0.01						
Cumulative Risks and Hazard Indices:				7E-06	0.7		8E-06	0.7		5E-05	3		4E-05	3

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the hypothetical residential land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the hypothetical residential land use scenario.

$\mu g/m^3$ micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United States Air Force

Surrogate list:

isopropanol is surrogate for ethanol

1,1-dichloroethene used as surrogate for trans-1,2-dichlorethene

xylene is surrogate for 4-ethyltoluene

n -hexane is surrogate for *n* -heptane

isopropylbenzene is surrogate for isopropyltoluene

TABLE 8. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDINGS 4806/07 (DTSC APPROACH) - MARCH 2013

(Page 1 of 4)

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		1,043															
1,1,1,2-tetrachloroethane	0.38	115															
1,1,2,2-tetrachlorethane	0.05	73															
1,1,2-trichoroethane	0.18	15															
1,1,2-trichlorotrifluoroethane		31,286	0.56		<0.01	0.6		<0.01	0.56		<0.01	0.57		<0.01	0.57		<0.01
1,1-dichloroethane	1.80	730															
1,1-dichloroethene		73															
1,2,4-trichlorobenzene	0.24	2.1															
1,2,4-trimethylbenzene		7.3	1.7		0.2	2.7		0.4	3.4		0.5	3.9		0.5	3.8		0.5
1,2-dichlorobenzene		209															
1,2-dichloroethane	0.11	7.3															
1,2-dichloropropane	0.28	4.2															
1,2-dichlorotetrafluoroethane		31,286															
1,3,5-trimethylbenzene		37	0.54		0.01	0.75		0.02	0.92		0.03	1.1		0.03	1		0.03
1,3-butadiene	0.01	2.1															
1,3-dichlorobenzene		209															
1,4-dichlorobenzene	0.26	834	0.14	5E-07	<0.01												
2-butanone (MEK)		5,214	6.5		<0.01	2.8		<0.01	2.5		<0.01	2.6		<0.01	2.8		<0.01
2-hexanone		31															
4-ethyltoluene		104	1.7		0.02	2.4		0.02	3.0		0.03	3.3		0.03	3.2		0.03
4-methyl-2-pentanone (MIBK)		3,129															
acetone		31,286	18		<0.01	17		<0.01	17		<0.01	19		<0.01	12		<0.01
acrylonitrile	0.01	5.2															
benzene	0.08	3.1	1.1	1E-05	0.35	1.3	2E-05	0.42	1.5	2E-05	0.48	1.8	2E-05	0.58	1.8	2E-05	0.58
benzyl chloride	0.06																
bromodichloromethane	0.08	73															
bromoform	2.60	73															
bromomethane		5.2	0.17		0.03	0.19		0.04	0.18		0.03	0.22		0.04	0.21		0.04
carbon disulfide		730	2.2		<0.01	0.69		<0.01	0.46		<0.01	0.28		<0.01	1.5		<0.01
carbon tetrachloride	0.06	42	0.46	8E-06	0.01	0.42	7E-06	0.01	0.43	7E-06	0.01	0.44	8E-06	0.01	0.41	7E-06	<0.01
chlorobenzene		52															
chloroethane		10,429															
chloroform	0.12	102										20	2E-04	0.20			
chloromethane		94	1.3		0.01	1.3		0.01	1.3		0.01	1.4		0.01	1.2		0.01
cis -1,2-dichloroethene		7.3															
cis -1,3-dichloropropene	0.15	21	0.28	2E-06	0.01	0.077	5E-07	<0.01	0.06	4E-07	<0.01	0.071	5E-07	<0.01			
cyclohexane		6,257	0.64		<0.01	1.2		<0.01	1.4		<0.01	1.6		<0.01	1.3		<0.01
dibromochloromethane	0.10	73															
dichlorodifluoromethane		209	2.5		0.01	2.7		0.01	2.7		0.01	2.8		0.01	2.8		0.01
ethanol		7,300	37		<0.01	21		<0.01	23		<0.01	30		<0.01	27		<0.01
ethyl acetate		73				0.69		<0.01	0.9			0.9			1.1		
ethylbenzene	1.10	1,043	1.9	2E-06	<0.01	1.6	1E-06	<0.01	2.0	2E-06	<0.01	2.2	2E-06	<0.01	2.0	2E-06	<0.01
ethylene dibromide (EDB)	0.005	9.4															
hexachlorobutadiene	0.13	3.7															
isopropanol		7,300	4		<0.01	2		<0.01	2.6			11			3.9		
isopropylbenzene		417	0.56		<0.01				0.14		<0.01	0.17		<0.01	0.14		<0.01
m - & *p* -xylene		104	5.1		0.05	6.7		0.06	8.1		0.08	9.0		0.09	8.7		0.08
methyl tert-butyl ether (MTBE)	11	3,129															

TABLE 8. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDINGS 4806/07 (DTSC APPROACH) - MARCH 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methylene chloride	2.4	417															
naphthalene	0.08	3.1				0.63	8E-06	0.2	0.83	1E-05	0.3	0.94	1E-05	0.3	0.89	1E-05	0.3
n-butyl benzene		183	0.36		<0.01	0.35		<0.01	0.45		<0.01	0.72		<0.01	0.52		<0.01
n-heptane		7,300	1.2		<0.01	1.8		<0.01	2		<0.01	2.1		<0.01	2		<0.01
n-hexane		7,300	2.1		<0.01	4.0		<0.01	5.4		<0.01	8.2		<0.01	10		<0.01
o-xylene		104	1.9		0.02	2.5		0.02	3.0		0.03	3.3		0.03	3.1		0.03
p-isopropyltoluene		417	0.87		<0.01				0.55		<0.01	0.16		<0.01	0.42		<0.01
propene		3,129															
sec-butyl benzene		417															
styrene		939	0.22		<0.01	0.15		<0.01	0.15		<0.01	0.19		<0.01	0.21		<0.01
tetrachloroethene (PCE)	0.41	37															
tetrahydrofuran		2,100	0.56		<0.01	0.28		<0.01	0.18		<0.01	0.19		<0.01	0.53		<0.01
toluene		313	6		0.02	8.5		0.03	9.3		0.03	10		0.03	10		0.03
trans-1,2-dichloroethene		73															
trans-1,3-dichloropropene	0.70	21															
trichloroethene (TCE)	0.48	2.1															
trichlorofluoromethane		730	2.5		<0.01	1.7		<0.01	1.8		<0.01	1.5		<0.01	1.3		<0.01
vinyl chloride	0.03	104						<0.01									
Cumulative Risks and Hazard Indices:				3E-05	0.8		3E-05	1.2		4E-05	1		2E-04	1.9		4E-05	1.7

TABLE 8. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDINGS 4806/07 (DTSC APPROACH) - MARCH 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		1,043												
1,1,1,2-tetrachloroethane	0.38	115												
1,1,2,2-tetrachlorethane	0.05	73												
1,1,2-trichoroethane	0.18	15												
1,1,2-trichlorotrifluoroethane		31,286	0.64		<0.01	0.59		<0.01	0.56		<0.01	0.6		<0.01
1,1-dichloroethane	1.80	730												
1,1-dichloroethene		73												
1,2,4-trichlorobenzene		2.1												
1,2,4-trimethylbenzene		7.3	2.0		0.3	2.4		0.3	13		1.8	8.2		1
1,2-dichlorobenzene		209												
1,2-dichloroethane	0.11	7.3												
1,2-dichloropropane	0.28	4.2												
1,2-dichlorotetrafluoroethane		31,286						<0.01						
1,3,5-trimethylbenzene		37	0.59		0.02	0.7		0.02	3.9		0.1	2.5		0.07
1,3-butadiene	0.01	2.1												
1,3-dichlorobenzene		209												
1,4-dichlorobenzene	0.26	834												
2-butanone (MEK)		5,214	3.0		<0.01	2.3		<0.01	6.1		<0.01	2.6		<0.01
2-hexanone		31												
4-ethyltoluene		104	1.7		0.02	2.1		0.02	11		0.11	6.5		0.06
4-methyl-2-pentanone (MIBK)		3,129												
acetone		31,286	18		<0.01	16		<0.01	30		<0.01	19		<0.01
acrylonitrile	0.01	63							1.3	2E-04	0.02			
benzene	0.08	3.1	1.7	2E-05	0.54	2.0	2E-05	0.64	8.3	1E-04	2.7	4.8	6E-05	1.5
benzyl chloride	0.06													
bromodichloromethane	0.08	73												
bromoform	2.60	73												
bromomethane		5.2	0.2		0.04	0.21		0.04	0.28		0.05	0.17		0.03
carbon disulfide		730	0.75		<0.01	2.1		<0.01	1.6		<0.01	1.1		<0.01
carbon tetrachloride	0.06	42	0.42	7E-06	0.01	0.42	7E-06	0.01	0.42	7E-06	0.01	0.39	7E-06	<0.01
chlorobenzene		52												
chloroethane		10,429												
chloroform	0.12	102							0.18	2E-06	<0.01			
chloromethane		94	1.5		0.01596	1.3		0.01	1.4		0.01	1.3		0.01
cis -1,2-dichloroethene		7.3												
cis -1,3-dichloropropene	0.15	21	0.11	7E-07	<0.01	0.056	4E-07	<0.01	0.16	1E-06	<0.01			
cyclohexane		6,257	1.3		<0.01	1.6		<0.01	11		<0.01	3.7		<0.01
dibromochloromethane	0.10	73												
dichlorodifluoromethane		209	2.7		0.01	2.7		0.01	2.8		0.01	2.7		0.01
ethanol		7,300	25		<0.01	23		<0.01	150		0.02	47		<0.01
ethyl acetate		73	1.2		0.02	0.86		<0.01	7.3			1.9		
ethylbenzene	1.10	1,043	1.4	1E-06	<0.01	1.6	1E-06	<0.01	8.3	8E-06	<0.01	4.3	4E-06	<0.01
ethylene dibromide (EDB)	0.005	9.4												
hexachlorobutadiene	0.13	3.7												
isopropanol		7,300	240		0.03	38		<0.01	4.3			5.3		
isopropylbenzene		417							0.63		<0.01	0.39		<0.01
m - & *p* -xylene		104	5.3		0.05	6.5		0.06	34		0.3	18		0.2
methyl tert-butyl ether (MTBE)	11	3,129												

TABLE 8. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDINGS 4806/07 (DTSC APPROACH) - MARCH 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methylene chloride	2.4	417												
naphthalene	0.08	3.1							1.9	2E-05	0.6	1.5	2E-05	0.5
n-butyl benzene		183	0.33		<0.01	0.26		<0.01	1.4		<0.01	1.4		<0.01
n-heptane		7,300	1.8		<0.01	2.1		<0.01	11		<0.01	4.9		<0.01
n-hexane		7,300	3.7		<0.01	4.3		<0.01	34		<0.01	11		<0.01
o-xylene		104	1.9		0.02	2.4		0.02	12		0.12	6.4		0.06
p-isopropyltoluene		417				0.17		<0.01	0.63		<0.01	0.61		<0.01
propene		3,129												
sec-butyl benzene		417							0.21		<0.01	0.35		<0.01
styrene		939	0.23		<0.01	0.26		<0.01	0.55		<0.01	0.62		<0.01
tetrachloroethene (PCE)	0.41	37							0.27	7E-07	<0.01			
tetrahydrofuran		2,100	1.7		<0.01				0.17		<0.01	0.24		<0.01
toluene		313	7.6		0.02	8.9		0.03	43		0.1	24		0.08
trans-1,2-dichloroethene		73												
trans-1,3-dichloropropene	0.70	21												
trichloroethene (TCE)	0.48	2.1												
trichlorofluoromethane		730	2.8		<0.01	3.4		<0.01	5.0		<0.01	3.2		<0.01
vinyl chloride	0.03	104						<0.01						
Cumulative Risks and Hazard Indices:				3E-05	1.1		3E-05	1.2		3E-04	6		9E-05	4

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the hypothetical residential land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the hypothetical residential land use scenario.

$\mu g/m^3$ micrograms per cubic meter

DTSC Department of Toxic Substances Control

HQ Hazard Quotient

Surrogate list:

isopropanol is surrogate for ethanol

1,1-dichloroethene used as surrogate for trans-1,2-dichlorethene

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for *n*-heptane

isopropylbenzene is surrogate for isopropyltoluene

TABLE 9. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDINGS 4806/07 (USAF/CERCLA APPROACH) - AUGUST 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		5,214															
1,1,1,2-tetrachloroethane	0.38																
1,1,2,2-tetrachlorethane	0.05																
1,1,2-trichoroethane	0.18	0.2															
1,1,2-trichlorotrifluoroethane		31,286	0.59		<0.01	0.6		<0.01	0.56		<0.01	0.58		<0.01	0.59		<0.01
1,1-dichloroethane	1.80																
1,1-dichloroethene		209															
1,2,4-trichlorobenzene		2.1															
1,2,4-trimethylbenzene		7.3	2.7		0.4	0.38		0.05	0.35		0.05	0.51		0.07	0.61		0.08
1,2-dichlorobenzene		209															
1,2-dichloroethane	0.11	7.3															
1,2-dichloropropane	0.28	4.2															
1,2-dichlorotetrafluoroethane		31,286															
1,3,5-trimethylbenzene		7.3	0.71		0.1										0.23		0.03
1,3-butadiene	0.09	2.1															
1,3-dichlorobenzene		209															
1,4-dichlorobenzene	0.26	834				0.15	6E-07	<0.01									
2-butanone (MEK)		5,214	4.5		<0.01	5.0		<0.01	1.8		<0.01	2.6		<0.01	6.4		<0.01
2-hexanone		31							0.28		<0.01						
4-ethyltoluene		104	2.2		0.02	0.27		<0.01	0.21		<0.01	0.36		<0.01	0.55		<0.01
4-methyl-2-pentanone (MIBK)		3,129															
acetone		32,329	110		<0.01	21		<0.01	14		<0.01	12		<0.01	20		<0.01
acrylonitrile	0.04	2.1															
benzene	0.36	31	1.2	3E-06	0.04	0.91	3E-06	0.03	0.93	3E-06	0.03	0.77	2E-06	0.02	0.94	3E-06	0.03
benzyl chloride	0.06	1.0													0.24	4E-06	0.23
bromodichloromethane	0.08					0.49	6E-06		0.15	2E-06							
bromoform	2.60								0.34	1E-07							
bromomethane		5.2															
carbon disulfide		730	8.1		0.01	0.72		<0.01	0.41		<0.01	2.2		<0.01	140		0.2
carbon tetrachloride	0.40	104	0.43	1E-06	<0.01	0.48	1E-06	<0.01	0.46	1E-06	<0.01	0.39	1E-06	<0.01	0.43	1E-06	<0.01
chlorobenzene		52															
chloroethane		10,429															
chloroform	0.12	313				0.21	2E-06	<0.01	0.14	1E-06	<0.01	7.9	7E-05	0.03	1.1	9E-06	<0.01
chloromethane		94	1.4		0.01	1.6		0.02	1.3		0.01	1.2		0.01	1.6		0.02
cis -1,2-dichloroethene		7.3															
cis -1,3-dichloropropene	0.70	21													0.097	1E-07	<0.01
cyclohexane		6,257	0.67		<0.01										1.1		<0.01
dibromochloromethane	0.10								0.42	4E-06							
dichlorodifluoromethane		104	8.8		0.08	10		0.1	13		0.1	3.1		0.03	3.9		0.04
ethanol		7,300	20		<0.01	28		<0.01	5.4		<0.01	20		<0.01	14		<0.01
ethyl acetate		73						<0.01									
ethylbenzene	1.10	1,043	1.5	1E-06	<0.01	0.29	3E-07	<0.01	0.15	1E-07	<0.01	0.22	2E-07	<0.01	0.29	3E-07	<0.01
ethylene dibromide (EDB)	0.005	9.4															
hexachlorobutadiene	0.13																
isopropanol		7,300	3.0		<0.01	24		<0.01	1.9			5.3			64		
isopropylbenzene		1,043															
m - & *p* -xylene		104	7.1		0.07	0.99		<0.01	0.77		<0.01	0.87		<0.01	1.2		0.01
methyl tert-butyl ether (MTBE)	11	3,129															

TABLE 9. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDINGS 4806/07 (USAF/CERCLA APPROACH) - AUGUST 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methylene chloride	100	626															
naphthalene	0.08	3.1	0.46	6E-06	0.1	0.72	9E-06	0.2	0.22	3E-06	0.07	0.26	3E-06	0.08	1	1E-05	0.3
n-butyl benzene		1,043	0.39		<0.01	0.77		<0.01	0.25		<0.01	0.33		<0.01			
n-heptane		730	0.97		<0.01												
n-hexane		730	9.4		0.01	2.8		<0.01	2.3		<0.01	5.7		<0.01	220		0.30
o-xylene		104	2.4		0.02	0.35		<0.01	0.21		<0.01	0.32		<0.01	1.2		0.01
p-isopropyltoluene		1,043	0.64		<0.01	0.41		<0.01				0.38		<0.01	3.3		<0.01
propene		3,129															
sec-butyl benzene		1,043															
styrene		1,043	0.51		<0.01	0.16		<0.01							0.13		<0.01
tetrachloroethene (PCE)	11.00	42															
tetrahydrofuran		2,100				0.52		<0.01							0.36		<0.01
toluene		5,214	83		0.02	3.0		<0.01	2.2		<0.01	1.3		<0.01	1.6		<0.01
trans-1,2-dichloroethene		210															
trans-1,3-dichloropropene	0.70	21															
trichloroethene (TCE)	0.48	2.1															
trichlorofluoromethane		730	6.4		<0.01	2.3		<0.01	2.6		<0.01	1.4		<0.01	1.9		<0.01
vinyl chloride	0.17	104															
Cumulative Risks and Hazard Indices:				1E-05	0.9		2E-05	0.5		1E-05	0.3		7E-05	0.3		3E-05	1.3

TABLE 9. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDINGS 4806/07 (USAF/CERCLA APPROACH) - AUGUST 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4806IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		5,214												
1,1,1,2-tetrachloroethane	0.38		0.17	4E-07										
1,1,2,2-tetrachlorethane	0.05													
1,1,2-trichoroethane	0.18	0.2												
1,1,2-trichlorotrifluoroethane		31,286	0.59		<0.01	0.58		<0.01	0.51		<0.01	0.53		<0.01
1,1-dichloroethane	1.80													
1,1-dichloroethene		209												
1,2,4-trichlorobenzene		2.1												
1,2,4-trimethylbenzene		7.3	3.6		0.5	5.1		0.7	33		4.5	1.1		0.2
1,2-dichlorobenzene		209												
1,2-dichloroethane	0.11	7.3												
1,2-dichloropropane	0.28	4.2												
1,2-dichlorotetrafluoroethane		31,286						<0.01						
1,3,5-trimethylbenzene		7.3	1.1		0.2	1.5		0.2	11		1.5	0.28		0.04
1,3-butadiene	0.09	2.1												
1,3-dichlorobenzene		209												
1,4-dichlorobenzene	0.26	834										0.14	5E-07	<0.01
2-butanone (MEK)		5,214	2.9		<0.01	3.0		<0.01	170		0.03	3.6		<0.01
2-hexanone		31							1.9		0.06			
4-ethyltoluene		104	3.2		0.03	4.5		0.04	32		0.3	0.84		<0.01
4-methyl-2-pentanone (MIBK)		3,129										0.62		<0.01
acetone		32,329	17		<0.01	19		<0.01	72		<0.01	19		<0.01
acrylonitrile	0.04	62.6							2	5E-05	0.03			
benzene	0.36	3.1	1.6	4E-06	0.51	1.2	3E-06	0.38	7.4	2E-05	2.4	0.93	3E-06	0.30
benzyl chloride	0.06	1.0												
bromodichloromethane	0.08					0.14	2E-06							
bromoform	2.60													
bromomethane		5.2												
carbon disulfide		730	9.9		0.01	2.3		<0.01	13		0.02	2.7		<0.01
carbon tetrachloride	0.47	104	0.44	9E-07	<0.01	0.41	9E-07	<0.01	0.37	8E-07	<0.01	0.43	9E-07	<0.01
chlorobenzene		52												
chloroethane		10,429												
chloroform	0.12	313	0.24	2E-06	<0.01	0.28	2E-06	<0.01				0.38	3E-06	<0.01
chloromethane		94	0.7		<0.01	1.3		0.01	4.7		0.05	1.2		0.01
cis -1,2-dichloroethene		7.3												
cis -1,3-dichloropropene	0.70	21	0.057	8E-08	<0.01									
cyclohexane		6,257				1.4		<0.01	11		<0.01	0.52		<0.01
dibromochloromethane	0.10													
dichlorodifluoromethane		104	0.24		<0.01	7.8		0.08	16		0.2	3.7		0.04
ethanol		7,300	25		<0.01	30		<0.01	430		0.06	18		<0.01
ethyl acetate		73						<0.01						
ethylbenzene	1.10	1,043	1.9	2E-06	<0.01	2.4	2E-06	<0.01	18	2E-05	0.02	0.6	5E-07	<0.01
ethylene dibromide (EDB)	0.005	9.4								0E+00				
hexachlorobutadiene	0.13									0E+00				
isopropanol		7,300	27		<0.01	14		<0.01	17			19		
isopropylbenzene		1,043	0.17		<0.01	0.2		<0.01	1.3		<0.01			
m - & *p* -xylene		104	7.8		0.08	10		0.1	74		0.7	2.3		0.02
methyl tert-butyl ether (MTBE)	11	3,129												

TABLE 9. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDINGS 4806/07 (USAF/CERCLA APPROACH) - AUGUST 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4806IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methylene chloride	100	626												
naphthalene	0.08	3.1	0.56	7E-06	0.2	0.58	7E-06	0.2	1.7	2E-05	0.5	0.3	4E-06	0.1
n-butyl benzene		1,043	0.41		<0.01	0.82		<0.01	3.2		<0.01	0.49		<0.01
n-heptane		730	1.5		<0.01	1.7		<0.01	14		0.02	0.52		<0.01
n-hexane		730	25		0.03	34		0.05	41		0.06	55		0.08
o-xylene		104	2.8		0.03	3.9		0.04	28		0.27	0.76		<0.01
p-isopropyltoluene		1,043	0.43		<0.01	0.39		<0.01	0.41		<0.01	0.38		<0.01
propene		3,129												
sec-butyl benzene		1,043							0.46		<0.01			
styrene		1,043	0.27		<0.01	0.27		<0.01	1.9		<0.01	0.19		<0.01
tetrachloroethene (PCE)	11.00	42												
tetrahydrofuran		2,100	1		<0.01	0.14		<0.01						
toluene		5,214	11		<0.01	11		<0.01	58		0.01	4.5		<0.01
trans-1,2-dichloroethene		210												
trans-1,3-dichloropropene	0.70	21												
trichloroethene (TCE)	0.48	2.1												
trichlorofluoromethane		730	6.7		<0.01	7.1		<0.01	3.9		<0.01	5.3		<0.01
vinyl chloride	0.17	104						<0.01						
Cumulative Risks and Hazard Indices:				2E-05	2		2E-05	2		1E-04	11		1E-05	0.8

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the hypothetical residential land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the hypothetical residential land use scenario.

$\mu g/m^3$ micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United States Air Force

Surrogate list:

isopropanol is surrogate for ethanol

1,1-dichloroethene used as surrogate for trans-1,2-dichlorethene

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for *n*-heptane

isopropylbenzene is surrogate for isopropyltoluene

TABLE 10. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDINGS 4806/07 (DTSC APPROACH) - AUGUST 2013

(Page 1 of 4)

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		1,043															
1,1,1,2-tetrachloroethane	0.38	115															
1,1,2,2-tetrachlorethane	0.05	73															
1,1,2-trichoroethane	0.18	15															
1,1,2-trichlorotrifluoroethane		31,286	0.59		<0.01	0.6		<0.01	0.56		<0.01	0.58		<0.01	0.59		<0.01
1,1-dichloroethane	1.80	730															
1,1-dichloroethene		73															
1,2,4-trichlorobenzene		2.1															
1,2,4-trimethylbenzene		7.3	2.7		0.4	0.38		0.05	0.35		0.05	0.51		0.07	0.61		0.08
1,2-dichlorobenzene		209															
1,2-dichloroethane	0.11	7.3															
1,2-dichloropropane	0.28	4.2															
1,2-dichlorotetrafluoroethane		31,286															
1,3,5-trimethylbenzene		37	0.71		0.02										0.23		<0.01
1,3-butadiene	0.01	2.1															
1,3-dichlorobenzene		209															
1,4-dichlorobenzene	0.26	834				0.15	6E-07	<0.01									
2-butanone (MEK)		5,214	4.5		<0.01	5.0		<0.01	1.8		<0.01	2.6		<0.01	6.4		<0.01
2-hexanone		31							0.28		<0.01						
4-ethyltoluene		104	2.2		0.02	0.27		<0.01	0.21		<0.01	0.36		<0.01	0.55		<0.01
4-methyl-2-pentanone (MIBK)		3,129															
acetone		31,286	110		<0.01	21		<0.01	14		<0.01	12		<0.01	20		<0.01
acrylonitrile	0.01	5.2															
benzene	0.08	3.1	1.2	1E-05	0.38	0.91	1E-05	0.29	0.93	1E-05	0.30	0.77	9E-06	0.25	0.94	1E-05	0.30
benzyl chloride	0.06														0.24	4E-06	
bromodichloromethane	0.08	73				0.49	6E-06	<0.01	0.15	2E-06							
bromoform	2.60	73							0.34	1E-07							
bromomethane		5.2															
carbon disulfide		730	8.1		0.01	0.72		<0.01	0.41		<0.01	2.2		<0.01	140		0.19
carbon tetrachloride	0.06	42	0.43	7E-06	0.01	0.48	8E-06	0.01	0.46	8E-06	0.01	0.39	7E-06	<0.01	0.43	7E-06	0.01
chlorobenzene		52															
chloroethane		10,429															
chloroform	0.12	102				0.21	2E-06	<0.01	0.14	1E-06	<0.01	7.9	7E-05	0.08	1.1	9E-06	0.01
chloromethane		94	1.4		0.01	1.6		0.02	1.3		0.01	1.2		0.01	1.6		0.02
cis -1,2-dichloroethene		7.3															
cis -1,3-dichloropropene	0.15	21													0.097	6E-07	<0.01
cyclohexane		6,257	0.67		<0.01										1.1		<0.01
dibromochloromethane	0.10	73							0.42	4E-06							
dichlorodifluoromethane		209	8.8		0.04	10		0.05	13		0.06	3.1		0.01	3.9		0.02
ethanol		7,300	20		<0.01	28		<0.01	5.4		<0.01	20		<0.01	14		<0.01
ethyl acetate		73															
ethylbenzene	1.10	1,043	1.5	1E-06	<0.01	0.29	3E-07	<0.01	0.15	1E-07	<0.01	0.22	2E-07	<0.01	0.29	3E-07	<0.01
ethylene dibromide (EDB)	0.005	9.4															
hexachlorobutadiene	0.13	3.7															
isopropanol		7,300	3.0		<0.01	24		<0.01	1.9			5.3			64		
isopropylbenzene		417															
m - & *p* -xylene		104	7.1		0.07	0.99		<0.01	0.77		<0.01	0.87		<0.01	1.2		0.01
methyl tert-butyl ether (MTBE)	11	3,129															

TABLE 10. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDINGS 4806/07 (DTSC APPROACH) - AUGUST 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methylene chloride	2.4	417															
naphthalene	0.08	3.1	0.46	6E-06	0.1	0.72	9E-06	0.2	0.22	3E-06	0.07	0.26	3E-06	0.08	1	1E-05	0.3
n-butyl benzene		183	0.39		<0.01	0.77		<0.01	0.25		<0.01	0.33		<0.01			
n-heptane		7,300	0.97		<0.01												
n-hexane		7,300	9.4		<0.01	2.8		<0.01	2.3		<0.01	5.7		<0.01	220		0.03
o-xylene		104	2.4		0.02	0.35		<0.01	0.21		<0.01	0.32		<0.01	1.2		0.01
p-isopropyltoluene		417	0.64		<0.01	0.41		<0.01				0.38		<0.01	3.3		<0.01
propene		3,129															
sec-butyl benzene		417															
styrene		939	0.51		<0.01	0.16		<0.01							0.13		<0.01
tetrachloroethene (PCE)	0.41	37															
tetrahydrofuran		2,100				0.52		<0.01							0.36		<0.01
toluene		313	83		0.27	3.0		<0.01	2.2		<0.01	1.3		<0.01	1.6		<0.01
trans-1,2-dichloroethene		73															
trans-1,3-dichloropropene	0.70	21															
trichloroethene (TCE)	0.48	2.1															
trichlorofluoromethane		730	6.4		<0.01	2.3		<0.01	2.6		<0.01	1.4		<0.01	1.9		<0.01
vinyl chloride	0.03	104															
Cumulative Risks and Hazard Indices:				3E-05	1		4E-05	0.7		3E-05	0.5		9E-05	0.5		4E-05	1.0

TABLE 10. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDINGS 4806/07 (DTSC APPROACH) - AUGUST 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		1,043												
1,1,1,2-tetrachloroethane	0.38	115	0.17	4E-07										
1,1,2,2-tetrachlorethane	0.05	73												
1,1,2-trichoroethane	0.18	15												
1,1,2-trichlorotrifluoroethane		31,286	0.59		<0.01	0.58		<0.01	0.51		<0.01	0.53		<0.01
1,1-dichloroethane	1.80	730												
1,1-dichloroethene		73												
1,2,4-trichlorobenzene		2.1												
1,2,4-trimethylbenzene		7.3	3.6		0.5	5.1		0.7	33		4.5	1.1		0.2
1,2-dichlorobenzene		209												
1,2-dichloroethane	0.11	7.3												
1,2-dichloropropane	0.28	4.2												
1,2-dichlorotetrafluoroethane		31,286						<0.01						
1,3,5-trimethylbenzene		37	1.1		0.03	1.5		0.04	11		0.3	0.28		<0.01
1,3-butadiene	0.01	2.1												
1,3-dichlorobenzene		209												
1,4-dichlorobenzene	0.26	834										0.14	5E-07	<0.01
2-butanone (MEK)		5,214	2.9		<0.01	3.0		<0.01	170		0.03	3.6		<0.01
2-hexanone		31							1.9		0.06			
4-ethyltoluene		104	3.2		0.03	4.5		0.04	32		0.3	0.84		<0.01
4-methyl-2-pentanone (MIBK)		3,129										0.62		<0.01
acetone		31,286	17		<0.01	19		<0.01	72		<0.01	19		<0.01
acrylonitrile	0.01	63							2	2E-04	0.03			
benzene	0.08	3.1	1.6	2E-05	0.51	1.2	1E-05	0.38	7.4	9E-05	2.4	0.93	1E-05	0.30
benzyl chloride	0.06													
bromodichloromethane	0.08	73				0.14	2E-06	<0.01						
bromoform	2.60	73												
bromomethane		5.2												
carbon disulfide		730	9.9		0.01	2.3		<0.01	13		0.02	2.7		<0.01
carbon tetrachloride	0.06	42	0.44	8E-06	0.01	0.41	7E-06	<0.01	0.37	6E-06	<0.01	0.43	7E-06	0.01
chlorobenzene		52												
chloroethane		10,429												
chloroform	0.12	102	0.24	2E-06	<0.01	0.28	2E-06	<0.01				0.38	3E-06	<0.01
chloromethane		94	0.7		<0.01	1.3		0.01	4.7		0.05	1.2		0.01
cis -1,2-dichloroethene		7.3												
cis -1,3-dichloropropene	0.15	21	0.057	4E-07	<0.01									
cyclohexane		6,257				1.4		<0.01	11		<0.01	0.52		<0.01
dibromochloromethane	0.10	73												
dichlorodifluoromethane		209	0.24		<0.01	7.8		0.04	16		0.08	3.7		0.02
ethanol		7,300	25		<0.01	30		<0.01	430		0.06	18		<0.01
ethyl acetate		73						<0.01						
ethylbenzene	1.10	1,043	1.9	2E-06	<0.01	2.4	2E-06	<0.01	18	2E-05	0.02	0.6	5E-07	<0.01
ethylene dibromide (EDB)	0.005	9.4												
hexachlorobutadiene	0.13	3.7												
isopropanol		7,300	27		<0.01	14		<0.01	17			19		
isopropylbenzene		417	0.17		<0.01	0.2		<0.01	1.3		<0.01			
m - & *p* -xylene		104	7.8		0.08	10		0.1	74		0.7	2.3		0.02
methyl tert-butyl ether (MTBE)	11	3,129												

TABLE 10. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDINGS 4806/07 (DTSC APPROACH) - AUGUST 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methylene chloride	2.4	417												
naphthalene	0.08	3.1	0.56	7E-06	0.2	0.58	7E-06	0.2	1.7	2E-05	0.5	0.3	4E-06	0.1
n-butyl benzene		183	0.41		<0.01	0.82		<0.01	3.2		0.02	0.49		<0.01
n-heptane		7,300	1.5		<0.01	1.7		<0.01	14		<0.01	0.52		<0.01
n-hexane		7,300	25		<0.01	34		<0.01	41		<0.01	55		<0.01
o-xylene		104	2.8		0.03	3.9		0.04	28		0.3	0.76		<0.01
p-isopropyltoluene		417	0.43		<0.01	0.39		<0.01	0.41		<0.01	0.38		<0.01
propene		3,129												
sec-butyl benzene		417							0.46		<0.01			
styrene		939	0.27		<0.01	0.27		<0.01	1.9		<0.01	0.19		<0.01
tetrachloroethene (PCE)	0.41	37												
tetrahydrofuran		2,100	1		<0.01	0.14		<0.01						
toluene		313	11		0.04	11		0.04	58		0.2	4.5		0.01
trans-1,2-dichloroethene		73												
trans-1,3-dichloropropene	0.70	21												
trichloroethene (TCE)	0.48	2.1												
trichlorofluoromethane		730	6.7		<0.01	7.1		<0.01	3.9		<0.01	5.3		<0.01
vinyl chloride	0.03	104						<0.01						
Cumulative Risks and Hazard Indices:				4E-05	1		3E-05	2		4E-04	10		3E-05	0.7

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the hypothetical residential land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the hypothetical residential land use scenario.

$\mu g/m^3$ micrograms per cubic meter

DTSC Department of Toxic Substances Control

HQ Hazard Quotient

Surrogate list:

isopropanol is surrogate for ethanol

1,1-dichloroethene used as surrogate for trans-1,2-dichlorethene

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltoluene

TABLE 11. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4810 (USAF/CERCLA APPROACH) - MARCH 2013

(Page 1 of 2)

	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		5,214												
1,1,1,2-tetrachloroethane	0.38		0.52	1E-06		0.37	1E-06							
1,1,2,2-tetrachlorethane	0.05													
1,1,2-trichoroethane	0.18	0.2												
1,1,2-trichlorotrifluoroethane		31,286	0.94		<0.01	0.78		<0.01	0.56		<0.01	0.57		<0.01
1,1-dichloroethane	1.80													
1,1-dichloroethene		209												
1,2,4-trichlorobenzene		2.1												
1,2,4-trimethylbenzene		7.3	1.1		0.2	0.64		0.09	0.23		0.03	0.095		0.01
1,2-dichlorobenzene		209												
1,2-dichloroethane	0.11	7.3	0.19	2E-06	0.03									
1,2-dichloropropane	0.28	4.2												
1,2-dichlorotetrafluoroethane		31,286	0.45		<0.01	0.51		<0.01						
1,3,5-trimethylbenzene		7.3	0.34		0.05	0.21		0.03						
1,3-butadiene	0.09	2.1												
1,3-dichlorobenzene		209												
1,4-dichlorobenzene	0.26	834	0.15	6E-07	<0.01	0.11	4E-07	<0.01						
2-butanone (MEK)		5,214	4.2		<0.01	3.0		<0.01	2.0		<0.01	2.5		<0.01
2-hexanone		31												
4-ethyltoluene		104	0.97		<0.01	0.58		<0.01	0.22		<0.01			
4-methyl-2-pentanone (MIBK)		3,129	0.94		<0.01	0.66		<0.01						
acetone		32,329	32		<0.01	25		<0.01	31		<0.01	120		<0.01
acrylonitrile	0.04	2.1												
benzene	0.36	31	1.2	3E-06	0.04	0.81	2E-06	0.03	0.39	1E-06	0.01	0.38	1E-06	0.01
benzyl chloride	0.06	1.0												
bromodichloromethane	0.08													
bromoform	2.60													
bromomethane		5.2				0.21		0.04	0.13		0.02	0.22		0.04
carbon disulfide		730	0.45		<0.01	2.1		<0.01	0.65		<0.01	4.7		<0.01
carbon tetrachloride	0.47	104	0.66	1E-06	<0.01	0.54	1E-06	<0.01	0.4	9E-07	<0.01	0.43	9E-07	<0.01
chlorobenzene		52												
chloroethane		10,429												
chloroform	0.12	313	0.35	3E-06	<0.01	0.21	2E-06	<0.01						
chloromethane		94	1.9		0.02	1.7		0.02	1.4		0.01	1.8		0.02
cis-1,2-dichloroethene		7.3												
cis-1,3-dichloropropene	0.70	21												
cyclohexane		6,257	0.76		<0.01	0.48		<0.01						
dibromochloromethane	0.10													
dichlorodifluoromethane		104	3.9		0.04	3.3		0.03				2.6		0.03
ethanol		7,300	220		0.03	120		0.02	33		<0.01	16		<0.01
ethyl acetate		73	1.7		0.02	0.73		<0.01						
ethylbenzene	1.10	1,043	1.8	2E-06	<0.01	1.6	1E-06	<0.01	4.4	4E-06	<0.01	0.13	1E-07	<0.01
ethylene dibromide (EDB)	0.005	9.4												
hexachlorobutadiene	0.13													
isopropanol		7,300	21		<0.01	18		<0.01	68			28		
isopropylbenzene		1,043	0.19		<0.01									
m- & *p*-xylene		104	4.2		0.04	4.0		0.04	11		0.1	0.33		<0.01
methyl tert-butyl ether (MTBE)	11	3,129	0.69	6E-08	<0.01	0.43	4E-08	<0.01						

TABLE 11. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4810 (USAF/CERCLA APPROACH) - MARCH 2013

(Page 2 of 2)

	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methylene chloride	100	626	1.3	1E-08	<0.01	0.81	8E-09	<0.01						
naphthalene	0.08	3.1	0.74	9E-06	0.2	0.51	6E-06	0.2						
n-butyl benzene		1,043				0.14		<0.01	0.24		<0.01			
n-heptane		730	0.9		<0.01	0.52		<0.01						
n-hexane		730	1.5		<0.01	1.9		<0.01	0.35		<0.01	0.15		<0.01
o-xylene		104	1.3		0.01	1.1		0.01	2.2		0.02	0.097		<0.01
p-isopropyltoluene		1,043	1.1		<0.01	0.81		<0.01	0.61		<0.01	1.3		<0.01
propene		3,129												
sec-butyl benzene		1,043												
styrene		1,043	2.0		<0.01	1.0		<0.01	0.14		<0.01			
tetrachloroethene (PCE)	11.00	42	0.66	6E-08	0.02									
tetrahydrofuran		2,100	0.5		<0.01	0.65		<0.01	2		<0.01	0.2		<0.01
toluene		5,214	9.6		<0.01	6.9		<0.01	13		<0.01	0.66		<0.01
trans-1,2-dichloroethene		210												
trans-1,3-dichloropropene	0.70	21												
trichloroethene (TCE)	0.48	2.1												
trichlorofluoromethane		730	1.9		<0.01	1.5		<0.01	1.2		<0.01	1.3		<0.01
vinyl chloride	0.17	104						<0.01						
Cumulative Risks and Hazard Indices:				2E-05	0.7		1E-05	0.5		6E-06	0.2		2E-06	0.1

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the hypothetical residential land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the hypothetical residential land use scenario.

$\mu g/m^3$ micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United States Air Force

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for *n*-heptane

isopropylbenzene is surrogate for isopropyltoluene

TABLE 12. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4810 (DTSC APPROACH) - MARCH 2013

(Page 1 of 2)

	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		1,043												
1,1,1,2-tetrachloroethane	0.38	115	0.52	1E-06		0.37	1E-06	<0.01						
1,1,2,2-tetrachlorethane	0.05	73												
1,1,2-trichoroethane	0.18	15												
1,1,2-trichlorotrifluoroethane		31,286	0.94		<0.01	0.78		<0.01	0.56		<0.01	0.57		<0.01
1,1-dichloroethane	1.80	730												
1,1-dichloroethene		73												
1,2,4-trichlorobenzene		2.1												
1,2,4-trimethylbenzene		7.3	1.1		0.2	0.64		0.09	0.23		0.03	0.095		0.01
1,2-dichlorobenzene		209												
1,2-dichloroethane	0.11	7.3	0.19	2E-06	0.03									
1,2-dichloropropane	0.28	4.2												
1,2-dichlorotetrafluoroethane		31,286	0.45		<0.01	0.51		<0.01						
1,3,5-trimethylbenzene		37	0.34		<0.01	0.21		<0.01						
1,3-butadiene	0.01	2.1												
1,3-dichlorobenzene		209												
1,4-dichlorobenzene	0.26	834	0.15	6E-07	<0.01	0.11	4E-07	<0.01						
2-butanone (MEK)		5,214	4.2		<0.01	3.0		<0.01	2.0		<0.01	2.5		<0.01
2-hexanone		31												
4-ethyltoluene		104	0.97		<0.01	0.58		<0.01	0.22		<0.01			
4-methyl-2-pentanone (MIBK)		3,129	0.94		<0.01	0.66		<0.01						
acetone		31,286	32		<0.01	25		<0.01	31		<0.01	120		<0.01
acrylonitrile	0.01	5.2												
benzene	0.08	3.1	1.2	1E-05	0.38	0.81	1E-05	0.26	0.39	5E-06	0.12	0.38	5E-06	0.12
benzyl chloride	0.06													
bromodichloromethane	0.08	73												
bromoform	2.60	73												
bromomethane		5				0.21		0.04	0.13		0.03	0.22		0.04
carbon disulfide		730	0.45		<0.01	2.1		<0.01	0.65		<0.01	4.7		<0.01
carbon tetrachloride	0.06	42	0.66	1E-05	0.02	0.54	9E-06	0.01	0.4	7E-06	<0.01	0.43	7E-06	0.01
chlorobenzene		52												
chloroethane		10,429												
chloroform	0.12	102	0.35	3E-06	<0.01	0.21	2E-06	<0.01						
chloromethane		94	1.9		0.02	1.7		0.02	1.4		0.01	1.8		0.02
cis-1,2-dichloroethene		7.3												
cis-1,3-dichloropropene	0.15	21												
cyclohexane		6,257	0.76		<0.01	0.48		<0.01						
dibromochloromethane	0.10	73												
dichlorodifluoromethane		209	3.9		0.02	3.3		0.02				2.6		0.01
ethanol		7,300	220		0.03	120		0.02	33		<0.01	16		<0.01
ethyl acetate		73	1.7		0.02	0.73		<0.01						
ethylbenzene	1.10	1,043	1.8	2E-06	<0.01	1.6	1E-06	<0.01	4.4	4E-06	<0.01	0.13	1E-07	<0.01
ethylene dibromide (EDB)	0.005	9.4												
hexachlorobutadiene	0.13	3.7												
isopropanol		7,300	21		<0.01	18		<0.01	68			28		
isopropylbenzene		417	0.19		<0.01									
m- & *p*-xylene		104	4.2		0.04	4.0		0.04	11		0.1	0.33		<0.01
methyl tert-butyl ether (MTBE)	11	3,129	0.69	6E-08	<0.01	0.43	4E-08	<0.01						

TABLE 12. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4810 (DTSC APPROACH) - MARCH 2013

(Page 2 of 2)

	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methylene chloride	2	417	1.3	5E-07	<0.01	0.81	3E-07	<0.01						
naphthalene	0.08	3.1	0.74	9E-06	0.2	0.51	6E-06	0.2						
n -butyl benzene		183				0.14		<0.01	0.24		<0.01			
n -heptane		7,300	0.9		<0.01	0.52		<0.01						
n -hexane		7,300	1.5		<0.01	1.9		<0.01	0.35		<0.01	0.15		<0.01
o -xylene		104	1.3		0.01	1.1		0.01	2.2		0.02	0.097		<0.01
p -isopropyltoluene		417	1.1		<0.01	0.81		<0.01	0.61		<0.01	1.3		<0.01
propene		3,129												
sec -butyl benzene		417												
styrene		939	2.0		<0.01	1.0		<0.01	0.14		<0.01			
tetrachloroethene (PCE)	0.41	37	0.66	2E-06	0.02									
tetrahydrofuran		2,100	0.5		<0.01	0.65		<0.01	2		<0.01	0.2		<0.01
toluene		313	9.6		0.03	6.9		0.02	13		0.04	0.66		<0.01
trans -1,2-dichloroethene		73												
trans -1,3-dichloropropene	0.70	21												
trichloroethene (TCE)	0.48	2.1												
trichlorofluoromethane		730	1.9		<0.01	1.5		<0.01	1.2		<0.01	1.3		<0.01
vinyl chloride	0.03	104						<0.01						
Cumulative Risks and Hazard Indices:				5E-05	1.0		3E-05	0.7		2E-05	0.4		1E-05	0.2

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the hypothetical residential land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the hypothetical residential land use scenario.

$\mu g/m^3$ micrograms per cubic meter

DTSC Department of Toxic Substances Control

HQ Hazard Quotient

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltoluene

TABLE 13. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4810 (USAF/CERCLA APPROACH) - AUGUST 2013

(Page 1 of 2)

	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		5,214												
1,1,1,2-tetrachloroethane	0.38		0.4	1E-06		0.25	7E-07							
1,1,2,2-tetrachlorethane	0.05													
1,1,2-trichoroethane	0.18	0.2												
1,1,2-trichlorotrifluoroethane		31,286	0.53		<0.01	0.52		<0.01	0.53		<0.01	0.51		<0.01
1,1-dichloroethane	1.80													
1,1-dichloroethene		209												
1,2,4-trichlorobenzene		2.1	1.4		0.7									
1,2,4-trimethylbenzene		7.3	2.9		0.4	2.0		0.3	1.7		0.2	0.18		0.02
1,2-dichlorobenzene		209	0.39		<0.01									
1,2-dichloroethane	0.11	7.3	0.14	1E-06	0.02									
1,2-dichloropropane	0.28	4.2												
1,2-dichlorotetrafluoroethane		31,286						<0.01						
1,3,5-trimethylbenzene		7.3	2.9		0.4	0.55		0.08	0.48		0.07			
1,3-butadiene	0.09	2.1												
1,3-dichlorobenzene		209												
1,4-dichlorobenzene	0.26	834	0.43	2E-06	<0.01									
2-butanone (MEK)		5,214	63		0.01	3.4		<0.01	5.5		<0.01	1.9		<0.01
2-hexanone		31	6.0		0.2									
4-ethyltoluene		104	2.6		0.02	1.7		0.02	1.5		0.01	0.16		<0.01
4-methyl-2-pentanone (MIBK)		3,129												
acetone		32,329				16		<0.01	22		<0.01	11		<0.01
acrylonitrile	0.04	2.1												
benzene	0.36	31	2	6E-06	0.06	1.2	3E-06	0.04	1.1	3E-06	0.04			
benzyl chloride	0.06	1.0	0.54	9E-06	0.5									
bromodichloromethane	0.08					0.14	2E-06							
bromoform	2.60													
bromomethane		5.2	0.83		0.2									
carbon disulfide		730				19		0.03	6.3		<0.01	29		0.04
carbon tetrachloride	0.47	104	0.43	9E-07	<0.01	0.46	1E-06	<0.01	0.43	9E-07	<0.01	0.38	8E-07	<0.01
chlorobenzene		52												
chloroethane		10,429												
chloroform	0.12	313												
chloromethane		94				1.3		0.01	1.8		0.02	1.1		0.01
cis-1,2-dichloroethene		7.3												
cis-1,3-dichloropropene	0.70	21												
cyclohexane		6,257	1.5		<0.01	0.87		<0.01	0.92		<0.01			
dibromochloromethane	0.10													
dichlorodifluoromethane		104	2.3		0.02	2.4		0.02	2.4		0.02	2.3		0.02
ethanol		7,300	1,800		0.2	57		<0.01	31		<0.01	16		<0.01
ethyl acetate		73				0.67		<0.01						
ethylbenzene	1.10	1,043	2.4	2E-06	<0.01	1.3	1E-06	<0.01	1.4	1E-06	<0.01	0.17	2E-07	<0.01
ethylene dibromide (EDB)	0.005	9.4	2.2	5E-04	0.2									
hexachlorobutadiene	0.13													
isopropanol		7,300				5.9		<0.01	58			39		
isopropylbenzene		1,043	0.25		<0.01									
m- & *p*-xylene		104	11		0.11	5.2		0.05	5.5		0.05	0.66		<0.01
methyl tert-butyl ether (MTBE)	11	3,129												

TABLE 13. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4810 (USAF/CERCLA APPROACH) - AUGUST 2013

(Page 2 of 2)

	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methylene chloride	100	626												
naphthalene	0.08	3.1	1.1	1E-05	0.4	0.3	4E-06	0.10	0.31	4E-06	0.1	0.14	2E-06	0.04
n-butyl benzene		1,043	0.9		<0.01	0.53		<0.01	0.3		<0.01			
n-heptane		730	2.3		<0.01	1.3		<0.01	1.2		<0.01			
n-hexane		730	3.4		<0.01	2.2		<0.01	2.6		<0.01	0.47		<0.01
o-xylene		104	3.5		0.03	1.8		0.02	1.8		0.02	0.22		<0.01
p-isopropyltoluene		1,043	3.8		<0.01	3.4		<0.01	1.1		<0.01	0.24		<0.01
propene		3,129												
sec-butyl benzene		1,043												
styrene		1,043	2.0		<0.01	0.2		<0.01	0.16		<0.01			
tetrachloroethene (PCE)	11.00	42												
tetrahydrofuran		2,100				3.4		<0.01	11		<0.01	0.52		<0.01
toluene		5,214	10		<0.01	5.9		<0.01	5.9		<0.01	1.0		<0.01
trans-1,2-dichloroethene		210												
trans-1,3-dichloropropene	0.70	21	0.31	4E-07	0.01									
trichloroethene (TCE)	0.48	2.1												
trichlorofluoromethane		730	1.3		<0.01	1.4		<0.01	1.4		<0.01	1.2		<0.01
vinyl chloride	0.17	104						<0.01						
Cumulative Risks and Hazard Indices:				5E-04	3		1E-05	0.7		9E-06	0.6		3E-06	0.2

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the hypothetical residential land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the hypothetical residential land use scenario.

$\mu g/m^3$ micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United States Air Force

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for *n*-heptane

isopropylbenzene is surrogate for isopropyltoluene

TABLE 14. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4810 (DTSC APPROACH) - AUGUST 2013

(Page 1 of 2)

	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		1,043												
1,1,1,2-tetrachloroethane	0.38	115	0.4	1E-06		0.25	7E-07	<0.01						
1,1,2,2-tetrachlorethane	0.05	73												
1,1,2-trichoroethane	0.18	15												
1,1,2-trichlorotrifluoroethane		31,286	0.53		<0.01	0.52		<0.01	0.53		<0.01	0.51		<0.01
1,1-dichloroethane	1.80	730												
1,1-dichloroethene		73												
1,2,4-trichlorobenzene		2.1	1.4		0.7									
1,2,4-trimethylbenzene		7.3	2.9		0.40	2.0		0.27	1.7		0.2	0.18		0.02
1,2-dichlorobenzene		209	0.39		<0.01									
1,2-dichloroethane	0.11	7.3	0.14	1E-06	0.02									
1,2-dichloropropane	0.28	4.2												
1,2-dichlorotetrafluoroethane		31,286						<0.01						
1,3,5-trimethylbenzene		37	2.9		0.08	0.55		0.02	0.48		0.01			
1,3-butadiene	0.01	2.1												
1,3-dichlorobenzene		209												
1,4-dichlorobenzene	0.26	834	0.43	2E-06	<0.01									
2-butanone (MEK)		5,214	63		0.01	3.4		<0.01	5.5		<0.01	1.9		<0.01
2-hexanone		31	6.0		0.19									
4-ethyltoluene		104	2.6		0.03	1.7		0.02	1.5		0.01	0.16		<0.01
4-methyl-2-pentanone (MIBK)		3,129												
acetone		31,286				16		<0.01	22		<0.01	11		<0.01
acrylonitrile	0.01	5.2												
benzene	0.08	3.1	2	2E-05	0.64	1.2	1E-05	0.38	1.1	1E-05	0.35			
benzyl chloride	0.06		0.54	9E-06										
bromodichloromethane	0.08	73				0.14	2E-06	<0.01						
bromoform	2.60	73												
bromomethane		5.2	0.83		0.2									
carbon disulfide		730				19		0.03	6.3		<0.01	29		0.04
carbon tetrachloride	0.06	42	0.43	7E-06	0.01	0.46	8E-06	0.01	0.43	7E-06	0.01	0.38	7E-06	<0.01
chlorobenzene		52												
chloroethane		10,429												
chloroform	0.12	102												
chloromethane		94				1.3		0.01	1.8		0.02	1.1		0.01
cis-1,2-dichloroethene		7.3												
cis-1,3-dichloropropene	0.15	21												
cyclohexane		6,257	1.5		<0.01	0.87		<0.01	0.92		<0.01			
dibromochloromethane	0.10	73												
dichlorodifluoromethane		209	2.3		0.01	2.4		0.01	2.4		0.01	2.3		0.01
ethanol		7,300	1,800		0.2	57		<0.01	31		<0.01	16		<0.01
ethyl acetate		73				0.67		<0.01						
ethylbenzene	1.10	1,043	2.4	2E-06	<0.01	1.3	1E-06	<0.01	1.4	1E-06	<0.01	0.17	2E-07	<0.01
ethylene dibromide (EDB)	0.005	9.4	2.2	5E-04	0.2									
hexachlorobutadiene	0.13	3.7												
isopropanol		7,300				5.9		<0.01	58			39		
isopropylbenzene		417	0.25		<0.01									
m- & *p*-xylene		104	11		0.1	5.2		0.05	5.5		0.05	0.66		<0.01
methyl tert-butyl ether (MTBE)	11	3,129												

TABLE 14. INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4810 (DTSC APPROACH) - AUGUST 2013

(Page 2 of 2)

	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methylene chloride	2	417												
naphthalene	0.08	3.1	1.1	1E-05	0.4	0.3	4E-06	0.10	0.31	4E-06	0.1	0.14	2E-06	0.05
n -butyl benzene		183	0.9		<0.01	0.53		<0.01	0.3		<0.01			
n -heptane		7,300	2.3		<0.01	1.3		<0.01	1.2		<0.01			
n -hexane		7,300	3.4		<0.01	2.2		<0.01	2.6		<0.01	0.47		<0.01
o -xylene		104	3.5		0.03	1.8		0.02	1.8		0.02	0.22		<0.01
p-isopropyltoluene		417	3.8		<0.01	3.4		<0.01	1.1		<0.01	0.24		<0.01
propene		3,129												
sec -butyl benzene		417												
styrene		939	2.0		<0.01	0.2		<0.01	0.16		<0.01			
tetrachloroethene (PCE)	0.41	37												
tetrahydrofuran		2,100				3.4		<0.01	11		<0.01	0.52		<0.01
toluene		313	10		0.03	5.9		0.02	5.9		0.02	1.0		<0.01
trans -1,2-dichloroethene		73												
trans -1,3-dichloropropene	0.70	21	0.31	4E-07	0.01									
trichloroethene (TCE)	0.48	2.1												
trichlorofluoromethane		730	1.3		<0.01	1.4		<0.01	1.4		<0.01	1.2		<0.01
vinyl chloride	0.03	104						<0.01						
Cumulative Risks and Hazard Indices:				5E-04	3		3E-05	1.0		3E-05	0.9		8E-06	0.2

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the hypothetical residential land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the hypothetical residential land use scenario.

$\mu g/m^3$ micrograms per cubic meter

DTSC Department of Toxic Substances Control

HQ Hazard Quotient

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n -hexane is surrogate for *n* -heptane

isopropylbenzene is surrogate for isopropyltoluene

TABLE 15. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4806 (USAF/CERCLA APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
2-butanone (MEK)		5,214	6.5		<0.01	2.8		<0.01	2.5		<0.01	2.6		<0.01	2.8		<0.01
acetone		32,329	18		<0.01	17		<0.01	17		<0.01	19		<0.01	12		<0.01
benzene	0.36	31	1.1	3E-06	0.03548	1.3	4E-06	0.04194	1.5	4E-06	0.05	1.8	5E-06	0.06	1.8	5E-06	0.06
isopropanol		7,300	4		<0.01	2		<0.01	2.6		<0.01	11		<0.01	3.9		<0.01
isopropylbenzene		1,043	0.56		<0.01				0.14		<0.01	0.17		<0.01	0.14		<0.01
n-heptane		730	1.2		<0.01	1.8		<0.01	2		<0.01	2.1		<0.01	2		<0.01
n-hexane		730	2.1		<0.01	4.0		<0.01	5.4		<0.01	8.2		0.01	10		0.01
p-isopropyltoluene		1,043	0.87		<0.01				0.55		<0.01	0.16		<0.01	0.42		<0.01
Cumulative Risks and Hazard Indices for all Analytes:				3E-06	0.04		4E-06	0.05		4E-06	0.06		5E-06	0.07		5E-06	0.08
Cumulative Risks and Hazard Indices for VIP-related Analytes:								<0.01					5E-06	0.07			<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

VIP vapor intrusion pathway

USAF United State Air Force

n-hexane is surrogate for n-heptane

Analyte is not likely vapor intrusion pathway related for this sample. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 16. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4806 (DTSC APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
2-butanone (MEK)		5,214	6.5		<0.01	2.8		<0.01	2.5		<0.01	2.6		<0.01	2.8		<0.01
acetone		31,286	18		<0.01	17		<0.01	17		<0.01	19		<0.01	12		<0.01
benzene	0.08	3.1	1.1	1E-05	0.35	1.3	2E-05	0.41935	1.5	2E-05	0.5	1.8	2E-05	0.6	1.8	2E-05	0.6
isopropanol		7,300	4		<0.01	2		<0.01	2.6		<0.01	11		<0.01	3.9		<0.01
isopropylbenzene		417	0.56		<0.01				0.14		<0.01	0.17		<0.01	0.14		<0.01
n-heptane		7,300	1.2		<0.01	1.8		<0.01	2		<0.01	2.1		<0.01	2		<0.01
n-hexane		7,300	2.1		<0.01	4.0		<0.01	5.4		<0.01	8.2		<0.01	10		<0.01
p-isopropyltoluene		417	0.87		<0.01				0.55		<0.01	0.16		<0.01	0.42		<0.01
Cumulative Risks and Hazard Indices:				1E-05	0.4		2E-05	0.4		2E-05	0.5		2E-05	0.6		2E-05	0.6
Cumulative Risks and Hazard Indices for VIP-related Analytes:								<0.01					2E-05	0.6			<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

n-hexane is surrogate for n-heptane

Analyte is not likely vapor intrusion pathway related for this sample. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 17. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4806 (USAF/CERCLA APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,2,4-trimethylbenzene		7.3	2.7		0.37	0.38		0.05	0.35		0.05	0.51		0.07	0.61		0.08
2-butanone (MEK)		5,214	4.5		<0.01	5.0		<0.01	1.8		<0.01	2.6		<0.01	6.4		<0.01
4-ethyltoluene		104	2.2		0.02115	0.27		<0.01	0.21		<0.01	0.36		<0.01	0.55		<0.01
benzene	0.36	31	1.2	3E-06	0.03871	0.91	3E-06	0.02935	0.93	3E-06	0.03	0.77	2E-06	0.024839	0.94	3E-06	0.03032
carbon disulfide		730	8.1		0.0111	0.72		<0.01	0.41		<0.01	2.2		<0.01	140		0.19
ethanol		7,300	20		<0.01	28		<0.01	5.4		<0.01	20		<0.01	14		<0.01
ethylbenzene	1.10	1,043	1.5	1E-06	<0.01	0.29	3E-07	<0.01	0.15	1E-07	<0.01	0.22	2E-07	<0.01	0.29	3E-07	<0.01
naphthalene	0.08	3.1	0.46	6E-06	0.15	0.72	9E-06	0.23	0.22	3E-06	0.07	0.26	3E-06	0.08	1	1E-05	0.32
o-xylene		104	2.4		0.02308	0.35		<0.01	0.21		<0.01	0.32		<0.01	1.2		0.01154
p-isopropyltoluene		1,043	0.64		<0.01	0.41		<0.01				0.38		<0.01	3.3		<0.01
Cumulative Risks and Hazard Indices:				1E-05	0.6		1E-05	0.3		5E-06	0.2		6E-06	0.2		3E-06	0.7
Cumulative Risks and Hazard Indices for VIP-related Analytes:				6E-06	0.2		3E-06	0.08			<0.01		2E-06	0.03		3E-06	<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway related for this sample. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 18. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4806 (DTSC APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,2,4-trimethylbenzene		7.3	2.7		0.37	0.38		0.05	0.35		0.05	0.51		0.07	0.61		0.08
2-butanone (MEK)		5,214	4.5		<0.01	5.0		<0.01	1.8		<0.01	2.6		<0.01	6.4		<0.01
4-ethyltoluene		104	2.2		0.02115	0.27		<0.01	0.21		<0.01	0.36		<0.01	0.55		<0.01
benzene	0.08	3.1	1.2	2E-05	0.39	0.91	1E-05	0.29355	0.93	1E-05	0.30	0.77	1E-05	0.25	0.94	1E-05	0.30
carbon disulfide		730	8.1		0.0111	0.72		<0.01	0.41		<0.01	2.2		<0.01	140		0.19
ethanol		7,300	20		<0.01	28		<0.01	5.4		<0.01	20		<0.01	14		<0.01
ethylbenzene	1.10	1,043	1.5	1E-06	<0.01	0.29	3E-07	<0.01	0.15	1E-07	<0.01	0.22	2E-07	<0.01	0.29	3E-07	<0.01
naphthalene	0.08	3.1	0.46	6E-06	0.15	0.72	9E-06	0.23	0.22	3E-06	0.07	0.26	3E-06	0.08	1	1E-05	0.32
o-xylene		104	2.4		0.02308	0.35		<0.01	0.21		<0.01	0.32		<0.01	1.2		0.01154
p-isopropyltoluene		417	0.64		<0.01	0.41		<0.01				0.38		<0.01	3.3		<0.01
Cumulative Risks and Hazard Indices:				2E-05	1.0		2E-05	0.6		1E-05	0.4		1E-05	0.4		2E-05	0.9
Cumulative Risks and Hazard Indices for VIP-related Analytes:				6E-06	0.2		1E-05	0.3			<0.01		1E-05	0.3		1E-05	<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway related for this sample. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 19. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4807 (USAF/CERCLA APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
2-butanone (MEK)		5,214	3.0		<0.01	2.3		<0.01	2.6		<0.01	2.6		<0.01
acetone		32,329	18		<0.01	16		<0.01	19		<0.01	19		<0.01
tetrahydrofuran		2,100	1.7		<0.01				0.24		<0.01	0.24		<0.01
Cumulative Risks and Hazard Indices:					<0.01			<0.01			<0.01			<0.01
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01			<0.01			<0.01			

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway related for this sample. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 20. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4807 (DTSC APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
2-butanone (MEK)		5,214	3.0		<0.01	2.3		<0.01	6.1		<0.01	2.6		<0.01
acetone		31,286	18		<0.01	16		<0.01	30		<0.01	19		<0.01
tetrahydrofuran		2,100	1.7		<0.01				0.17		<0.01	0.24		<0.01
Cumulative Risks and Hazard Indices:					<0.01			<0.01			<0.01			<0.01
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01			<0.01			<0.01			

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway related for this sample. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 21. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4807 (USAF/CERCLA APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
acetone		32,329	17		<0.01	19		<0.01	72		<0.01	19		<0.01
benzene	0.36	31	1.6	4E-06	0.05	1.2	3E-06	0.03871	7.4	2E-05	0.24	0.93	3E-06	0.03
carbon disulfide		730	9.9		0.01356	2.3		<0.01	13		0.01781	2.7		<0.01
dichlorodifluoromethane		104	0.24		<0.01	7.8		0.08	16		0.15	3.7		0.035577
Cumulative Risks and Hazard Indices:				4E-06	0.07		3E-06	0.1		2E-05	0.4		3E-06	0.07
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01		3E-06	0.04						<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway related for this sample. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 22. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4807 (DTSC APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
acetone		31,286	17		<0.01	19		<0.01	72		<0.01	19		<0.01
benzene	0.08	3.1	1.6	2E-05	0.5	1.2	2E-05	0.39	7.4	9E-05	2.4	0.93	1E-05	0.30
carbon disulfide		730	9.9		0.01356	2.3		<0.01	13		0.01781	2.7		<0.01
dichlorodifluoromethane		209	0.24		<0.01	7.8		0.04	16		0.08	3.7		0.017703
Cumulative Risks and Hazard Indices:				2E-05	0.5		2E-05	0.4		9E-05	2		1E-05	0.3
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01		2E-05	0.4						<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway related for this sample. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 23. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4810 (USAF/CERCLA APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,2-trichlorotrifluoroethane		31,286	0.94		<0.01	0.78		<0.01	0.56		<0.01	0.57		<0.01
1,2,4-trimethylbenzene		7.3	1.1		0.15	0.64		0.09	0.23		0.03151	0.095		0.013014
2-butanone (MEK)		5,214	4.2		<0.01	3.0		<0.01	2.0		<0.01	2.5		<0.01
4-methyl-2-pentanone (MIBK)		3,129	0.94		<0.01	0.66		<0.01						
acetone		32,329	32		<0.01	25		<0.01	31		<0.01	120		<0.01
benzene	0.36	31	1.2	3E-06	0.03871	0.81	2E-06	0.02613	0.39	1E-06	0.01258	0.38	1E-06	0.012258
bromomethane		5.2				0.21		0.04038	0.13		0.025	0.22		0.04
cyclohexane		6,257	0.76		<0.01	0.48		<0.01						
ethylbenzene	1.1	1,043	1.8	2E-06	<0.01	1.6	1E-06	<0.01	4.4	4E-06	<0.01	0.13	1E-07	<0.01
isopropanol		7,300	21		<0.01	18		<0.01	68			28		
m- & p-xylene		104	4.2		0.04038	4.0		0.03846	11		0.11	0.33		<0.01
n-hexane		730	1.5		<0.01	1.9		<0.01	0.35		<0.01	0.15		<0.01
o-xylene		104	1.3		0.0125	1.1		0.01058	2.2		0.02115	0.097		<0.01
toluene		5,214	9.6		<0.01	6.9		<0.01	13		<0.01	0.66		<0.01
Cumulative Risks and Hazard Indices:				5E-06	0.3		4E-06	0.2		5E-06	0.2		1E-06	0.08
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01			<0.01		1E-06	0.2		1E-06	0.07

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway related for this sample. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 24. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4810 (DTSC APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,2-trichlorotrifluoroethane		31,286	0.94		<0.01	0.78		<0.01	0.56		<0.01	0.57		<0.01
1,2,4-trimethylbenzene		7.3	1.1		0.15	0.64		0.09	0.23		0.03151	0.095		0.013014
2-butanone (MEK)		5,214	4.2		<0.01	3.0		<0.01	2.0		<0.01	2.5		<0.01
4-methyl-2-pentanone (MIBK)		3,129	0.94		<0.01	0.66		<0.01						
acetone		31,286	32		<0.01	25		<0.01	31		<0.01	120		<0.01
benzene	0.08	3.1	1.2	2E-05	0.39	0.81	1E-05	0.26	0.39	5E-06	0.12581	0.38	5E-06	0.12
bromomethane		5.2				0.21		0.04038	0.13		0.025	0.22		0.04
cyclohexane		6,257	0.76		<0.01	0.48		<0.01						
ethylbenzene	1.1	1,043	1.8	2E-06	<0.01	1.6	1E-06	<0.01	4.4	4E-06	<0.01	0.13	1E-07	<0.01
isopropanol		7,300	21		<0.01	18		<0.01	68		<0.01	28		<0.01
m- & p-xylene		104	4.2		0.04038	4.0		0.03846	11		0.11	0.33		<0.01
n-hexane		7,300	1.5		<0.01	1.9		<0.01	0.35		<0.01	0.15		<0.01
o-xylene		104	1.3		0.0125	1.1		0.01058	2.2		0.02115	0.097		<0.01
toluene		313	9.6		0.03067	6.9		0.02204	13		0.04153	0.66		<0.01
Cumulative Risks and Hazard Indices:				2E-05	0.6		1E-05	0.5		9E-06	0.4		5E-06	0.2
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01			<0.01		5E-06	0.1		5E-06	0.2

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway related for this sample. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 25. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4810 (USAF/CERCLA APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,2,4-trimethylbenzene		7.3	2.9		0.40	2.0		0.27	1.7		0.23	0.18		0.024658
2-butanone (MEK)		5,214	63		0.01208	3.4		<0.01	5.5		<0.01	1.9		<0.01
4-ethyltoluene		104	2.6		0.025	1.7		0.01635	1.5		0.01442	0.16		<0.01
carbon disulfide		730				19		0.02603	6.3		<0.01	29		0.039726
ethanol		7,300	1,800		0.25	57		<0.01	31		<0.01	16		<0.01
ethylbenzene	1.1	1,043	2.4	2E-06	<0.01	1.3	1E-06	<0.01	1.4	1E-06	<0.01	0.17	2E-07	<0.01
m- & p-xylene		104	11		0.11	5.2		0.05	5.5		0.05	0.66		<0.01
naphthalene	0.08	3.1	1.1	1E-05	0.35	0.3	4E-06	0.10	0.31	4E-06	0.10	0.14	2E-06	0.05
o-xylene		104	3.5		0.03365	1.8		0.01731	1.8		0.01731	0.22		<0.01
p-isopropyltoluene		1,043	3.8		<0.01	3.4		<0.01	1.1		<0.01	0.24		<0.01
Cumulative Risks and Hazard Indices:				2E-05	1		5E-06	0.5		5E-06	0.4		2E-06	0.1
Cumulative Risks and Hazard Indices for VIP-related Analytes:								0.03					2E-06	0.08

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway related for this sample. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 26. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR HYPOTHETICAL FUTURE RESIDENTIAL RISK CALCULATION, BUILDING 4810 (DTSC APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,2,4-trimethylbenzene		7.3	2.9		0.40	2.0		0.3	1.7		0.23	0.18		0.024658
2-butanone (MEK)		5,214	63		0.01208	3.4		<0.01	5.5		<0.01	1.9		<0.01
4-ethyltoluene		104	2.6		0.025	1.7		0.01635	1.5		0.01442	0.16		<0.01
carbon disulfide		730				19		0.02603	6.3		<0.01	29		0.039726
ethanol		7,300	1,800		0.25	57		<0.01	31		<0.01	16		<0.01
ethylbenzene	1.1	1,043	2.4	2E-06	<0.01	1.3	1E-06	<0.01	1.4	1E-06	<0.01	0.17	2E-07	<0.01
m- & p-xylene		104	11		0.11	5.2		0.05	5.5		0.05	0.66		<0.01
naphthalene	0.08	3.1	1.1	1E-05	0.35	0.3	4E-06	0.10	0.31	4E-06	0.10	0.14	2E-06	0.05
o-xylene		104	3.5		0.03365	1.8		0.01731	1.8		0.01731	0.22		<0.01
p-isopropyltoluene		417	3.8		<0.01	3.4		<0.01	1.1		<0.01	0.24		<0.01
Cumulative Risks and Hazard Indices:				2E-05	1		5E-06	0.5		5E-06	0.4		2E-06	0.1
Cumulative Risks and Hazard Indices for VIP-related Analytes:								0.03					2E-06	0.08

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway related for this sample. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

ATTACHMENT A
HUMAN HEALTH RISK SCREENING - DIRECT CONTACT (TAPWATER) PATHWAY
(HYPOTHETICAL FUTURE RESIDENTIAL)
DTSC-PREFERRED APPROACH
SITES N3 AND N4

TABLE A-1. HUMAN HEALTH RISK SCREENING - DIRECT CONTACT (TAPWATER) PATHWAY (HYPOTHETICAL FUTURE RESIDENTIAL), DTSC-PREFERRED APPROACH
SITE N3

			2003 HHRA Hypothetical Future Residential Risk Results [1]					2012 Hypothetical Future Residential Risk Results[2]	
Analyte	2003 HHRA Maximum Detected Concentration (μg/L)	Tapwater PRG (μg/L)	Cancer risk	Hazard Quotient	2012 Maximum Detected Concentration (μg/L)	Cancer RSL (μg/L)	Non-cancer RSL (μg/L)	Cancer Risk	Hazard Quotient
1,1,2-trichloroethane	1.4	0.20	7E-06	NA	---	---	---	---	---
1,1-dichloroethene	3.9	0.05	9E-05	NA	0.61	NA	280	NA	<0.01
1,2,3-trichlorobenzene	660	194	NA	3.39	---	---	---	---	---
1,2,4-trimethylbenzene	4,400	12.3	NA	356.96	980	NA	15	NA	65
1,2-dichlorobenzene	9.60	370	NA	0.03	0.16	NA	300	NA	<0.01
1,2-dichloroethane	860	0.12	7E-03	NA	67	0.17	13	4E-04	5
1,2-dichloropropane	7.70	0.16	5E-05	NA	---	---	---	---	---
1,3,5-trimethylbenzene	1,200	12.3	NA	97.35	730	NA	12.3	NA	59
1-methylnaphthalene	200	6.2	NA	32.26	---	---	---	---	---
2-butanone (MEK)	1,700	1,904	NA	0.89	57	NA	5,600	NA	0.01
2-hexanone	62	158	NA	0.39	110	NA	38	NA	3
2-methylnaphthalene	190	6.2	NA	30.65	---	---	---	---	---
2-methylphenol	46	1,825	NA	0.03	---	---	---	---	---
4-chlorotoluene	110	122	NA	0.90	---	---	---	---	---
4-methyl-2-pentanone (MIBK)	28	158	NA	0.18	---	---	---	---	---
4-methylphenol	18	182	NA	0.10	---	---	---	---	---
acetone	9,800	608	NA	16.11	31	NA	14,000	NA	<0.01
benzene	13,000	0.35	4E-02	NA	3,900	0.45	33	9E-03	118
bromobenzene	---	---	---	---	0.41	NA	62	NA	<0.01
bromochloromethane	1.2	0.18	NA	6.64	4.7	NA	83	NA	0.06
bromodichloromethane	47	0.18	3E-04	NA	---	---	---	---	---
bromoform	---	---	---	---	3.6	9.2	380	4E-07	<0.01
carbon disulfide	410	1,043	NA	0.39	0.7	NA	810	NA	<0.01
carbon tetrachloride	14,000	0.17	8E-02	NA	7,400	0.45	49	2E-02	151
chloroform	4,200	0.16	3E-02	NA	1,100	0.22	97	5E-03	11
chloromethane	23	1.5	2E-05	NA	0.65	NA	190	NA	<0.01
cis-1,2-dichloroethene	1,800	60.8	NA	29.59	5100	NA	36	NA	142
dibromochloromethane	---	---	---	---	0.26	0.17	380	2E-06	<0.01
dibromomethane	13	60.8	NA	0.21	---	---	---	---	---
dichlorofluoromethane (Freon 21)	2	395	NA	<0.01	---	---	---	---	---
ethylbenzene	2,600	1,340	NA	1.94	1,200	1.5	810	8E-04	1
ethylene dibromide	330	0.0008	4E-01	NA	12	0.0075	17	2E-03	0.7
isopropylbenzene (cumene)	210	658	NA	0.32	100	NA	660	NA	0.2
methylene chloride	4,000	4.3	9E-04	NA	23	4.3	110	5E-06	0.2
naphthalene	140,000	6.2	NA	22,569.94	420	0.17	6.1	2E-03	69
n-butylbenzene	140	60.8	NA	2.30	21	NA	1,000	NA	0.02
N-nitrosodimethylamine (NDMA)	0.17	0.001	1E-04	NA	0.091	0.00049	0.16	2E-04	1
n-propylbenzene	470	60.8	NA	7.73	270	NA	660	NA	0.4
organic lead	0.94	0.004	NA	261.11	14	NA	190	NA	0.07
p-cymene (p-isopropyltoluene)	78	660	NA	0.12	---	---	---	---	---
phenol	45	21,900	NA	<0.01	---	---	---	---	---
sec-butylbenzene	40	60.8	NA	0.66	23	NA	240	NA	0.10
styrene	100	1,641	NA	0.06	---	---	---	---	---
tert-butylbenzene	700	60.8	NA	11.51	0.63	NA	240	NA	<0.01
tetrachloroethene (PCE)	4.70	1.1	4E-06	NA	0.495	0.1	41	5E-06	0.01
toluene	31,000	723	NA	42.85	1,400	NA	1,100	NA	1
t-butyl alcohol	---	---	---	---	120	NA	40,000	NA	<0.01
trans-1,2-dichloroethene	0.75	122	NA	<0.01	0.95	NA	360	NA	<0.01
trans-1,3-dichloropropene	8.50	0.40	NA	21.25	---	---	---	---	---
trichloroethene (TCE)	65,000	1.6	4E-02	NA	66,000	0.49	2.8	1E-01	23,571
vinyl acetate	10	412	NA	0.02	---	---	---	---	---
vinyl chloride	2.60	0.04	6E-05	NA	---	---	---	---	---
xylene (m,p)	17,000	1,400	NA	12.14	---	---	---	---	---
xylene (o)	8,400	1,400	NA	6.00	---	---	---	---	---
xylenes, total	---	---	---	---	2,220	NA	190	NA	12
		Total:	6E-01	20,000				Total : 2E-01	20,000

Notes:

[1] Calculated as the ratio of the maximum detected concentration to the PRG for noncarcinogens. This ratio is multiplied by 1 x 10^{-6} for carcinogens (Earth Tech 2001).

[2] Calculated as the ratio of the maximum detected concentration to the RSL for noncarcinogens. This ratio is multipied by 1 x 10^{-6} for carcinogens.

--- not detected above reporting limit, therefore RSLs and/or PRGs are not indicated and risk and hazards are not calculated.
μg/L micrograms per liter
HHRA human health risk assessment
NA not applicable/available, toxicity values were not available in 2003 and/or toxicity values are not currently available.
PRG Preliminary Remediation Goal (USEPA 2000)
RSL USEPA Regional Screening Levels for tapwater (May 2014) or HERO Note 3 (May 2013) if available.

The PRG for 1,2,4-trichlorobenzene was used for 1,2,3-trichlorobenzene.

The PRG for napthalene was used for 1-methylnapthalene and 2-methylnaphthalene.

The PRG for n-hexane was used for 2-hexanone.

The PRG for 2-chlorotoluene was used for 4-chlorotoluene.

The PRG for bromodichloromethane was used for bromochloromethane.

The PRG for dichlorodifluoromethane was used for dichlorofluoromethane.

The PRG for isopropylbenzene (cumene) was used for p-isopropyltoluene (p-cymene).

The PRG for 1,3-dichloropropene was used for trans-1,3-dichloropropene.

n-propylbenzene used as a surrogate for isopropylbenzene.

TABLE A-2. HUMAN HEALTH RISK SCREENING - DIRECT CONTACT (TAPWATER) PATHWAY (HYPOTHETICAL FUTURE RESIDENTIAL), DTSC-PREFERRED APPROACH
SITE N4

			2003 HHRA Hypothetical Future Residential Risk Results [1]					2012 Hypothetical Future Residential Risk Results [2]	
Analyte	2003 HHRA Maximum Detected Concentration (μg/L)	Tapwater PRG (μg/L)	Cancer Risk	Hazard Quotient	2012 Maximum Detected Concentration (μg/L)	Cancer RSL (μg/L)	Non-cancer RSL (μg/L)	Cancer Risk	Hazard Quotient
1,2-dichloroethane	6.4	0.12	5E-05	NA	3.1	0.17	13	2E-05	0.2
1,1,2-trichlorotrifluoroethane	---	---	---	---	1.2	NA	55,000	NA	<0.01
acetone	1.1	608	NA	<0.01	---	---	---	---	---
bromochloromethane	0.24	0.18	1E-06	NA	---	---	---	---	---
bromodichloromethane	13	0.18	7E-05	NA	1.4	0.13	380	1E-05	<0.01
bromoform	---	---	---	---	0.32	9.2	380	3E-08	<0.01
benzene	32	0.35	9E-05	NA	---	---	---	---	---
carbon disulfide	0.43	1,043	NA	<0.01	---	---	---	---	---
carbon tetrachloride	74	0.17	4E-04	NA	370	0.45	49	8E-04	8
chloroform	39	0.16	2E-04	NA	68	0.22	97	3E-04	0.7
chloromethane	---	---	---	---	0.26	NA	190	NA	<0.01
cis-1,2-dichloroethene	24	60.8	NA	0.39	14	NA	36	NA	0.4
dibromochloromethane	3.00	0.13	2E-05	NA	0.26	0.17	380	2E-06	<0.01
methylene chloride	0.28	4.3	7E-08	NA	---	---	---	---	---
naphthalene	3.7	6.2	NA	0.60	0.2	0.17	6.1	1E-06	0.03
N-nitrosodimethylamine (NDMA)	---	---	---	---	0.0029	0.0005	0.16	6E-06	0.0
tetrachloroethene (PCE)	10	1.1	9E-06	NA	3.2	0.1	41	3E-05	0.08
trans-1,2-dichloroethene	1.7	122	NA	0.01	0.26	NA	360	NA	<0.01
trichloroethene (TCE)	350	1.6	2E-04	NA	580	0.49	2.8	1E-03	207
xylene (o)	1.6	1,400	NA	<0.01	---	---	---	---	---
		Total:	1E-03	1			Total :	2E-03	200

Notes:

[1] Calculated as the ratio of the maximum detected concentration to the PRG for noncarcinogens. This ratio is multiplied by 1 x 10^{-6} for carcinogens (Earth Tech 2001).

[2] Calculated as the ratio of the maximum detected concentration to the RSL for noncarcinogens. This ratio is multipied by 1 x 10^{-6} for carcinogens.

--- not detected above reporting limit, therefore RSLs and/or PRGs are not indicated and risk and hazards are not calculated.
μg/L micrograms per liter
HHRA human health risk assessment
NA not applicable/available, toxicity values were not available in 2003 and/or toxicity values are not currently available.
PRG Preliminary Remediation Goal (USEPA 2000)
RSL USEPA Regional Screening Levels for tapwater (May 2014) or HERO Note 3 (May 2013) if available.

ATTACHMENT B
VAPOR INTRUSION INVESTIGATION REPORT
(ON CD)

National Aeronautics and Space Administration
Armstrong Flight Research Center
Edwards Air Force Base, California

Environmental Restoration Program

Vapor Intrusion Investigation Report
Operable Unit 6

Final

June 2016

ENVIRONMENTAL RESTORATION PROGRAM

VAPOR INTRUSION INVESTIGATION REPORT
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ARMSTRONG FLIGHT RESEARCH CENTER
OPERABLE UNIT 6

EDWARDS AIR FORCE BASE
CALIFORNIA

FINAL

JUNE 2016

Prepared for:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ARMSTRONG FLIGHT RESEARCH CENTER
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RESTORATION PROGRAM MANAGEMENT OFFICE-WEST (AFCEC/CZRW)
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REPORT DOCUMENTATION PAGE	Form Approved OMB No. 0704-0188

The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

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1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
14-06-2016	Final	June 2012 – August 2013

4. TITLE AND SUBTITLE

Vapor Intrusion Investigation Report
National Aeronautics and Space Administration
Armstrong Flight Research Center
Operable Unit 6
Edwards Air Force Base
California

5a. CONTRACT NUMBER
USAF No. FA8903-08-D-8770

5b. GRANT NUMBER
NA

5c. PROGRAM ELEMENT NUMBER
NA

6. AUTHOR(S)

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5d. PROJECT NUMBER
NASA 2012-002

5e. TASK NUMBER6
0262

5f. WORK UNIT NUMBER
NA

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

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8. PERFORMING ORGANIZATION REPORT NUMBER
NA

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

U.S. Air Force Civil Engineer Center
Environmental Center of Excellence - West (AFCEC/CZRW)
3515 S. General McMullen
San Antonio, TX 78226-2018

10. SPONSOR/MONITOR'S ACRONYM(S)
AFCEC/CZRW

11. SPONSOR/MONITOR'S REPORT NUMBER(S)
NA

12. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited

13. SUPPLEMENTARY NOTES

None

14. ABSTRACT

This document details the assessment of potential risk associated with the vapor intrusion pathway (VIP) at Operable Unit 6 Buildings 4806, 4807, and 4810. The investigation effort consisted of the collection and laboratory analysis of sub-slab vapor samples as well as indoor and outdoor air samples at the three buildings. The chemical concentration data were assessed to determine if the VIP is complete between groundwater and indoor air and to evaluate the potential risks posed by the VIP in these buildings under the current industrial land use scenario. This document summarizes the field procedures employed, the activities conducted between June 2012 and August 2013, field survey results, sample analytical results, risk evaluation, and the conclusions and recommendations of the investigation.

15. SUBJECT TERMS

Vapor Intrusion Investigation Report, NASA Armstrong, Operable Unit 6, Edwards AFB

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
					Eric Barefoot
a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. TELEPHONE NUMBER *(Include area code)*
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	428	(210) 395-0634

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PREFACE

This document presents the *Vapor Intrusion Investigation Report, National Aeronautics and Space Administration, Armstrong Flight Research Center, Operable Unit 6, Edwards Air Force Base, California*. The investigation effort consisted of collecting sub-slab vapor and indoor/outdoor air samples at Buildings 4806, 4807, and 4810, which are routinely occupied by site workers and overlie or are within 100 feet of the Operable Unit (OU) 6 groundwater contamination plumes. The data collected during this investigation were used to assess whether or not the vapor intrusion pathway (VIP) is complete and evaluate the potential risks posed by the VIP in these buildings under the current industrial land use scenario.

This report was prepared by AECOM Technical Services, Inc. (AECOM) according to the requirements of Contract Number (No.) FA8903-08-D-8770, Task Order Number 0262, between the United States Air Force Civil Engineer Center (AFCEC) and AECOM. The AFCEC Contracting Officer's Representative is Eric Barefoot, the National Aeronautics and Space Administration Armstrong Flight Research Center project manager is Jennifer Flavin, and the Edwards Air Force Base (AFB) OU 6 manager is Tom Merendini. The AECOM Edwards AFB program manager is Manish Joshi, the AECOM OU 6 manager is Kimberly Coleman, and the AECOM OU 6 technical reviewer is Dr. Yuanyuan Andren.

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LIST OF ABBREVIATIONS AND ACRONYMS

1×10^{-6}	one in a million
μg/L	micrograms per liter
μg/m^3	micrograms per cubic meter
A/C	air conditioning
AECOM	AECOM Technical Services, Inc.
AFB	Air Force Base
AFCEC/CZOW	Air Force Civil Engineer Center/Environmental Restoration Operations Division – West
AFCEC/CZRW	Air Force Civil Engineer Center/ Environmental Center of Excellence – West
AFRC	Armstrong Flight Research Center
ASTM	American Society for Testing and Materials
ATL	Air Technology Laboratories, Inc.
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CA-IASL	California Indoor Air Screening Level
Cal EPA	California Environmental Protection Agency
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chemical of concern
CT	carbon tetrachloride
DoD	Department of Defense
DTSC	Department of Toxic Substances Control
e.g.	for example (*exempli gratia*)
Earth Tech	Earth Tech, Inc.
ERP	Environmental Restoration Program
ft	foot; feet
FY	fiscal year
H&P	H&P Mobile Geochemistry, Inc.
HHRA	human health risk assessment
HI	Hazard Index
HQ	Hazard Quotient
HVAC	heating, ventilating, and air conditioning
i.e.	that is (*id est*)
IASL	Indoor Air Screening Level
IRIS	Integrated Risk Information System
ISCO	*in situ* chemical oxidation
ITRC	Interstate Technology and Regulatory Council
IUR	inhalation unit risk
LUC	land use control
mL/min	milliliter per minute

LIST OF ABBREVIATIONS AND ACRONYMS *(Continued)*

NASA	National Aeronautics and Space Administration
No.	number
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
Pa	Pascal
PCE	tetrachloroethene
PID	photoionization detector
ppb	parts per billion
QASR	quality assurance summary report
RBSL	risk based screening level
RfC	reference concentration
ROD	Record of Decision
SAP	Generic Uniform Federal Policy Quality Assurance Project Plan
SVSL	Soil Vapor Screening Level
TCE	trichloroethene
TMB	trimethylbenzene
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VI	vapor intrusion
VIP	vapor intrusion pathway
VOC	volatile organic compound

EXECUTIVE SUMMARY

Under the Environmental Restoration Program, the United States Air Force (USAF) conducted a vapor intrusion pathway (VIP) investigation at Buildings 4806, 4807, and 4810, which are routinely occupied by site workers and are adjacent to the Operable Unit (OU) 6 groundwater contamination plumes. The investigation effort consisted of collecting sub-slab vapor samples as well as indoor and outdoor air samples at Buildings 4806, 4807, and 4810. The chemical concentration data were assessed to determine if the VIP is complete between groundwater and indoor air and to evaluate the potential risks posed by the VIP in these buildings under the current industrial land use scenario. This report summarizes the field procedures employed, the activities conducted between March and August 2013, field survey results, sample analytical results, risk evaluation, and the conclusions and recommendations of the investigation.

There are no current or anticipated residential land uses at OU 6; therefore, the hypothetical residential scenario is not addressed in this report. An evaluation of the hypothetical residential scenario may be addressed during future projects as appropriate.

OU 6 is in the remedial action phase of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. No remedial action was determined to be necessary for soil in the Record of Decision (ROD). For groundwater, the ROD identified potential exposure pathways requiring prevention or minimization, including groundwater ingestion and dermal contact as well as inhalation of groundwater vapors. Though the inhalation pathway may include both direct inhalation and inhalation through the VIP into buildings, the selected remedy was designed to be protective of direct inhalation based on available groundwater data evaluated as part of the original human health risk assessment (Earth Tech, Inc. 2003), which, at the time of the ROD signing, indicated no VIP risk that may require mitigation.

The *First Five-Year Review Report* (AECOM Technical Services, Inc. 2011) for OU 6 was submitted in 2011. One of the purposes of a five-year review is to determine if changes in site conditions or changes in elements which comprise past risk assessments may have changed in to an extent that the previous conclusions supporting the protectiveness of the ROD-selected remedy may no longer be valid. The OU 6 *First Five-Year Review Report* identified changes in toxicity data and risk assessment

methodologies that had the potential to adversely affect the calculated VIP risk and the protectiveness of the remedy. Based on the findings of that document, the USAF and the regulatory agencies deferred determination of remedy protectiveness pending additional investigation and assessment of indoor air risk to current site workers (the focus of this report).

The VIP investigation summarized in this report was designed to meet the following objectives:

1. Collect sub-slab vapor samples and evaluate whether indoor workers may be at risk from subsurface volatile organic compounds (VOCs), if detected, in Buildings 4806, 4807, and 4810 overlying or in close proximity to the OU 6 contamination plumes.

2. Collect indoor/outdoor air samples and use multiple lines of evidence to identify those VOCs with a moderate to high likelihood of intruding into indoor air spaces from the subsurface via the VIP.

3. Quantify the cumulative risk for these VIP-related VOCs and all VOCs detected in the indoor air samples for each sampling location.

4. Based upon the evaluations, provide conclusions regarding the potential VIP risks at Buildings 4806, 4807, and 4810 under the current industrial land use scenario.

The VIP investigation activities consisted of:

- Initial building surveys in June 2012 to verify the proposed sampling locations,

- Sampling event building surveys to confirm the proposed sampling locations,

- Installation of sub-slab vapor sampling points in all three buildings,

- Collection of sub-slab vapor samples and indoor and outdoor air samples for laboratory analysis for VOCs, and

- Data evaluation of potential VIP risks at all three buildings based on the current industrial land use scenario.

The following is a summary of the conclusions for the VIP investigation conducted from March through August 2013 at Buildings 4806, 4807, and 4810:

- (Met Objectives Number [No.] 1 and No. 2) Upon the completion of the initial building surveys in June 2012, five sub-slab vapor and indoor air sampling points were proposed for Building 4806, and four sub-slab vapor and indoor air sampling points were proposed for

each of Buildings 4807 and 4810. Three outdoor air sampling locations were proposed each for Buildings 4806/4807 and 4810. The sampling event buildings surveys in March 2013 confirmed these proposed sampling locations.

Sub-slab vapor and indoor and outdoor air samples were collected from all three buildings during the weeks of 4 March and 19 August 2013. Sub-slab vapor sample results served as lines of evidence for comparison to indoor air and were not used for VIP risk calculations.

- (Met Objectives No. 3 and No. 4) The estimated indoor air risks are summarized below. Non-cancer risks are expressed as the Hazard Index (HI), which is the summation of individual hazard quotients. The hazard quotients were not expressed on a target organ basis and, therefore, the non-cancer risks are likely over-estimated.

  - Using the USAF/CERCLA approach for the selection of toxicity criteria, the total cancer industrial risk for individual samples ranged from 5×10^{-7} to 1×10^{-4} and the total HIs ranged from 0.03 to slightly below 2 in Buildings 4806, 4807, and 4810 for the VOCs detected during the March and August 2013 sampling events.

  - Using the (Department of Toxic Substances Control) DTSC-preferred approach for the selection of toxicity criteria, the total cancer industrial risk for individual samples ranged from 2×10^{-6} to 1×10^{-4} and the HIs ranged from 0.04 to 3 in Buildings 4806, 4807, and 4810 for the VOCs detected during the March and August 2013 sampling events.

  - Using various lines of evidence and the USAF/CERCLA approach for the selection of toxicity criteria, the total cancer industrial risk was up to 1×10^{-6} and the HIs ranged from less than 0.01 to 0.04 in Buildings 4806, 4807, and 4810 for VOCs considered VIP-related or likely to be VIP-related.

  - Using various lines of evidence and the DTSC-preferred approach for the selection of toxicity criteria, the total cancer industrial risks were up to 4×10^{-6} and the HIs ranged from less than 0.01 to 0.09 in Buildings 4806, 4807, and 4810 for VOCs considered VIP-related or likely to be VIP-related.

- TCE was not detected above the 1.1-microgram per cubic meter ($\mu g/m^3$) reporting limit in indoor air, which is below the 8.8-$\mu g/m^3$ concentration estimated to represent a Hazard Quotient of 1 for any exposure over an 8-hour day. The (United State Environmental Protection Agency [USEPA]-calculated) industrial worker May 2014 Regional Screening Level for TCE in air uses the USEPA Integrated Risk Information System reference concentration to calculate a scenario-specific (industrial worker) concentration that is protective of both genders (and an unborn fetus) as 8.8 $\mu g/m^3$.

The following is a summary of the recommendations for future VIP monitoring in Buildings 4806, 4807, and 4810:

1. Based upon the results of the indoor air sampling that (1) the potential cancer risks for all VOCs detected in indoor air were at or less than 1×10^{-4}, and no cumulative HI for chemicals potentially impacting the same target organ exceeded unity (1.0); and (2) the potential cancer risks from VIP and likely VIP-related indoor air VOCs were less than 1×10^{-6} (except for risks calculated using DTSC-preferred toxicity values which were 4×10^{-6} in Building 4806 for the March 2013 sampling event, 2×10^{-6} in Building 4806 for the August 2013 sampling event, and 3×10^{-6} in Building 4807 for the August 2013 sampling event), and the HIs were less than 1, no further action appeared to be necessary. However, due to a demolition delay and to confirm seasonal observations (as further discussed below), an additional winter sampling event was performed in February 2016 at Buildings 4806 and 4807. Results of the sampling event will be included in the Second Five-Year Review Report.

2. Although the heating, ventilating, and air conditioning system is mostly operating in the heating mode during the winter season and tends to induce a negative pressure differential inside the buildings in relation to the outside air, the measurements during this VIP investigation exhibited that negative pressure differentials are as likely to be present as positive pressure differentials during either winter or summer months. Therefore, the results from the March and August 2013 sampling events appear to be representative of building conditions in the "winter to spring" and "summer" seasons, respectively. To confirm these findings, an additional winter sampling event was performed in February 2016.

3. Although a VIP exists in Buildings 4806, 4807, and 4810 (particularly in Building 4806 for benzene, a known site contaminant in groundwater), a VIP monitoring program does not appear to be necessary due to the estimated indoor air risks (for VIP-related and likely VIP-related indoor air VOCs) being well within the CERCLA risk management range for cancer risks (1×10^{-6} to 1×10^{-4}) and non-cancer hazards being well below 1. Although the benzene plume is likely under Buildings 4806 and 4807 and is projected to continue to migrate beneath the buildings, Buildings 4806 and 4807 are slated for demolition as early as Fiscal Year 2018 and no replacement structures are planned. To confirm the seasonal findings and to account for a delay in demolition of Buildings 4806 and 4807 (Building 4810 was demolished in September 2014), an additional winter sampling event was performed at Buildings 4806 and 4807 in February 2016. Results of the sampling event will be included in the Second Five-Year Review Report. Buildings 4806 and 4807 were selected for this investigation due in part to their proximity to the benzene and trichloroethene (TCE) plumes. No other current or planned occupied buildings are or will be closer to the plumes; therefore Buildings 4806 and 4807 are the most likely buildings to have VIP-related indoor air risks outside of the risk management range. Based on this investigation which demonstrated that VIP-related indoor air risks are well within the risk management range and that TCE was not detected in any indoor air samples, an indoor air

monitoring program is not recommended at these buildings or any other NASA buildings in the path of the benzene and TCE plumes. This recommendation will be re-evaluated in the Second Five Year Review pending the results of the February 2016 sampling event.

Unlike Buildings 4806 and 4807, a replacement building is planned near the former location of Building 4810. In order to evaluate whether sub-slab vapor sources have the potential to pose unacceptable health risks due to vapor intrusion in the future if site conditions were to change such as new building construction, the sub-slab vapor sampling results were compared on a sample-by-sample basis to the respective Soil Vapor Screening Levels (SVSLs). Although no VOCs detected in the sub-slab vapor samples collected during either season from Building 4810 exceeded the respective SVSLs or California-SVSLs, NASA has included a vapor barrier in the construction specifications for the Building 4810 replacement due to its downgradient location relative to the plumes.

4. Because the indoor risks associated with the VOCs that are VIP-related and likely VIP-related are within the CERCLA risk management cancer range (1×10^{-6} to 1×10^{-4}) while the HI is below 1, the actual sources of the likely VIP-related VOCs were not further studied.

5. If, during any future investigations, TCE is detected in indoor air, the receptor pathway for short-term exposure of developing fetuses and related uncertainty regarding residential and industrial exposure durations should be addressed.

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1.0 INTRODUCTION

Under the Environmental Restoration Program (ERP), the United States Air Force (USAF) and the National Aeronautics and Space Administration (NASA) conducted a vapor intrusion pathway (VIP) investigation at Buildings 4806, 4807, and 4810 within Operable Unit (OU) 6, Edwards Air Force Base (AFB), California (Figure 1). Buildings 4806, 4807, and 4810 are routinely occupied by site workers and overlie or are within 100 feet (ft) of the OU 6 groundwater contamination plumes. The investigation effort consisted of collecting sub-slab vapor samples and indoor/outdoor air samples at Buildings 4806, 4807, and 4810. The data collected during this investigation were used to assess whether or not the VIP is complete and evaluate the potential risks posed by the VIP in these buildings under the current industrial land use scenario. This VIP report summarizes the field procedures and activities between March and August 2013, sampling results, risk evaluation as well as the conclusions and recommendations.

There are no current residential land uses at OU 6 and none are anticipated; however, the hypothetical residential scenario will be evaluated as part of the update to the OU 6 human health risk assessment (HHRA) (Earth Tech, Inc. [Earth Tech] 2003) in preparation for the OU 6 *First Five-Year Review Report Addendum* (scheduled for February 2015). The hypothetical residential scenario is discussed in the *Edwards AFB Basewide Vapor Intrusion Evaluation Protocol* (hereinafter referred to as the *Basewide VIP Protocol*) (AECOM Technical Services, Inc. [AECOM] 2012b).

1.1 OPERABLE UNIT 6 HISTORY

The USAF, due to its primary mission in national defense, has long been engaged in a wide variety of operations that involve the use, storage, and disposal of hazardous substances. In 1980, the Department of Defense (DoD) developed the ERP, formerly known as the Installation Restoration Program, to investigate hazardous substance disposal sites on DoD facilities. The objectives of the ERP are to assess past hazardous substance disposal and release sites at USAF installations and to develop remedial actions consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act, and the National Oil and Hazardous Substances Contingency Plan for sites that pose a threat to human health and welfare or the environment.

In response to Edwards AFB's listing on the National Priorities List on 30 August 1990, and to facilitate the ERP's investigation of wastes from past military and/or tenant agency use, and implement response actions, the Base was divided into 10 operable units. The operable units are defined by lease boundaries, if applicable, geographical location, similarities in contaminant types and distribution, and/or hydrologic setting. OU 6 is defined by the NASA Armstrong Flight Research Center (AFRC) (formerly Dryden Flight Research Center) lease boundary (Figure 2). Initial NASA AFRC investigations began in 1988 principally at a former gas station (now identified as Site N3). In 1993, an expanded investigation was conducted at OU 6 in which several sites and areas of concern were identified as documented in the *Base-wide Expanded Source Investigation/Resource Conservation and Recovery Act Facility Assessment* (The Earth Technology Corporation 1993). The OU 6 remedial investigation/feasibility study phase was completed in September 2006 with the signing of the Record of Decision (ROD). The ROD documented the remedy of:

- Land Use Controls (LUCs): Implement, monitor, maintain, enforce, and report LUCs on groundwater in accordance with the Base General Plan and NASA AFRC Master Plan;
- *In Situ* Chemical Oxidation (ISCO): Treatment of high concentration portions of the chlorinated hydrocarbon (primarily trichloroethene [TCE]) plume via ISCO (Sites N3 and N7 areas);
- Bioremediation: Treatment of high concentration portions of the aromatic hydrocarbon plume (primarily benzene) via enhanced natural attenuation (bioremediation) (Site N3 area);
- Groundwater Monitoring: Demonstrate the effectiveness of natural attenuation in low concentration areas of the groundwater plume (plume containment) through periodic groundwater monitoring (Sites N1 and N4 areas), and document reduction in contaminant levels throughout the plume (Sites N1, N2, N3, N4, and N7 areas); and
- Five-Year Reviews: Conduct five-year reviews to evaluate the effectiveness of the selected remedy and monitor the status of the remedial action objectives.

No remedial action was determined to be necessary for soil in the ROD. For groundwater, the ROD identified exposure pathways that need to be prevented and/or minimized. The exposure pathways are groundwater ingestion and dermal contact, and inhalation of groundwater vapors. Though the inhalation pathway includes direct inhalation and inhalation through the VIP into buildings, the selected remedy was designed to be protective of direct inhalation based on available groundwater data evaluated as part of the original HHRA (Earth Tech 2003), which showed no unacceptable VIP risk requiring action at the time of the ROD signing. The remedial action selected in the ROD is led by the USAF, and overseen by the United States Environmental Protection Agency (USEPA), Region 9; California

Department of Toxic Substances Control (DTSC); and California Regional Water Quality Control Board, Lahontan Region.

The *First Five-Year Review Report* for OU 6 was submitted in 2011. One of the purposes of a five-year review is to determine if changes in site conditions or to the elements making up past risk assessments may have changed in such a way that the previous conclusions supporting the protectiveness of the ROD-selected remedy may no longer be valid. Changes in toxicity data and risk assessment methodologies were identified in the OU 6 *First Five-Year Review Report* (AECOM 2011b) as potentially having an adverse effect on the calculated VIP risk, and the protectiveness of the remedy for the VIP. Based on the findings of the *First Five-Year Review Report*, the USAF and the regulatory agencies deferred determination of remedy protectiveness pending additional investigation and assessment of indoor air risk to current site workers (the focus of this investigation).

1.2 ENVIRONMENTAL SETTING

Edwards AFB is located in the Southern California counties of Kern, Los Angeles, and San Bernardino, approximately 2 miles east of the city of Rosamond (Figure 1). NASA AFRC is a tenant organization at Edwards AFB; the 838-acre leased facility is designated as Environmental Restoration Program OU 6 and is located in the north-central portion of the Base on the main flightline, wholly within Kern County.

OU 6 is located on the northwestern edge of Rogers Dry Lake, in generally flat, but gently sloping terrain. Surface elevations vary by approximately 30 ft between the high points on the western side of OU 6 and the low points along the lakebed. Subsurface materials at OU 6 consist of granitic bedrock overlain by a relatively thin layer of unconsolidated alluvial and lake bed deposits. The alluvial layer consists of sandy deposits that appear to have been derived from granitic bedrock outcrops. The bedrock at OU 6 is generally competent, except for surface weathering and localized fracturing.

Due to the near surface occurrence of bedrock, the saturated zone at OU 6 lies entirely within fractures in the granitic bedrock. Groundwater depth ranges from approximately 30 ft below grade along the western side of OU 6 to approximately 5 ft below grade along the eastern side of OU 6. Historical groundwater elevations for wells located throughout OU 6 define a water table sloping toward Rogers Dry Lake, indicating that groundwater generally flows from OU 6 to the east.

1.3 OPERABLE UNIT 6 DESCRIPTION AND POTENTIAL VIP RISKS

1.3.1 OPERABLE UNIT 6 DESCRIPTION AND CONCEPTUAL SITE MODEL

Land uses surrounding NASA AFRC are industrial in nature and support aeronautical flight testing. AFRC is NASA's primary flight research center. Elements of NASA AFRC's mission include: perform flight research and technology integration to revolutionize aviation and pioneer aerospace technology, validate space exploration concepts, and conduct airborne remote-sensing and science missions. Mission-critical activities involve the movement of aircraft on taxiways in the vicinity of contamination. As shown on Figure 3, the majority of the contaminant plume underlies key aircraft ramps and taxiways.

As documented in the ROD (USAF 2006), the locations of former releases to the environment have been designated as Sites N1, N2, N3, N4, and N7 in OU 6. The location and nature of these releases contributed to a commingled groundwater plume that starts in the Site N3 area in the west, extends downgradient to the east to include Sites N1, N2, N4, and N7, and eventually reaches Rogers Dry Lake (Figure 3). The groundwater plume consists of the following chemicals of concern (COCs): chlorinated hydrocarbons (primarily TCE, a solvent used in aeronautical operations) and aromatic hydrocarbons (including benzene, toluene, ethylbenzene and xylenes [BTEX] typically found in petroleum products). N-nitrosodimethylamine is not identified as a COC in the ROD, but is present in groundwater at Site N3.

Sites N2, N3, and N7 are considered to be the primary source areas, with Sites N3 and N7 containing the highest contaminant concentrations. Site N3 formerly consisted of a gas station with underground storage tanks (USTs) and drum dispensing and storage areas, and contributed TCE and BTEX to the commingled groundwater plume. Former drum storage and waste disposal activities at Sites N2 and N7 contributed TCE and other chlorinated solvents to the groundwater plume. The portion of the groundwater plume beneath Site N3 is located within fractured bedrock. As the plume extends east toward Rogers Dry Lake, the groundwater plume enters alluvial lakebed sediments in the areas of Sites N1 and N4. Sites N1 and N4 consist of a series of topographic depressions along the lakebed boundary and were used to manage surface water runoff originating from NASA AFRC. Historically, the lowest contaminant concentrations within the OU 6 plume were located beneath Sites N1 and N4, likely due to the diluted nature of Sites N1 and N4 contaminant sources (surface water runoff).

The plume shape is narrower at Sites N3 and N7, where releases occurred in smaller areas. Since contaminated groundwater at Sites N3 and N7 is in bedrock, the plume geometry is controlled by fractures. As the plume reaches Sites N1 and N4 it enters sediments that allow more lateral dispersion. In addition, the Sites N1 and N4 sources are more diffuse, covering larger areas.

Historically, all 30 volatile organic compounds (VOCs) listed in Table 1 have been detected in groundwater samples collected from Site N3 at concentrations exceeding their respective cleanup goals set in the OU 6 ROD (Maximum Contaminant Levels) or risk-based USEPA Regional Screening Levels. Additionally, the majority of the historical maximum VOC concentrations listed in Table 1 were detected in samples collected from Site N3 monitoring wells. While chlorinated hydrocarbons attributable to former on-site sources (drum storage and dispensing) contribute to the OU 6 commingled plume (which includes former sources at Sites N1, N2, N4, and N7), aromatic hydrocarbons are specific to the Site N3 area and are attributable to former on-site sources (USTs). The aromatic and chlorinated hydrocarbons are commingled in the Site N3 area.

The principal aromatic hydrocarbons detected at Site N3 include benzene, ethylbenzene, toluene and total xylenes. Due to its presence at high concentrations over a wide area, benzene is used as an indicator for plume delineation and concentration trends in aromatic hydrocarbons at Site N3. The principal chlorinated hydrocarbons detected at Site N3 include carbon tetrachloride (CT), 1,2-dichloroethane, *cis*-1,2,-dichloroethene, and TCE. Due to its presence at high concentrations over a wide area, TCE is used as an indicator for plume delineation and concentration trends in chlorinated hydrocarbons at Site N3. Because benzene and TCE were used as indicators throughout the investigations at OU 6, results for these compounds are presented separately in Sections 3.2, 3.3, and 3.4.

1.3.2 POTENTIAL VIP RISKS AT OPERABLE UNIT 6 AND BUILDINGS 4806, 4807, AND 4810

As previously mentioned, one of the purposes of a five-year review is to determine if changes in site conditions or to the elements making up past risk assessments may have changed in such a way that the previous conclusions supporting the protectiveness of the ROD-selected remedy may no longer be valid. The HHRA (Earth Tech 2003), which influenced the selection of the remedy documented in the ROD, indicated no unacceptable VIP risk requiring action. In evaluating if this conclusion is still valid,

changes in toxicity data, groundwater contaminant concentrations, and risk assessment methodologies were identified in the OU 6 *First Five-Year Review Report* (AECOM 2011) as potentially changing the conclusions of the calculated VIP risk, and leading to uncertainty regarding the protectiveness of the remedy for the VIP. In particular, uncertainties related to the current VIP risks at Buildings 4806, 4807, and 4810 were identified. The remainder of this section presents the methodology for selecting buildings for further VIP investigation.

The selection of buildings for further VIP investigation was based on a screening procedure to conservatively calculate a concentration in groundwater that would be protective of indoor air in overlying buildings. This process identified areas of groundwater where the concentration of chemicals was above a level that corresponded to an acceptable risk in indoor air. The next step was to identify whether there were any buildings that were within this area, and then to determine if these buildings were occupied on a routine basis. Both cancer risks and non-cancer hazards above 1 were considered. However, the groundwater risk-based concentrations were determined to be most protective if they were based on cancer risks rather than non-cancer risks. For the purpose of this screening effort, two groundwater VOCs were selected as indicator chemicals. They were selected based on their high degree of carcinogenic potential and on their representativeness of the groundwater impact beneath the site. Although there are other VOCs in the OU 6 plume (Table 1), the use of these indicator chemicals to define the area of potential impact is expected to encompass all areas where risks from the vapor intrusion of these additional VOCs may be of concern to indoor workers.

The Johnson and Ettinger Indoor Air Exposure Model was used along with site-specific depth to groundwater information representative of the plume area and generic building parameter values to calculate the risk-based screening levels. The minimum depth of 5 ft below ground surface (bgs) was used as a health-protective measure that represents the eastern portion of the plume, but is expected to slightly over estimate (and therefore provide a better screening tool) risk in the western portion of the plume. A generic building 30 ft by 30 ft with a ceiling height of 10 ft and an air exchange rate of 1 building volume per hour was assumed. Since most of the buildings in the area are larger (as shown on Figure 3), this is considered a health-protective assumption. A sandy soil was conservatively selected as the soil type. The default intrusion flux of 5 liters per minute was also assumed.

Because the indoor air risks at OU 6 under the current industrial scenario were primarily driven by the inhalation of TCE and benzene volatilized from groundwater into indoor air, groundwater risk based screening levels (RBSLs) were developed for these chemicals as detailed in Appendix A of the *Vapor Intrusion Sampling Plan and Risk Assessment (Work Plan*) (AECOM 2013).

The areas identified by the TCE and benzene RBSL contours are presented on Figure 3. As Figure 3 shows, the TCE plume occupies a larger areal extent than does the benzene plume. However, neither of these plumes underlies an entire building. In fact, the building with the greatest area underlain by a plume is Building 4802; a large airplane hangar. Due to the large size and open nature of this building, it was not selected to assess potential worker exposure to subsurface VOCs in indoor air. Additional reasons for the deprioritization of Building 4802 are included in Table A-2 in Appendix A of the *Work Plan* (AECOM 2013). The only other building to overlie concentrations of groundwater VOCs that might result in a risk to indoor workers is a very small portion of Building 4806, which overlies the area defined by the benzene RBSL contour (Figure 3). This building is also within 100 ft of the TCE RBSL contour. According to State and Federal vapor intrusion guidance (DTSC 2011 and USEPA 2013a), this 100-foot distance is considered close enough to influence indoor air due to lateral diffusion from the plume. Building 4807 is not underlain by the TCE or benzene plumes. However, since it is located immediately adjacent to Building 4806, is routinely occupied and is within 100 ft of both the TCE and benzene plumes, it was included in the assessment.

Buildings 4806 and 4807 are scheduled for demolition in Fiscal Year (FY) 2018 and no replacement buildings are planned. Despite demolition plans, the buildings were selected for investigation for the reasons outlined above and in the *Work Plan* (AECOM 2013). Buildings 4806 and 4807 are the buildings most likely to have complete VIPs based on their occupancy and proximity to the TCE and benzene plumes.

Building 4810 was determined to be routinely occupied. Although it is not located over the areas defined by the RBSLs for either indicator chemical, it is within 100 ft of the TCE RBSL contour and the indoor air could be impacted by lateral VOC diffusion from the plume. For this reason, Building 4810 was selected for assessment. Building 4810 was demolished in September 2014 and a new building is scheduled for construction in FY 2017 in the same location.

1.4 CONCEPTUAL SITE MODEL FOR SITES N3 (BUILDINGS 4806 AND 4807) AND N7 (BUILDING 4810)

Buildings 4806, 4807, and 4810 overlie two distinct hydrogeologic areas of the OU 6 commingled groundwater plume. Buildings 4806 and 4807 are located in the upper plume area distinguished by shallower bedrock (and therefore thinner alluvial veneer), deeper groundwater, and aromatic hydrocarbon (primarily benzene) and chlorinated hydrocarbon (primarily TCE) groundwater contaminants. Building 4810 is closer to Rogers Dry Lake where the alluvium overburden becomes thicker, the bedrock becomes deeper, and the groundwater becomes shallower. Unlike Buildings 4806 and 4807, Building 4810 is not near the aromatic hydrocarbon (benzene) contamination.

Buildings 4806 and 4807 are located in the upper plume area near Site N3. Based upon the boring logs for monitoring wells N3-MW20, which is 40.5 ft in depth and located approximately 12 ft north of Building 4806, and N3-MW12, which is 260 ft in depth and located approximately 60 ft northeast of Building 4806, the geology near Buildings 4806 and 4807 appears to consist of a relatively thin veneer of alluvium (silty sand) (approximately 3 ft) overlying weathered (over 60 ft) and competent granitic bedrock. The bedrock is fractured, and the groundwater level is approximately 12 ft bgs (Figure 4).

The nearest identified potential point sources to Buildings 4806 and 4807 are associated with Site N3, and include former solvent drum storage and dispensers, and former gasoline underground storage tanks associated with a former gas station (Figure 4).

Building 4806 partially overlies the benzene groundwater plume, and both Buildings 4806 and 4807 are in close proximity to the TCE plume. A benzene concentration of 450 micrograms per liter (μg/L) was detected in a groundwater sample collected from monitoring well N3-MW20 (the nearest monitoring well to Building 4806) in May/June 2012.

Building 4810 is located in the mid-plume area near Site N7. Based upon the boring log for monitoring well N7-MW10, which is 37 ft in depth and located approximately 90 ft east of the southeast corner of Building 4810, the geology near Building 4810 appears to have a thicker veneer of alluvium (approximately 8 ft) compared to the approximately 3 ft of alluvium present beneath Buildings 4806 and 4807. Conversely, the groundwater beneath Building 4810 is shallower than the groundwater beneath Buildings 4806 and 4807. The groundwater level beneath Building 4810 is approximately 5 ft bgs.

The nearest identified potential point sources to Building 4810 are associated with Site N7 and include former solvent drum storage areas (Figure 5).

Building 4810 is located upgradient and approximately 60 ft laterally from the TCE plume. A TCE concentration of 29 μg/L was detected in a groundwater sample collected from monitoring well N7-MW07 in March 2002. Monitoring well N7-MW07 is located approximately 70 ft laterally from Building 4810 and near a former potential source area (former drum storage area) (Figure 5).

Subsurface vapors containing VOCs may volatilize from groundwater (as illustrated on Figures 4 and 5), and may travel upward and pose a risk to workers breathing the indoor air in the buildings overlying or near the groundwater contaminants (Interstate Technology and Regulatory Council [ITRC] 2007a and b). Underground utility lines that extend into areas above the estimated contaminant plume area are present at all three buildings (Figures 6 and 7) and may provide preferential pathways for VOCs into the buildings. With the exception of the utility tunnel indicated on Figure 6, the majority of the utilities are installed in pea-gravel lined trenches. Although, based on its size, the concrete-lined utility tunnel appears to be a significant potential preferential pathway, it is less likely to convey vapors compared to the more permeable pea-gravel lined utility trenches.

Vapor fate and transport is also affected by the concentrations of VOCs at the source of the contamination, the separation distance between the source and the base of the building, the effective diffusivity of VOC vapors in the vadose zone, the magnitude and direction of the airflow between the building and the sub-slab fill materials, and the rate of vapor dilution due to air exchange between the building and the atmosphere. For petroleum hydrocarbons and vinyl chloride, aerobic biodegradation in the vadose zone is also an important mechanism (USEPA 2013a, Davis et al. 2009, Patterson et al. 2013).

1.5 INITIAL BUILDING SURVEY AT BUILDINGS 4806, 4807, AND 4810

Initial building surveys were conducted in June 2012 to record information on the buildings' occupancy patterns, identify preferential flow pathways and chemical usage that could affect sampling results, and evaluate the heating, ventilating, and air conditioning (HVAC) systems. Building managers were also interviewed and building floor plans were acquired to verify that potential sampling locations would not be obstructed by equipment or require special security arrangements for sampling personnel to gain

access. In order to aid in the selection of sub-slab vapor sample and indoor air sample locations, pressure differential measurements between the inside and outside air at various locations within the building were recorded along with temperature measurements. The initial building survey results were recorded on Building Survey Forms and are provided in Appendix A of this document and Appendix B of the *Work Plan* (AECOM 2013).

1.5.1 BUILDING 4806

The initial building survey results indicated that Building 4806 is a metal-skinned structure on concrete slab with uninsulated walls, insulated roof, and cinderblock interior dividing walls. Although it is adjacent to Building 4807, no direct access between the two buildings exists. The building is single-story, approximately 26 ft tall, and has a combination of office and auto/aircraft maintenance spaces. The building has an attached bathroom and is occupied by two to four employees. Air movement is influenced by a fume hood in the battery storage area, evaporative coolers, and a bathroom exhaust fan. Doors in the shop are generally left open during vehicle repair/maintenance work. Flooring consists of the bare concrete slab with vinyl tile over the slab in some rooms. The slab thickness, as determined during the vapor sampling point installation, is 4 inches. Although no significant cracks in the foundation were identified, a floor drain penetration exists in the shop area. Chemical storage/usage includes paint, cleaners, coolant, lubricant, oil, hydraulic fluid, and starting fluid.

Air pressure differentials between indoor and outdoor as well as indoor temperature were measured in June 2012 at multiple locations inside the building. The indoor to outdoor air pressure differentials were negative in several rooms, including those without air movement equipment.

1.5.2 BUILDING 4807

The initial building survey results indicated that Building 4807 is a metal-skinned structure on concrete slab with an insulated roof, drop ceiling in some rooms, and cinderblock interior dividing walls. The building is single-story, approximately 26 ft tall, and serves as a pilot exercise facility and storage area. The building is occupied by four to six people and air movement may be influenced by a restroom exhaust fan. Flooring includes the bare concrete slab, vinyl tile, and wood.

VOC usage includes periodic varnish of the wood gym floor and general maintenance.

Air pressure differentials between indoor and outdoor as well as indoor temperature measurements were measured in June 2012 at multiple locations inside the building. The indoor to outdoor air pressure differentials were negative in several rooms, including those without air movement equipment.

1.5.3 BUILDING 4810

The initial building survey results indicated that Building 4810 is a metal-skinned structure on concrete slab with an insulated roof with drop ceiling and finished sheet rock walls in some rooms. The building is single-story, approximately 26 ft tall, and serves as office space, workshop, and warehouse. The building is occupied by as many as 75 people. Air movement is influenced by restroom exhaust fans, multiple external heat and air conditioning units, and roof-mounted evaporative cooling units. Flooring includes the bare concrete slab, vinyl tile, and carpet. Floor drains and utility lines penetrate the foundation throughout the building. Chemicals are stored in the building's pharmacy.

Air pressure differentials between indoor and outdoor as well as indoor temperature measurements were taken in June 2012 at multiple locations inside the building. Both negative and positive indoor to outdoor air pressure differentials were observed.

1.6 PROJECT SCOPE AND OBJECTIVES OF THE VAPOR INTRUSION MONITORING PROGRAM

1.6.1 PROJECT SCOPE

The project scope and activities followed the activities outlined in the *Work Plan* (AECOM 2013) without significant deviation. The *Work Plan* adhered to guidelines presented in the:

- *DoD Vapor Intrusion Handbook* (DoD 2009a)
- California Environmental Protection Agency (Cal EPA) *Advisory - Active Soil Gas Investigations* (Cal EPA 2012)
- *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* (DTSC 2011)

- Office of Solid Waste and Emergency Response (OSWER) *Final Guidance for Assessing and Mitigating the Vapor Intrusion to Indoor Air Pathway from Subsurface Sources to Indoor Air (External Review Draft)* (USEPA 2013a)

- *Vapor Intrusion Pathway: A Practical Guideline* (ITRC 2007a) and *Vapor Intrusion Pathway: Investigative Approaches for Typical Scenarios* (ITRC 2007b)

Field activities were performed during March and August 2013 and conducted in accordance with the *Work Plan* (AECOM 2013) and *Base-wide Generic Uniform Federal Policy Quality Assurance Project Plan (Base-wide SAP)* (AECOM 2012a).

Prior to the initiation of any field activities, the NASA AFRC Environmental Officer met with the building facility manager(s) to request access to the selected building and discuss the scope of field activities.

The project scope consisted of the following activities:

1. **Initial Building Survey.** An initial building survey and interview were conducted with the facility manager. The objective of the initial building survey was to record information on the building's occupancy patterns, identify preferential flow pathways and chemical usages that could possibly confound the sampling results, and evaluate the HVAC systems. In addition, the building floor plan was reviewed with the facility manager to identify inaccessible areas and potential sampling locations. Completed building survey forms are included in Appendix A.

2. **Sampling Event Building Survey.** The day before and on the day of each sampling event, additional building surveys (pre- and post-sampling) were performed. The objectives of these surveys were to record information on the status of the HVAC, collect temperature and differential pressure measurements (measurements taken at various locations within the building), record outside weather conditions during sample collection, and if possible, ensure removal of any chemicals identified during the initial building survey. Completed sampling event building survey forms are included in Appendix B.

3. **Sub-Slab Probe Installation/Sampling**. A soil gas survey was conducted by H&P Mobile Geochemistry, Inc. (H&P) and included drilling and installing sub-slab vapor probes below the building foundations. Five, four, and four probes were installed inside Buildings 4806, 4807, and 4810, respectively. Vapor probe sampling was performed by the off-site laboratory for VOC analysis by USEPA TO-15 (standard level) and helium analysis by American Society for Testing and Materials (ASTM) D1946.

4. **Indoor Air Sampling**. Indoor air samples were collected, when possible, in close proximity to occupied offices, areas with highest detections of groundwater VOCs, and/or

within the vicinity of the installed sub-slab probes over an 8-hour period for analysis of VOCs in accordance with USEPA Method TO-15 (low level).

5. **Outdoor (ambient) Air Sampling**. Outdoor air samples were collected 5 to 15 ft upwind of the building where indoor air samples were collected. The samples were collected over an 8-hour period for VOC analysis in accordance with USEPA Method TO-15 (low level).

Section 2.0 details the procedures used to complete the field tasks described above.

1.6.2 PROJECT OBJECTIVES

The vapor intrusion (VI) sampling and monitoring program was designed to meet the following objectives:

1. Collect sub-slab vapor samples and evaluate whether indoor workers may be at risk from subsurface VOCs, in Buildings 4806, 4807, and 4810 overlying or in close proximity to the OU 6 contamination plumes.

2. Collect indoor/outdoor air samples and use multiple lines of evidence to identify those VOCs with a moderate to high likelihood of intruding into indoor air spaces from the subsurface via the VIP.

3. Quantify the cumulative risk for these VIP-related VOCs and all VOCs detected in the indoor air samples for each sampling location.

4. Based upon the evaluations, provide conclusions regarding the potential VIP risks at Buildings 4806, 4807, and 4810 under the current industrial land use scenario.

1.7 PROCEDURE USED FOR DERIVATION OF SCREENING LEVELS

In general, the constituents of potential concern are those chemicals that meet volatility requirements for consideration as a potential VIP risk. The criteria used for volatility are that the chemical must have a molecular weight of 200 grams per mole or less and have a Henry's Law Constant greater than 1×10^{-5} atmospheres-cubic meter per mole (USEPA 2014 and DoD 2009a). Organic compounds meeting these criteria are hereinafter referred to as VOCs, and the Indoor Air Screening Levels (IASLs) for the VOCs meeting these criteria were derived and listed in Table 2. Soil Vapor Screening Levels (SVSLs) are usually employed as a screening tool to compare to sub-slab vapor concentrations to determine if indoor air sampling is warranted. Although SVSLs were presented in the *Work Plan* (AECOM 2013), because indoor air samples were collected during each sampling event SVSL

comparisons were not necessary for this assessment. Instead, sub-slab vapor concentrations were compared to indoor air concentrations as a line of evidence to determine if chemicals detected in indoor air are attributable to the VIP as discussed in Section 3.5.2.

The IASLs were derived using the equations shown on the bottom of Table 2, and are the lower of the concentrations in air that correspond to a carcinogenic risk of 1×10^{-6} or a Hazard Quotient (HQ) of 1. The toxicity criteria (inhalation unit risk factors for carcinogens and reference concentrations for non-carcinogens) used in the derivation of the IASLs were selected in accordance with the following hierarchy presented in OSWER Directive 9285.7-53, *Human Health Toxicity Values in Superfund Risk Assessments* (USEPA 2003), as cited in Enclosure 3 of the DoD Instruction 4715.18, *Emerging Contaminants* (DoD 2009b):

1. Tier 1 - USEPA's Integrated Risk Information System (IRIS) located at http://cfpub.epa.gov/ncea/iris/index.cfm?fuseaction=iris.showSubstanceList.

2. Tier 2 - USEPA's Provisional Peer-Reviewed Toxicity Values accessible through USEPA risk assessors.

3. Tier 3 - Other toxicity values, including USEPA and non-USEPA sources of toxicity information. Priority should be given to sources of information that use sound science and are the most current, peer-reviewed, transparent, and publically available. Example sources for Tier 3 include the Cal EPA toxicity criteria database (available at www.oehha.ca.gov/risk/ChemicalDB/index.asp) and the USEPA's Health Effects Assessment Summary Table.

The source and values used for the toxicity criteria are also provided in Table 2, and the IASLs under the current industrial land use scenario were derived accordingly. The VOCs listed in Table 2 are those reported by USEPA Method TO-15 and include the VOCs detected in OU 6 groundwater monitoring wells from 2006 to 2012 (Table 1). Furthermore, the screening levels in Table 2 are generic risk-based screening-level criteria developed for Edwards AFB, and not based on site-specific factors. Because land use will remain industrial for the foreseeable future, IASLs were derived for the default USEPA industrial land use scenario assuming an exposure frequency of 250 days per year, exposure time of 8 hours per day, and exposure duration of 25 years.

Because DTSC does not agree with the USAF (and DoD) policy of selecting toxicity criteria in accordance with the 2003 USEPA OSWER directive, DTSC recommended using the most

health-protective of the toxicity values selected from the sources listed above to derive IASLs. As a result, these criteria, called California IASLs (CA-IASLs), are identified as the DTSC-preferred approach, where using toxicity values from a Tier 2 or 3 source (rather than from IRIS) would result in a lower screening value than the IASLs (USAF/CERCLA approach). IASLs and CA-IASLs are listed in Table 2.

The results of the risk calculations are discussed in Section 3.0.

1.8 TOXICITY ASSESSMENT

The objective of the screening level evaluation described in Section 1.7 and the risk assessment presented in Section 3.0 of this report is to assess the relationship between daily intake and toxic response. The toxicity assessment identifies toxicity values for each chemical and the type of effect each chemical is capable of producing. Toxicological effects fall into two categories: those that could potentially cause cancer (carcinogenic) and those that cause other types of adverse health effects (non-carcinogenic).

The parameter used to describe the toxicity for carcinogenic chemicals via the inhalation route is the inhalation unit risk (IUR), and the parameter for non-carcinogenic effects is the reference concentration (RfC). Chemicals that show a potential for both carcinogenic and non-carcinogenic health effects are assigned both IURs and RfCs.

Use of Cal EPA recommended toxicity values in addition to the USAF recommended toxicity values results in the creation of a separate set of screening levels and risks incorporating the Cal EPA toxicity values.

1.8.1 TOXICITY VALUES FOR CARCINOGENS

IURs express the relationship between average daily intake and the potential for excess lifetime risk of cancer in people. IURs are developed using a mathematical model that uses data from the results of human epidemiological studies or laboratory animal studies to estimate the dose corresponding to a 1 in 1,000,000 probability of developing cancer. The IUR is the upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration of 1 μg/L in water, or 1 $\mu g/m^3$ in air (USEPA 2014).

Most of the IURs are developed from data on laboratory animals that are exposed to the maximum dose that they can tolerate for relatively short periods. This is intended to be protective, as human receptors are more often exposed to much lower levels over long periods of time.

1.8.2 TOXICITY VALUES FOR NON-CARCINOGENS

Each RfC is associated with a specific adverse health effect (e.g., central nervous system damage). The RfC is a concentration below which there is little potential for adverse health effects over the exposure period. RfCs are derived from either human or animal studies and are adjusted using uncertainty factors to account for experimental uncertainties. The RfC is calculated from the highest long-term exposure level that did not cause adverse effects.

Results of the risk assessment are presented in Section 3.0.

2.0 FIELD PROCEDURES AND ACTIVITIES

This section summarizes the field procedures and activities utilized during this VIP investigation. The field procedures and activities were conducted in accordance with the *Work Plan* (AECOM 2013).

2.1 SAMPLING EVENT BUILDING SURVEYS

Initial building surveys were conducted in June 2012 (Appendix A). Building surveys were also conducted in March and August 2013 immediately before each sampling event. The completed building survey forms are provided in Appendix B. The objective for the building surveys conducted immediately before and after each sampling event was to assess whether any significant changes occurred during each sampling event. Also, prior to each indoor air sampling event, the facility manager was contacted to review the list of chemicals on hand and request the removal of any interior VOC source materials that could complicate evaluation of the subsurface vapor intrusion pathway.

2.1.1 DIFFERENTIAL PRESSURES AND TEMPERATURE MEASUREMENTS

The differential pressure measurements were obtained using ¼-inch tubing. One length of the tubing was connected to the inlet (or reference) port of an Omniguard IV pressure meter. The terminal end of the inlet tubing was placed inside a dry container (with the bottom half of the container cut-off), and this was placed inside a dry bucket outside the building (to prevent any wind from blowing across the tube and artificially decreasing the air pressure). A second length of tubing connected to the outlet port of the meter with the terminal end of that tubing placed in the room to be measured. The differential pressure readings were recorded in Pascals (Pa).

In a building where the differential pressure between the indoor and outdoor air was greater than or equal to 6 Pa, the presumption would be that the positive pressure was sufficient to prevent the intrusion of subsurface vapors. Conversely, in a building under negative pressure where the differential pressure between the indoor and outdoor air was less than or equal to -6 Pa, the presumption would be that a completed VIP is possible. Heating systems, basements, and strong winds promote VI into buildings by reducing the internal air pressure and creating a vacuum effect that enhances advective flow from underlying soil and/or groundwater into buildings ("the stack effect") (ITRC 2007a and b).

The outside temperatures, wind conditions, and barometric pressure measured during each sampling date are presented in Section 3.0 and Appendix B of this report. Layouts of the buildings where temperature and differential pressures were taken and sub-slab and indoor and outdoor air samples were collected are included as Figures 8 and 9 of this report.

2.1.2 HVAC SYSTEMS

Specifications regarding each building's HVAC system were obtained (as available) from the facility manager. This information was supplemented where possible by interviewing other building personnel regarding the typical hours of HVAC operation; whether building doors or windows were open to the outdoor air; and the locations and usage of any space heaters or ventilation fans.

Building 4806 is equipped with ceiling mounted evaporative cooling units that utilize external air for cooling and separate internal ceiling mounted natural gas-fired heaters that recycle interior air for heating. Portable air conditioning units are utilized on hotter days. Although there are no windows, the shop roll up door is usually left open when vehicle maintenance/repair is performed. The restroom is equipped with a ventilation fan and shop areas are equipped with roof ventilators.

Building 4807 is equipped with a heat pump unit in the locker room and a ceiling mounted air conditioning (A/C) unit (servicing both buildings 4807 and 4808) for cooling; both units recycle interior air. The restroom is equipped with a ventilation fan and large rooms are equipped with roof ventilators.

Building 4810 is equipped with an external containerized heating and A/C unit and multiple external wall mounted heating and A/C units which utilize both external and recycled air. The building is also equipped with roof mounted evaporative cooling units that utilize external air for cooling. Restrooms are equipped with ventilation fans.

2.2 SUB-SLAB PROBE LOCATIONS AND RATIONALE

On 6 March 2013, five sub-slab probes were installed inside Building 4806 (Figure 8) and four sub-slab probes were installed inside Building 4807 (Figure 8). Four sub-slab probes were installed inside Building 4810 (Figure 9) on 7 March 2013. The vapor sampling probes were installed as permanent sub-slab wells to allow for future sampling. The sub-slab vapor probes are referred to as "wells" in the

remainder of this document. The sub-slab wells were installed based on rationale presented in Table 17-1 of the *Work Plan* (AECOM 2013).

Installation of the sub-slab wells followed guidelines outlined in the *Cal EPA Advisory – Active Soil Gas Investigations* (Cal EPA 2012) and procedures outlined in Appendix G of the *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* (DTSC 2011) and in accordance with procedures specified in the *Work Plan* (AECOM 2013). Installation and sampling of sub-slab wells were performed by H&P.

2.2.1 SUB-SLAB VAPOR WELL CONSTRUCTION

Boreholes were installed using a hand-held hammer drill to advance a 1-inch outer diameter hole through each 4-inch thick foundation to 3 inches below the concrete foundation of each building. A stainless steel vapor implant (screen) was connected to ¼-inch stainless steel tubing and inserted into the bottom of the borehole with a Teflon® separator placed immediately above the filter connection. The terminal end of the ¼-inch tubing was connected to a threaded compression fitting with a metal screw plug. Granular bentonite was added and hydrated up to approximately 3 inches below grade, and then concrete was placed to grade around the stainless steel mount fitting and capped flush with the building floor. Although the stainless steel screen on the implant is 0.5-inch long, the screen interval is considered to be the annular space around the filter which is approximately 1-inch (borehole diameter) by 3 inches (from bottom of borehole to the Teflon® separator just above the filter connection). All sub-slab sampling locations were constructed in this manner. Figure 10 presents a construction diagram of a typical sub-slab vapor well (as previously noted, subject building foundations are approximately 4 inches thick as opposed to the 5-inch slab thickness indicated for a typical sub-slab vapor well depicted on Figure 10).

Where present at the sub-slab well location, carpet, if possible, was cut in a 4-inch triangular fashion (with two sides cut and the third side left intact) and the apex was pulled back to allow access to the concrete foundation.

The sub-slab wells will be abandoned as part of building demolitions. Building 4810 was demolished in September 2014 and Buildings 4806/07 are scheduled for demolition in FY 2018.

2.2.2 EQUIPMENT DECONTAMINATION

Dedicated soil gas sampling probes and new tubing were used and therefore no decontamination was performed. Drilling equipment was decontaminated prior to reuse. The decontamination procedures included: 1) scrubbing the equipment with Alconox/water solution; 2) final rinse with deionized water; and 3) air drying.

2.3 SAMPLING PROCEDURES

Sampling procedures were in accordance with the procedures outlined in Appendix B of the *Edwards AFB Base-wide SAP* (AECOM 2012a) except where additional sampling techniques, as specified in the *Work Plan* (AECOM 2013), are discussed below.

2.3.1 LEAK TESTING

The sub-slab vapor sampling points were leak tested during each sampling event. The objective was to verify that each sub-slab vapor sampling point was properly installed and that indoor air is not drawn into the vapor sampling point. Helium used as a tracer compound was introduced into the atmosphere immediately surrounding the well while a hand-held field helium detector was used to test for the tracer. Prior to leak tests, a shroud (Figure 11) was placed over the vapor sampling point and the tracer compound was introduced into the air beneath the shroud. Modeling clay was used to form a seal and contain vapors beneath the shroud. Helium was introduced into the shroud at less than 1 pound per square inch. The shroud was fitted with tubing at the top of the chamber to introduce the tracer gas into the shroud and a valve fitting at the bottom to let ambient air out while introducing the tracer gas. The helium concentration within the shroud was maintained at greater than 30 percent. A vapor sample was collected from the sampling point in a 1-liter Tedlar™ bag for screening of helium introduced into the isolated area at the well head. Helium concentrations detected within each vapor sampling point are presented in Table 3.

During sampling attempts at N3-4807-SS02 and N3-4807-SS03 on 6 March 2013, helium was detected in the field at concentrations exceeding 5 percent in the vapor sampling point, indicating leakage. Leaks were repaired and samples for laboratory analysis were collected on 7 March 2013. Based on

hand-held field instrument readings the helium concentrations within the vapor sampling point were less than 5 percent.

To provide an additional quality control measure, sub-slab vapor samples were analyzed at the laboratory for helium by ASTM D1946. Laboratory analytical results indicated that helium concentrations exceeded the 5 percent threshold in the sample collected from N3-4807-SS03 on 7 March 2013 and in the sample collected from N3-4806-SS02 on 22 August 2013. Field sampling forms are presented in Appendix C and analytical results are included in Appendix D. Although field readings indicated helium concentrations below 5 percent in these vapor sampling points, because of the presence of helium in the samples, the VOC analytical results were qualified as described in the quality assurance summary report (QASR) (Appendix E).

2.3.2 SOIL GAS SAMPLING

Prior to vapor sampling, the sub-slab vapor sampling points were purged to achieve removal of stagnant or ambient air from the sampling system, and allow the collection of environmental samples that are representative of subsurface conditions. The dead space volume was estimated as the internal volume of the well tubing plus the annular space around the vapor tip. In accordance with procedures recommended in the *Cal EPA Advisory – Active Soil Gas Investigations* (Cal EPA 2012), a default of three purge volumes were extracted prior to sub-slab vapor sampling because SUMMA® canisters were to be used to collect these vapor samples at less than 5 ft bgs. Because lithology, the primary factor influencing the number of purge volumes required to obtain a representative sample, is not expected to vary significantly between the Building 4806/4807 area and the Building 4810 area, purge volumes were the same for the sub-slab vapor sampling points in both building areas. The purge flow rates were maintained between 100 and 200 milliliters per minute (mL/min) to minimize partitioning of vapors from pore water to soil vapor, prevent ambient air from diluting the sub-slab vapor samples, and reduce the variability of purge rates if activities were performed by multiple field technicians.

Immediately after purging, samples from sub-slab vapor sampling points were collected in batch-certified 1-liter SUMMA® canisters and submitted to Air Technology Laboratories, Inc. (ATL) for laboratory analysis in accordance with USEPA Method TO-15 (standard level) and ASTM D1946. A flow controller was used to regulate the collection of the samples at a flow rate not exceeding

200 mL/min. Prior to the collection of a sample, each canister was vacuum tested using a dedicated vacuum gauge to confirm that it had been properly evacuated. The initial pressure inside the canister and the pressure after the completion of sub-slab vapor sampling were recorded on the "Vapor Sampling with Helium Shroud" field forms provided in Appendix C. The initial canister vacuum readings ranged from 24 to 30 inches of mercury.

The air pressure differential measurements between indoor and outdoor air and between indoor air and sub-slab vapor sampling points, indoor air temperatures, and photoionization detector (PID) readings were also collected before and/or after sub-slab vapor sampling.

2.3.3 INDOOR AIR AND OUTDOOR AIR SAMPLING

Six-liter capacity SUMMA® canisters were used for collection of indoor and outdoor air samples. The canisters were individually-certified clean by the laboratory prior to shipment and were fitted with a flow regulator for collection of the sample over a typical 8-hour work day or for collection of a grab sample. Prior to sample collection, each canister was vacuum tested to confirm that it has been properly evacuated. If the vacuum pressure was less than 28 inches of mercury, the canister was not used for sampling. The sub-slab samples were collected concurrently with the indoor/outdoor air samples and were sent to ATL under chain-of-custody documentation (Appendix C) for VOC analysis in accordance with USEPA Method TO-15 (low level).

2.3.3.1 Indoor Air

Indoor air samples were collected concurrently with the outdoor air samples. Five indoor air samples were collected in Building 4806, four indoor air samples were collected in Building 4807, and four indoor air samples were collected in Building 4810 as shown on Figures 8 and 9. Indoor air samples were collected in the vicinity of the sub-slab wells and approximately 3 ft (i.e., desk height) above the floor surface.

2.3.3.2 Outdoor Air

Outdoor air samples were collected concurrently with the indoor air samples. Three outdoor air samples were collected outside of the Building 4806/4807/4808 footprint and three outdoor air samples

were collected at Building 4810 (Figures 8 and 9). The outdoor air samples were collected approximately 10 ft from the buildings at 3 to 5 ft above the ground surface.

2.3.4 SAMPLE LABELING AND IDENTIFICATION

Samples were identified and labeled using the following: 1) site number (Site N3 or Site N7); followed by 2) building number (Building 4806 or Building 4807 or Building 4810); and then 3) the type of sample, i.e., whether indoor air, outside air, or sub-slab.

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3.0 RESULTS AND DISCUSSION

This section presents results of the air sampling events conducted in March and August 2013. Section 3.1 presents the results of the sampling event building surveys. Section 3.2 presents the analytical results for sub-slab samples and Section 3.3 presents the analytical results for the indoor air samples and compares these sample results to IASLs and CA-IASLs developed for Edwards AFB. Section 3.4 presents the analytical results for the outdoor air samples, Section 3.5 presents the indoor air sampling results evaluation, and Section 3.6 introduces the QASR prepared for the VIP investigations.

3.1 SAMPLE EVENT BUILDING SURVEY RESULTS

Building surveys were conducted as described in Section 2.1. The completed building survey forms are provided in Appendix B of this document. Sampling event building surveys were conducted during each of the March and August 2013 sampling events. The purpose of the sampling event building surveys was to verify the June 2012 initial building survey results, and to confirm selection of sampling locations that were based upon the initial building surveys. Sampling event building surveys included recording information on the status of the HVAC, temperature, and differential pressure measurements; recording outside weather conditions; and evaluating evidence for any preferential flow pathways, as well as determining the presence of chemicals that should be removed prior to actual sub-slab vapor and indoor air sampling. The sampling event building surveys identified no major changes in the building occupancy patterns, HVAC systems, or chemical usage since the initial building surveys that would affect sampling results. The completed building survey forms are provided in Appendix B of this document.

3.1.1 DIFFERENTIAL PRESSURE MEASUREMENTS

Pressure differential data is used to help determine if VI is possible. In a building where the differential pressure between the indoor and outdoor air is greater than or equal to 6 Pa, the presumption is that the positive pressure is sufficient to prevent the intrusion of subsurface vapors via advective flow through building foundation cracks and penetrations. Conversely, in a building under negative pressure where the differential pressure between the indoor and outdoor air is less than or equal to -6 Pa, the presumption is that a completed VIP is possible.

3.1.1.1 Building 4806

Conditions conducive to subsurface vapor intrusion (e.g., negative pressure) were generally present in Building 4806 during the March 2013 event. Conversely, conditions conducive to VI were generally absent during the August 2013 event.

During the March 2013 sampling event the air handling/HVAC equipment was in operation. Negative pressure differentials were present in Rooms 1, 5 through 9, 11, and 12; differentials were neutral (no differential between the room and outdoor air) to 1 Pa in Rooms 2 and 10; and the differential was 3.5 Pa in Rooms 3 and 4. The majority of the rooms measured during the March 2013 event exhibited negative pressure, a condition likely to promote VI.

During the August 2013 sampling event the air handling/HVAC equipment was in operation. Pressure differentials ranged from neutral to below 3 Pa in Rooms 5 through 12 and differentials were 3 Pa or above in the remaining rooms measured. The majority of the rooms measured during the August 2013 exhibited positive pressure, a condition under which VI is impeded.

3.1.1.2 Building 4807

The majority of the rooms measured in Building 4807 exhibited neutral pressure differentials during the March 2013 event and positive pressure differentials during the August 2013 event. Positive pressure differentials indicate that VI was likely impeded during the August 2013 event.

During the March 2013 sampling event the air handling/HVAC equipment was in operation. Negative pressure differentials were present in Rooms 1 and 5 (-0.5 Pa in each) and in Room 8 (-2.5 Pa) and differentials were neutral in the remaining rooms measured. Differential readings indicated that the majority of the rooms measured during the March 2013 event exhibited neutral pressure.

During the August 2013 sampling event the air handling/HVAC equipment was not in operation. Negative pressure differentials were present in Rooms 1 (-1.5 Pa) and 5 (-6 Pa). Differentials were neutral to 1.5 Pa in the remaining rooms measured. Differential readings indicated that the majority of the rooms measured during the August 2013 exhibited positive pressure, a condition that impedes VI.

3.1.1.3 Building 4810

The majority of the rooms measured in Building 4810 exhibited negative pressure differentials during the March 2013 event and neutral pressure differentials during the August 2013 event. Negative pressure differentials indicate that VI was possible during the March 2013 event.

During the March 2013 sampling event the air handling/HVAC equipment was in operation. Negative pressure differentials were present in Rooms 1a, 2b, 2c, 3, 3c, 5 through 13, 15a, 16, 17, 19, and the kitchen and ranged from -3.5 Pa to -0.5 Pa. Differentials were neutral to positive in the remaining rooms measured (ranging from 0 to 3 Pa). Differential readings indicated that the majority of the rooms measured during the March 2013 event exhibited negative pressure, a condition under which VI is promoted.

During the August 2013 sampling event the air handling/HVAC equipment was in operation. Negative pressure differentials were present in Rooms 12 and 13 (-0.5 Pa in each). Differentials were neutral to 2.5 Pa in the remaining rooms measured. Differential readings indicated that the majority of the rooms measured during the August 2013 exhibited neutral pressure.

3.1.2 TEMPERATURE MEASUREMENTS

Temperature data are presented in Table 4 and differentials are discussed in the following subsections.

3.1.2.1 Building 4806

Temperature differences between the June 2012 initial building survey and the March 2013 sampling event building survey at Building 4806 were less than 5 degrees in each room with one exception. The temperature recorded in Room 12 was 69.0 and 61.4 degrees during the June 2012 initial building survey and the March 2013 sampling event survey, respectively. Temperature differences between the March and August 2013 sampling event building surveys were less than 10 degrees in each room with two exceptions. The temperature recorded in Rooms 8 and 12 were 68.1 and 61.4 degrees, respectively, during the March 2013 event and 79.0 and 87.0 degrees, respectively, during the August 2013 event.

3.1.2.2 Building 4807

Temperature differences between the June 2012 initial building survey and the March 2013 sampling event building survey at Building 4807 were less than 10 degrees in each room with two exceptions. The temperature recorded in Room 2 was 55.0 and 69.8 degrees during the June 2012 initial building survey and the March 2013 sampling event survey, respectively and the temperature recorded in Room 6 was 66.0 and 77.1 degrees during the June 2012 initial building survey and the March 2013 sampling event survey, respectively. Temperature differences between the March and August 2013 sampling event building surveys were less than 10 degrees in each room.

3.1.2.3 Building 4810

Temperature differences between the June 2012 initial building survey and the March 2013 sampling event building survey at Building 4810 were less than 10 degrees in each room with one exception. The temperature recorded in the crew crib locker room was 64.0 and 74.2 degrees during the initial building survey and the March 2013 sampling event survey, respectively. Temperature differences between the March and August 2013 sampling event building surveys were less than 10 degrees in each room.

3.1.3 PHOTOIONIZATION DETECTOR READINGS

Because VOCs detected in indoor air may be an indication of VI, total VOC concentrations were measured using a PID throughout the investigation. However, PID measurements alone cannot differentiate between VOCs originating from the subsurface (VI contribution) and VOCs originating from interior activities. For example, auto/aircraft maintenance activities specific to Building 4806 are likely significant contributors to the building's high PID readings. PID readings indicated the presence of VOCs in all three buildings during both events. However, since VOCs are used regularly in the buildings, this was expected and their presence was not deemed significant. The methodology for determining VI is further discussed in Section 3.5.2. A summary of PID readings with comparisons to laboratory analytical results are provided in the following sections.

3.1.3.1 Building 4806

PID readings collected in rooms that were also sampled for laboratory analysis indicated that the highest VOC concentration in Building 4806 was 45 parts per billion (ppb) in Room 3 during the

March 2013 event and 84 ppb in Room 4 during the August 2013 event. These rooms are adjacent to the area where sample N3-4806IA04 was collected. Laboratory analytical results indicated that the highest total VOC concentrations detected in Building 4806 during either event were not detected in sample N3-4806IA04. Indoor air sample laboratory analytical results are presented in Section 3.3.

3.1.3.2 Building 4807

PID readings collected in rooms that were also sampled for laboratory analysis indicated that the highest VOC concentration in Building 4807 were 214 and 211 ppb in Room 11 during the March 2013 event August 2013 event, respectively. This room is in the area where sample N3-4807IA03 was collected. Laboratory analytical results indicated that the highest total VOC concentrations detected in Building 4807 during both events were detected in sample N3-4807IA03.

3.1.3.3 Building 4810

PID readings collected in rooms that were also sampled for laboratory analysis indicated that the highest VOC concentration in Building 4810 was 150 ppb in Room 19 during the March 2013 event and 80 ppb in Room 16 during the August 2013 event. Room 19 is adjacent to the Crew Crib area where sample N7-4810IA04 was collected and Room 16 is the area where sample N7-4810IA03 was collected. Laboratory analytical results indicated that the highest total VOC concentrations detected in Building 4810 were detected in sample N7-4806IA04 during the March 2013 and in N7-4806IA01 during the August 2013 event.

3.2 SUB-SLAB ANALYTICAL RESULTS

Sub-slab vapor samples were collected on 6 and 7 March 2013 and 22 and 23 August 2013. As discussed in Sections 1.7 and 3.5.2, sub-slab vapor laboratory analytical results were primarily used as a line of evidence to determine if chemicals detected in indoor air are attributable to the VIP by comparing sub-slab vapor concentrations to indoor air concentrations. However, in order to evaluate whether sub-slab vapor sources have the potential to pose unacceptable health risks due to vapor intrusion in the future if site conditions were to change such as new building construction, the sub-slab vapor sampling results were compared on a sample-by-sample basis to the respective SVSLs. The SVSLs were derived by dividing the IASLs by a soil vapor-to-indoor air attenuation factor (alpha) of 0.001, which was presented in the Basewide VIP Protocol (AECOM 2012b) for the industrial land use

scenario. As indicated in Appendix D (Appendices D-1 through D-6) no VOCs detected in the sub-slab vapor samples collected during either season from Buildings 4806, 4807, or 4810 exceeded the respective SVSLs or California-SVSLs. The laboratory analytical results are discussed in the following subsections and complete laboratory analytical results, reporting limits, and qualifiers are presented in Appendix D.

3.2.1 BUILDING 4806 SUB-SLAB ANALYTICAL RESULTS

Laboratory analytical results for sub-slab vapor samples collected at Building 4806 are discussed in the following subsections and included in Appendix D. As noted in Section 1.3.1, results are first given for indicator chemicals TCE and benzene, followed by results for other VOCs detected in sub-slab samples.

3.2.1.1 TCE and Benzene

March 2013

The TCE concentrations detected in sub-slab samples were 1.8 micrograms per cubic meter ($\mu g/m^3$) (N3-4806SS1), 94 $\mu g/m^3$ (N3-4806SS4), and 79 $\mu g/m^3$ (N3-4806SS5). The TCE concentrations were below the reporting limits (11 to 12 $\mu g/m^3$) in the samples collected from wells N3-4806SS2 and N3-4806SS3.

The benzene concentrations detected in sub-slab samples were 3.8 $\mu g/m^3$ (N3-4806SS1), 6.5 $\mu g/m^3$ (N3-4806SS2), 2.8 and 1.7 $\mu g/m^3$ (the normal sample and duplicate from well N3-4806SS3), 33 $\mu g/m^3$ (N3-4806SS4), and 2.6 $\mu g/m^3$ (N3-4806SS5).

August 2013

The TCE concentrations detected in sub-slab samples were 4.3 $\mu g/m^3$ (N3-4806SS1), 1.3 $\mu g/m^3$ (N3-4806SS2), 110 $\mu g/m^3$ (N3-4806SS4), and 120 $\mu g/m^3$ (N3-4806SS5). The TCE concentrations were below the reporting limit (11 $\mu g/m^3$) in the normal and duplicate samples collected from well N3-4806SS3.

The benzene concentrations detected in sub-slab samples were 4.9 $\mu g/m^3$ (N3-4806SS1), 13 $\mu g/m^3$ (N3-4806SS2), 8.2 $\mu g/m^3$ (in both the normal sample and duplicate samples from well N3-4806SS3), 9.2 $\mu g/m^3$ (N3-4806SS4), and 9.8 $\mu g/m^3$ (N3-4806SS5).

3.2.1.2 Other Chemicals Detected in Sub-Slab Samples

March 2013

Other than benzene and TCE, the following VOCs were detected at all five sub-slab sample locations:

- Acetone – concentrations ranged from 40 $\mu g/m^3$ (N3-4806SS3) to 200 $\mu g/m^3$ (N3-4806SS4);
- 2-Butanone – concentrations ranged from 4.7 $\mu g/m^3$ (N3-4806SS3) to 33 $\mu g/m^3$ (N3-4806SS5);
- Cyclohexane – concentrations ranged from 3.1 $\mu g/m^3$ (N3-4806SS5) to 5 $\mu g/m^3$ (N3-4806SS2);
- Dichlorodifluoromethane – concentrations ranged from 2.9 $\mu g/m^3$ (N3-4806SS1) to 5 $\mu g/m^3$ (N3-4806SS5);
- Ethanol – concentrations ranged from 36 $\mu g/m^3$ (N3-4806SS1) to 120 $\mu g/m^3$ (N3-4806SS2);
- Ethylbenzene - concentrations ranged from 1.6 $\mu g/m^3$ (N3-4806SS5) to 4 $\mu g/m^3$ (N3-4806SS2);
- 4-ethyltoluene - concentrations ranged from 1.5 $\mu g/m^3$ (N3-4806SS5) to 2.9 $\mu g/m^3$ (N3-4806SS1);
- Isopropanol - concentrations ranged from 8.7 $\mu g/m^3$ (N3-4806SS1) to 32 $\mu g/m^3$ (N3-4806SS5);
- Tetrachloroethene (PCE) – concentrations ranged from 3.9 $\mu g/m^3$ (N3-4806SS4) to 16 $\mu g/m^3$ (N3-4806SS2 and N3-4806SS3);
- Toluene - concentrations ranged from 5.3 $\mu g/m^3$ (N3-4806SS3) to 16 $\mu g/m^3$ (N3-4806SS1 and N3-4806SS2);
- 1,2,4-trimethylbenzene (TMB) - concentrations ranged from 1.5 $\mu g/m^3$ (N3-4806SS3) to 4.3 $\mu g/m^3$ (N3-4806SS1); and
- Total xylenes – concentrations ranged from 6.5 $\mu g/m^3$ (N3-4806SS3) to 24 $\mu g/m^3$ (N3-4806SS2).

August 2013

Other than benzene and TCE, the following VOCs were detected at all five sub-slab sample locations:

- Acetone – concentrations ranged from 75 $\mu g/m^3$ (N3-4806SS3) to 150 $\mu g/m^3$ (N3-4806SS2);
- 2-Butanone – concentrations ranged from 8.1 $\mu g/m^3$ (N3-4806SS4) to 27 $\mu g/m^3$ (N3-4806SS5);
- Carbon disulfide – concentrations ranged from 40 $\mu g/m^3$ (N3-4806SS2) to 240 $\mu g/m^3$ (N3-4806SS5);
- Chloromethane – concentrations ranged from 1.7 $\mu g/m^3$ (N3-4806SS5) to 3.9 $\mu g/m^3$ (N3-4806SS2);
- Dichlorodifluoromethane – concentrations ranged from 3.3 $\mu g/m^3$ (N3-4806SS4) to 5.8 $\mu g/m^3$ (N3-4806SS2);
- Ethanol – concentrations ranged from 27 $\mu g/m^3$ (N3-4806SS4) to 110 $\mu g/m^3$ (N3-4806SS3);
- PCE – concentrations ranged from 4.1 $\mu g/m^3$ (N3-4806SS4) to 19 $\mu g/m^3$ (N3-4806SS2);
- Toluene - concentrations ranged from 4.5 $\mu g/m^3$ (N3-4806SS3) to 9.5 $\mu g/m^3$ (N3-4806SS2);
- 1,2,4-TMB - concentrations ranged from 1.2 $\mu g/m^3$ (N3-4806SS3) to 4.5 $\mu g/m^3$ (N3-4806SS4); and
- Total xylenes – concentrations ranged from 4.3 $\mu g/m^3$ (N3-4806SS3) to 11.5 $\mu g/m^3$ (N3-4806SS4).

3.2.2 BUILDING 4807 SUB-SLAB ANALYTICAL RESULTS

Laboratory analytical results for sub-slab vapor samples collected at Building 4807 are discussed in the following subsections and included in Appendix D. As noted in Section 1.3.1, results are first given for indicator chemicals TCE and benzene, followed by results for other VOCs detected in sub-slab samples.

3.2.2.1 TCE and Benzene

March 2013

The TCE concentrations detected in sub-slab samples were 4 $\mu g/m^3$ (well N3-4807SS1), 48 $\mu g/m^3$ (well N3-4807SS2), 2.5 $\mu g/m^3$ (well N3-4807SS3), and 3 $\mu g/m^3$ (well N3-4807SS4).

The benzene concentrations detected in sub-slab samples were 7 $\mu g/m^3$ (well N3-4807SS1), 18 $\mu g/m^3$ (well N3-4807SS2), 7.5 $\mu g/m^3$ (well N3-4807SS3), and 3.7 $\mu g/m^3$ (well N3-4807SS4).

August 2013

The TCE concentrations detected in sub-slab samples were 8.2 $\mu g/m^3$ (well N3-4807SS1), 100 $\mu g/m^3$ (well N3-4807SS2), and 2.7 $\mu g/m^3$ (well N3-4807SS3). The TCE concentration was below the reporting limit (12 $\mu g/m^3$) in the sample collected from well N3-4807SS4.

The benzene concentrations detected in sub-slab samples were 8.4 $\mu g/m^3$ (well N3-4807SS1), 14 $\mu g/m^3$ (well N3-4807SS2), 11 $\mu g/m^3$ (well N3-4807SS3), and 8.2 $\mu g/m^3$ (well N3-4807SS4).

3.2.2.2 Other Chemicals Detected in Sub-Slab Samples

March 2013

Other than benzene and TCE, the following VOCs were detected at all four sub-slab sample locations:

- Acetone – concentrations ranged from 45 $\mu g/m^3$ (N3-4807SS4) to 540 $\mu g/m^3$ (N3-4807SS2);
- 2-Butanone – concentrations ranged from 10 $\mu g/m^3$ (N3-4807SS3) to 45 $\mu g/m^3$ (N3-4807SS2);
- Cyclohexane – concentrations ranged from 2 $\mu g/m^3$ (N3-4807SS2) to 6.4 $\mu g/m^3$ (N3-4807SS1);
- Dichlorodifluoromethane – concentrations ranged from 2.7 $\mu g/m^3$ (N3-4807SS1) to 3.8 $\mu g/m^3$ (N3-4807SS2);
- Ethanol – concentrations ranged from 27 $\mu g/m^3$ (N3-4807SS4) to 71 $\mu g/m^3$ (N3-4807SS1);
- Ethylbenzene - concentrations ranged from 1.6 $\mu g/m^3$ (N3-4807SS4) to 6.7 $\mu g/m^3$ (N3-4807SS1);

- 4-ethyltoluene - concentrations ranged from 1.7 $\mu g/m^3$ (N3-4807SS2 and N3-4807SS4) to 5 $\mu g/m^3$ (N3-4807SS1);
- Toluene - concentrations ranged from 12 $\mu g/m^3$ (N3-4807SS2) to 40 $\mu g/m^3$ (N3-4807SS1);
- 1,2,4-TMB - concentrations ranged from 2.2 $\mu g/m^3$ (N3-4807SS4) to 6.1 $\mu g/m^3$ (N3-4807SS1); and
- Total xylenes – concentrations ranged from 9.2 $\mu g/m^3$ (N3-4807SS2) to 40.5 $\mu g/m^3$ (N3-4807SS1).

August 2013

Other than benzene and TCE, the following VOCs were detected at all four sub-slab sample locations:

- Acetone – concentrations ranged from 78 $\mu g/m^3$ (N3-4807SS4) to 210 $\mu g/m^3$ (N3-4807SS1);
- 2-Butanone – concentrations ranged from 14 $\mu g/m^3$ (N3-4807SS2) to 29 $\mu g/m^3$ (N3-4807SS3);
- Carbon disulfide – concentrations ranged from 24 $\mu g/m^3$ (N3-4807SS1) to 51 $\mu g/m^3$ (N3-4807SS2);
- Dichlorodifluoromethane – concentrations ranged from 12 $\mu g/m^3$ (N3-4807SS1) to 30 $\mu g/m^3$ (N3-4807SS2);
- Ethanol – concentrations ranged from 35 $\mu g/m^3$ (N3-4807SS2) to 160 $\mu g/m^3$ (N3-4807SS4);
- Ethylbenzene - concentrations ranged from 1.2 $\mu g/m^3$ (N3-4807SS2) to 3.1 $\mu g/m^3$ (N3-4807SS4);
- 4-Ethyltoluene - concentrations ranged from 1.4 $\mu g/m^3$ (N3-4807SS2) to 3.2 $\mu g/m^3$ (N3-4807SS3);
- Isopropanol – concentrations ranged from 12 $\mu g/m^3$ (N3-4807SS2) to 31 $\mu g/m^3$ (N3-4807SS3);
- Methylene chloride – concentrations ranged from 3.1 $\mu g/m^3$ (N3-4807SS4) to 10 $\mu g/m^3$ (N3-4807SS1);
- Naphthalene – concentrations ranged from 1.3 $\mu g/m^3$ (N3-4807SS1) to 2.6 $\mu g/m^3$ (N3-4807SS3);
- Toluene - concentrations ranged from 6 $\mu g/m^3$ (N3-4807SS1) to 10 $\mu g/m^3$ (N3-4807SS4);

- 1,2,4-TMB - concentrations ranged from 1.9 $\mu g/m^3$ (N3-4807SS2) to 4.1 $\mu g/m^3$ (N3-4807SS3);
- Total xylenes – concentrations ranged from 5.4 $\mu g/m^3$ (N3-4807SS2) to 12.8 $\mu g/m^3$ (N3-4807SS4); and
- Trichlorofluoromethane – concentrations ranged from 3.5 $\mu g/m^3$ (N3-4807SS2) to 5.3 $\mu g/m^3$ (N3-4807SS4).

3.2.3 BUILDING 4810 SUB-SLAB ANALYTICAL RESULTS

Laboratory analytical results for sub-slab vapor samples collected at Building 4810 are discussed in the following subsections and included in Appendix D. As noted in Section 1.3.1, results are first given for indicator chemicals TCE and benzene, followed by results for other VOCs detected in sub-slab samples.

3.2.3.1 TCE and Benzene

March 2013

The TCE concentration detected in the duplicate sub-slab sample collected from N7-4810SS1 was 3 $\mu g/m^3$. Concentrations in all other samples were below reporting limits (9.7 to 12 $\mu g/m^3$).

The benzene concentrations detected in sub-slab samples were 3.7 $\mu g/m^3$ (well N7-4810SS1), 4.2 $\mu g/m^3$ (well N7-4810SS2), 3.8 $\mu g/m^3$ (well N7-4810SS3), and 3.1 and 4.7 $\mu g/m^3$ (in the normal and duplicate samples from well N7-4810SS4).

August 2013

TCE was not detected in any of the sub-slab samples at Building 4810.

The benzene concentrations detected in sub-slab samples were 7.3 $\mu g/m^3$ (well N7-4810SS1), 8.5 $\mu g/m^3$ (well N7-4810SS2), 8.8 $\mu g/m^3$ (well N7-4810SS3), and 4.6 and 6.9 $\mu g/m^3$ (in the normal and duplicate samples from well N7-4810SS4).

3.2.3.2 Other Chemicals Detected in Sub-Slab Samples

March 2013

Other than benzene and TCE, the following VOCs were detected at all four sub-slab sample locations:

- Acetone – concentrations ranged from 91 $\mu g/m^3$ (N7-4810SS3) to 590 $\mu g/m^3$ (N7-4810SS2);
- 2-Butanone – concentrations ranged from 16 $\mu g/m^3$ (N7-4810SS3) to 62 $\mu g/m^3$ (N7-4810SS1);
- Cyclohexane – concentrations ranged from 3 $\mu g/m^3$ (N7-4810SS4) to 8.5 $\mu g/m^3$ (N7-4810SS2);
- Ethanol – concentrations ranged from 26 $\mu g/m^3$ (N7-4810SS3) to 96 $\mu g/m^3$ (N7-4810SS2);
- Ethylbenzene - concentrations ranged from 1.5 $\mu g/m^3$ (N7-4810SS3) to 4.3 $\mu g/m^3$ (N7-4810SS4);
- Isopropanol - concentrations ranged from 15 $\mu g/m^3$ (N7-4810SS4) to 410 $\mu g/m^3$ (N7-4810SS2);
- 4-Methyl-2-pentanone - concentrations ranged from 9.1 $\mu g/m^3$ (N7-4810SS3) to 120 $\mu g/m^3$ (N7-4810SS4);
- Toluene - concentrations ranged from 4.8 $\mu g/m^3$ (N7-4810SS4) to 8.1 $\mu g/m^3$ (N7-4810SS2);
- 1,2,4-TMB - concentrations ranged from 2 $\mu g/m^3$ (N7-4810SS3) to 2.9 $\mu g/m^3$ (N7-4810SS1); and
- Total xylenes – concentrations ranged from 9.7 $\mu g/m^3$ (N7-4810SS1) to 28 $\mu g/m^3$ (N7-4810SS4).

August 2013

The following VOCs were detected at all four sub-slab sample locations:

- Acetone – concentrations ranged from 63 $\mu g/m^3$ (N7-4810SS1) to 100 $\mu g/m^3$ (N7-4810SS2);
- 2-Butanone – concentrations ranged from 9.4 $\mu g/m^3$ (N7-4810SS3) to 35 $\mu g/m^3$ (N7-4810SS2);

- Carbon disulfide – concentrations ranged from 33 $\mu g/m^3$ (N7-4810SS3) to 240 $\mu g/m^3$ (N7-4810SS2);
- Chloromethane – concentrations ranged from 1.4 $\mu g/m^3$ (N7-4810SS3) to 8.3 $\mu g/m^3$ (N7-4810SS4);
- Ethanol – concentrations ranged from 10 $\mu g/m^3$ (N7-4810SS4 normal sample) to 190 $\mu g/m^3$ (N7-4810SS4 duplicate);
- Methylene chloride – concentrations ranged from 3.8 $\mu g/m^3$ (N7-4810SS4) to 5.2 $\mu g/m^3$ (N7-4810SS3);
- Naphthalene – concentrations ranged from 1.6 $\mu g/m^3$ (N7-4810SS2 and N7-4810SS4) to 1.9 $\mu g/m^3$ (N7-4810SS4);
- Toluene - concentrations ranged from 4.2 $\mu g/m^3$ (N7-4810SS1) to 8.7 $\mu g/m^3$ (N7-4810SS4);
- 1,2,4-TMB - concentrations ranged from 1.5 $\mu g/m^3$ (N7-4810SS4) to 3.8 $\mu g/m^3$ (N7-4810SS2); and
- Total xylenes – concentrations ranged from 3.7 $\mu g/m^3$ (N7-4810SS1) to 11.1 $\mu g/m^3$ (N7-4810SS4).

3.3 INDOOR AIR ANALYTICAL RESULTS

Indoor air samples were collected on 5 and 6 March 2013 and 21 and 22 August 2013. The laboratory analytical results are discussed in the following subsections. Detected analytes and related risks are summarized in Tables 5 through 16. The complete laboratory analytical results, including IASL exceedances, qualifiers, and reporting limits, are presented in Appendix D.

3.3.1 BUILDING 4806 INDOOR AIR ANALYTICAL RESULTS

Laboratory analytical results for indoor air samples collected at Building 4806 are presented in Tables 5 through 8 and Appendix D and discussed in the following subsections. As noted in Section 1.3.1, results are first given for indicator chemicals TCE and benzene, followed by results for other VOCs detected in indoor air samples.

3.3.1.1 TCE and Benzene

March 2013

TCE was not detected above the 1.1 $\mu g/m^3$ reporting limit in any indoor air samples collected in Building 4806.

The benzene concentrations detected in indoor air samples were 1.1 $\mu g/m^3$ (N3-4806IA1), 1.3 $\mu g/m^3$ (N3-4806IA2), 1.5 $\mu g/m^3$ (N3-4806IA3), 1.8 $\mu g/m^3$ (N3-4806IA4), and 1.8 $\mu g/m^3$ (N3-4806IA5). Although all of these concentrations exceeded the CA-IASL (0.42 $\mu g/m^3$), only the concentrations in the samples collected at N3-4806IA4 and N3-4806IA5 exceeded the IASL (1.6 $\mu g/m^3$).

August 2013

TCE was not detected above the 1.1 $\mu g/m^3$ reporting limit in any indoor air samples collected in Building 4806.

The benzene concentrations detected in indoor air samples were 1.2 $\mu g/m^3$ (N3-4806IA1), 0.91 $\mu g/m^3$ (N3-4806IA2), 0.93 $\mu g/m^3$ (N3-4806IA3), 0.77 $\mu g/m^3$ (N3-4806IA4), and 0.94 $\mu g/m^3$ (N3-4806IA5). All of these concentrations exceeded the CA-IASL (0.42 $\mu g/m^3$) and none exceeded the IASL (1.6 $\mu g/m^3$).

3.3.1.2 Other Chemicals Detected in Indoor Air

March 2013

The following VOCs were detected at all five indoor air sample locations:

- Acetone – concentrations ranged from 12 $\mu g/m^3$ (N3-4806IA5) to 19 $\mu g/m^3$ (N3-4806IA4);
- 2-Butanone – concentrations ranged from 2.5 $\mu g/m^3$ (N3-4806IA3) to 6.5 $\mu g/m^3$ (N3-4806IA1);
- Bromomethane – concentrations ranged from 0.12 $\mu g/m^3$ (N3-4806IA1) to 0.22 $\mu g/m^3$ (N3-4806IA4);
- Carbon disulfide – concentrations ranged from 0.28 $\mu g/m^3$ (N3-4806IA4) to 2.2 $\mu g/m^3$ (N3-4806IA1);

- CT – concentrations ranged from 0.41 $\mu g/m^3$ (N3-4806IA5) to 0.46 $\mu g/m^3$ (N3-4806IA1);
- Chloromethane – concentrations ranged from 1.2 $\mu g/m^3$ (N3-4806IA1 and N3-4806IA5) to 1.4 $\mu g/m^3$ (N3-4806IA4);
- Cyclohexane – concentrations ranged from 0.64 $\mu g/m^3$ (N3-4806IA1) to 1.6 $\mu g/m^3$ (N3-4806IA4);
- Dichlorodifluoromethane – concentrations ranged from 2.5 $\mu g/m^3$ (N3-4806IA1) to 2.8 $\mu g/m^3$ (N3-4806IA5);
- Ethanol – concentrations ranged from 16 $\mu g/m^3$ (N3-4806IA1 duplicate) to 37 $\mu g/m^3$ (N3-4806IA1 normal sample);
- Ethyl acetate - concentrations ranged from 0.63 $\mu g/m^3$ (N3-4806IA1) to 1.1 $\mu g/m^3$ (N3-4806IA5);
- Ethylbenzene - concentrations ranged from 1.2 $\mu g/m^3$ (N3-4806IA1) to 2.2 $\mu g/m^3$ (N3-4806IA4);
- 4-ethyltoluene - concentrations ranged from 1.4 $\mu g/m^3$ (N3-4806IA1) to 3.3 $\mu g/m^3$ (N3-4806IA4);
- Isopropanol - concentrations ranged from 2 $\mu g/m^3$ (N3-4806IA2) to 11 $\mu g/m^3$ (N3-4806IA4);
- n-butylbenzene - concentrations ranged from 0.2 $\mu g/m^3$ (N3-4806IA1) to 0.72 $\mu g/m^3$ (N3-4806IA4);
- n-heptane - concentrations ranged from 1.1 $\mu g/m^3$ (N3-4806IA1) to 2.1 $\mu g/m^3$ (N3-4806IA4);
- n-hexane - concentrations ranged from 1.5 $\mu g/m^3$ (N3-4806IA1) to 10 $\mu g/m^3$ (N3-4806IA5);
- Styrene - concentrations ranged from 0.15 $\mu g/m^3$ (N3-4806IA2 and N3-4806IA3) to 0.22 $\mu g/m^3$ (N3-4806IA1);
- Tetrahydrofuran - concentrations ranged from 0.18 $\mu g/m^3$ (N3-4806IA3) to 0.56 $\mu g/m^3$ (N3-4806IA1);
- Toluene - concentrations ranged from 5.5 $\mu g/m^3$ (N3-4806IA1) to 10 $\mu g/m^3$ (N3-4806IA5);
- Trichlorofluoroethane - concentrations ranged from 1.3 $\mu g/m^3$ (N3-4806IA5) to 2.5 $\mu g/m^3$ (N3-4806IA1);

- 1,1,2-trichlorotrifluoroethane - concentrations ranged from 0.54 $\mu g/m^3$ (N3-4806IA1 duplicate) to 0.6 $\mu g/m^3$ (N3-4806IA2);
- 1,2,4-TMB - concentrations ranged from 1.5 $\mu g/m^3$ (N3-4806IA1) to 3.9 $\mu g/m^3$ (N3-4806IA4);
- 1,3,5-TMB - concentrations ranged from 0.46 $\mu g/m^3$ (N3-4806IA1) to 1.1 $\mu g/m^3$ (N3-4806IA4); and
- Total xylenes – concentrations ranged from 5.9 $\mu g/m^3$ (N3-4806IA1) to 12.3 $\mu g/m^3$ (N3-4806IA4).

Naphthalene and benzene were detected above the IASL in indoor air during the March 2013 event at Building 4806. Appendix D lists the full suite of analytical results for VOCs analyzed by ATL.

August 2013

The following VOCs were detected at all five indoor air sample locations:

- Acetone – concentrations ranged from 12 $\mu g/m^3$ (N3-4806IA4) to 110 $\mu g/m^3$ (N3-4806IA1);
- 2-Butanone – concentrations ranged from 1.8 $\mu g/m^3$ (N3-4806IA3) to 6.4 $\mu g/m^3$ (N3-4806IA5);
- Carbon disulfide – concentrations ranged from 0.41 $\mu g/m^3$ (N3-4806IA3) to 210 $\mu g/m^3$ (N3-4806IA5);
- CT – concentrations ranged from 0.39 $\mu g/m^3$ (N3-4806IA4) to 0.48 $\mu g/m^3$ (N3-4806IA2);
- Chloromethane – concentrations ranged from 1.2 $\mu g/m^3$ (N3-4806IA1) to 1.7 $\mu g/m^3$ (N3-4806IA5);
- Dichlorodifluoromethane – concentrations ranged from 3.1 $\mu g/m^3$ (N3-4806IA4) to 13 $\mu g/m^3$ (N3-4806IA3);
- Ethanol – concentrations ranged from 5.4 $\mu g/m^3$ (N3-4806IA3) to 28 $\mu g/m^3$ (N3-4806IA2);
- Ethylbenzene - concentrations ranged from 0.15 $\mu g/m^3$ (N3-4806IA3) to 1.5 $\mu g/m^3$ (N3-4806IA1);
- 4-ethyltoluene - concentrations ranged from 0.21 $\mu g/m^3$ (N3-4806IA3) to 2.2 $\mu g/m^3$ (N3-4806IA1);

- Isopropanol - concentrations ranged from 1.9 $\mu g/m^3$ (N3-4806IA3) to 64 $\mu g/m^3$ (N3-4806IA5);
- n-hexane - concentrations ranged from 2.3 $\mu g/m^3$ (N3-4806IA2) to 220 $\mu g/m^3$ (N3-4806IA5);
- Naphthalene - concentrations ranged from 0.22 $\mu g/m^3$ (N3-4806IA3) to 1.0 $\mu g/m^3$ (N3-4806IA5);
- Toluene - concentrations ranged from 1.3 $\mu g/m^3$ (N3-4806IA4) to 83 $\mu g/m^3$ (N3-4806IA1);
- Trichlorofluoromethane - concentrations ranged from 1.4 $\mu g/m^3$ (N3-4806IA4) to 6.4 $\mu g/m^3$ (N3-4806IA1);
- 1,1,2-trichlorotrifluoroethane - concentrations ranged from 0.56 $\mu g/m^3$ (N3-4806IA1 and N3-4806IA3) to 0.6 $\mu g/m^3$ (N3-4806IA2);
- Trichlorofluoromethane - concentrations ranged from 1.4 $\mu g/m^3$ (N3-4806IA4) to 6.4 $\mu g/m^3$ (N3-4806IA1);
- 1,2,4-TMB - concentrations ranged from 0.35 $\mu g/m^3$ (N3-4806IA3) to 2.7 $\mu g/m^3$ (N3-4806IA1);
- 1,3,5-TMB - concentrations ranged from 0.23 $\mu g/m^3$ (N3-4806IA5) to 0.71 $\mu g/m^3$ (N3-4806IA1); and
- Total xylenes – concentrations ranged from 0.98 $\mu g/m^3$ (N3-4806IA3) to 9.5 $\mu g/m^3$ (N3-4806IA1).

Benzene, bromodichloromethane, chloroform, and naphthalene were detected above respective IASL in indoor air during the August 2013 event at Building 4806.

3.3.2 BUILDING 4807 INDOOR AIR ANALYTICAL RESULTS

Laboratory analytical results for indoor air samples collected at Building 4807 are presented in Tables 9 through 12 and Appendix D and discussed in the following subsections. As noted in Section 1.3.1, results are first given for indicator chemicals TCE and benzene, followed by results for other VOCs detected in indoor air samples.

3.3.2.1 TCE and Benzene

March 2013

TCE was not detected above the 1.1 $\mu g/m^3$ reporting limit in any indoor air samples collected in Building 4807.

The benzene concentrations detected in indoor air samples were 1.7 $\mu g/m^3$ (N3-4807IA1), 2 $\mu g/m^3$ (N3-4807IA2), 8.3 $\mu g/m^3$ (N3-4807IA3), and 4.8 $\mu g/m^3$ (N3-4807IA4). All of these concentrations exceeded the CA-IASL (0.42 $\mu g/m^3$) and the IASL (1.6 $\mu g/m^3$).

August 2013

TCE was not detected above the 1.1 $\mu g/m^3$ reporting limit in any indoor air samples collected in Building 4807.

The benzene concentrations detected in indoor air samples were 1.6 $\mu g/m^3$ (N3-4807IA1), 1.2 $\mu g/m^3$ (N3-4807IA2), 7.4 $\mu g/m^3$ (N3-4807IA3), and 0.93 $\mu g/m^3$ (N3-4807IA4). Although all of these concentrations exceeded the CA-IASL (0.42 $\mu g/m^3$), only the concentration in the sample collected at N3-4807IA3 exceeded the IASL (1.6 $\mu g/m^3$). The sample collected at N3-4807IA1 equaled the 1.6 $\mu g/m^3$ – IASL.

3.3.2.2 Other Chemicals Detected in Indoor Air

March 2013

The following VOCs were detected at all four indoor air sample locations:

- Acetone – concentrations ranged from 16 $\mu g/m^3$ (N3-4807IA2) to 30 $\mu g/m^3$ (N3-4807IA3);
- Bromomethane – concentrations ranged from 0.17 $\mu g/m^3$ (N3-4807IA4) to 0.28 $\mu g/m^3$ (N3-4807IA3);
- 2-Butanone – concentrations ranged from 2.3 $\mu g/m^3$ (N3-4807IA2) to 6.1 $\mu g/m^3$ (N3-4807IA3);
- Carbon disulfide – concentrations ranged from 0.75 $\mu g/m^3$ (N3-4807IA1) to 2.1 $\mu g/m^3$ (N3-4807IA2);

- CT – concentrations ranged from 0.39 $\mu g/m^3$ (N3-4807IA4) to 0.42 $\mu g/m^3$ (N3-4807IA1 through N3-4807IA3);
- Chloromethane – concentrations ranged from 1.3 $\mu g/m^3$ (N3-4807IA2 and N3-4807IA4) to 1.5 $\mu g/m^3$ (N3-4807IA1);
- Cyclohexane – concentrations ranged from 1.3 $\mu g/m^3$ (N3-4807IA1) to 11 $\mu g/m^3$ (N3-4807IA3);
- Dichlorodifluoromethane – concentrations ranged from 2.7 $\mu g/m^3$ (N3-4807IA1, N3-4807IA2, and N3-4807IA4) to 2.8 $\mu g/m^3$ (N3-4807IA3);
- Ethanol – concentrations ranged from 23 $\mu g/m^3$ (N3-4807IA2) to 150 $\mu g/m^3$ (N3-4807IA3);
- Ethyl acetate - concentrations ranged from 0.86 $\mu g/m^3$ (N3-4807IA2) to 7.3 $\mu g/m^3$ (N3-4807IA3);
- Ethylbenzene - concentrations ranged from 1.4 $\mu g/m^3$ (N3-4807IA1) to 8.3 $\mu g/m^3$ (N3-4807IA3);
- 4-ethyltoluene - concentrations ranged from 1.7 $\mu g/m^3$ (N3-4807IA1) to 11$\mu g/m^3$ (N3-4807IA3);
- Isopropanol - concentrations ranged from 4.3 $\mu g/m^3$ (N3-4807IA3) to 240 $\mu g/m^3$ (N3-4807IA1);
- n-butylbenzene - concentrations ranged from 0.26 $\mu g/m^3$ (N3-4807IA2) to 1.4 $\mu g/m^3$ (N3-4807IA3 and N3-4807IA4);
- n-heptane - concentrations ranged from 1.8 $\mu g/m^3$ (N3-4807IA1) to 11 $\mu g/m^3$ (N3-4807IA3);
- n-hexane - concentrations ranged from 3.7 $\mu g/m^3$ (N3-4807IA1) to 34 $\mu g/m^3$ (N3-4807IA3);
- Styrene - concentrations ranged from 0.23 $\mu g/m^3$ (N3-4807IA1) to 0.62 $\mu g/m^3$ (N3-4807IA4);
- Toluene - concentrations ranged from 7.6 $\mu g/m^3$ (N3-4807IA1) to 43 $\mu g/m^3$ (N3-4807IA3);
- Trichlorofluoromethane - concentrations ranged from 2.8 $\mu g/m^3$ (N3-4807IA1) to 5 $\mu g/m^3$ (N3-4807IA3);
- 1,1,2-trichlorotrifluoroethane - concentrations ranged from 0.56 $\mu g/m^3$ (N3-4807IA3) to 0.64 $\mu g/m^3$ (N3-4807IA1);

- 1,2,4-TMB - concentrations ranged from 2 $\mu g/m^3$ (N3-4807IA1) to 13 $\mu g/m^3$ (N3-4807IA3);
- 1,3,5-TMB - concentrations ranged from 0.59 $\mu g/m^3$ (N3-4807IA1) to 3.9 $\mu g/m^3$ (N3-4807IA3); and
- Total xylenes – concentrations ranged from 7.2 $\mu g/m^3$ (N3-4807IA1) to 46 $\mu g/m^3$ (N3-4807IA3).

Acrylonitrile, benzene, CT, ethylbenzene, and naphthalene were detected above respective IASL in indoor air during the March 2013 event at Building 4807.

August 2013

The following VOCs were detected at all four indoor air sample locations:

- Acetone – concentrations ranged from 17 $\mu g/m^3$ (N3-4807IA1) to 72 $\mu g/m^3$ (N3-4807IA3);
- 2-Butanone – concentrations ranged from 2.9 $\mu g/m^3$ (N3-4807IA1) to 170 $\mu g/m^3$ (N3-4807IA3);
- Carbon disulfide – concentrations ranged from 2.3 $\mu g/m^3$ (N3-4807IA2) to 13 $\mu g/m^3$ (N3-4807IA3);
- CT – concentrations ranged from 0.37 $\mu g/m^3$ (N3-4807IA3) to 0.44 $\mu g/m^3$ (N3-4807IA1);
- Chloromethane – concentrations ranged from 0.7 $\mu g/m^3$ (N3-4807IA1) to 4.7 $\mu g/m^3$ (N3-4807IA3);
- Dichlorodifluoromethane – concentrations ranged from 0.24 $\mu g/m^3$ (N3-4807IA1) to 16 $\mu g/m^3$ (N3-4807IA3);
- Ethanol – concentrations ranged from 18 $\mu g/m^3$ (N3-4807IA4) to 430 $\mu g/m^3$ (N3-4807IA3);
- Ethylbenzene - concentrations ranged from 0.6 $\mu g/m^3$ (N3-4807IA4) to 18 $\mu g/m^3$ (N3-4807IA3);
- 4-ethyltoluene - concentrations ranged from 0.84 $\mu g/m^3$ (N3-4807IA4) to 32 $\mu g/m^3$ (N3-4807IA3);
- Isopropanol - concentrations ranged from 14 $\mu g/m^3$ (N3-4807IA2) to 27 $\mu g/m^3$ (N3-4807IA1);
- n-butylbenzene - concentrations ranged from 0.41 $\mu g/m^3$ (N3-4807IA1) to 3.2 $\mu g/m^3$ (N3-4807IA3);

- n-heptane - concentrations ranged from 0.52 $\mu g/m^3$ (N3-4807IA4) to 14 $\mu g/m^3$ (N3-4807IA3);
- n-hexane - concentrations ranged from 25 $\mu g/m^3$ (N3-4807IA1) to 55 $\mu g/m^3$ (N3-4807IA4);
- Naphthalene - concentrations ranged from 0.3 $\mu g/m^3$ (N3-4807IA4) to 1.7 $\mu g/m^3$ (N3-4807IA3);
- p-isopropyltoluene - concentrations ranged from 0.38 $\mu g/m^3$ (N3-4807IA4) to 43 $\mu g/m^3$ (N3-4807IA1);
- Styrene - concentrations ranged from 0.19 $\mu g/m^3$ (N3-4807IA4) to 2.3 $\mu g/m^3$ (N3-4807IA3);
- Toluene - concentrations ranged from 4.5 $\mu g/m^3$ (N3-4807IA4) to 58 $\mu g/m^3$ (N3-4807IA3);
- Trichlorofluoromethane - concentrations ranged from 3.9 $\mu g/m^3$ (N3-4807IA3) to 7.1 $\mu g/m^3$ (N3-4807IA2);
- 1,1,2-trichlorotrifluoroethane - concentrations ranged from 0.51 $\mu g/m^3$ (N3-4807IA3) to 0.59 $\mu g/m^3$ (N3-4807IA1);
- 1,2,4-TMB - concentrations ranged from 1.1 $\mu g/m^3$ (N3-4807IA4) to 33 $\mu g/m^3$ (N3-4807IA3);
- 1,3,5-TMB - concentrations ranged from 0.28 $\mu g/m^3$ (N3-4807IA4) to 11 $\mu g/m^3$ (N3-4807IA3); and
- Total xylenes – concentrations ranged from 3.1 $\mu g/m^3$ (N3-4807IA4) to 111 $\mu g/m^3$ (N3-4807IA3).

Acrylonitrile, benzene, CT, ethylbenzene, and naphthalene were detected above respective IASLs in indoor air during the August 2013 event at Building 4807.

3.3.3 BUILDING 4810 INDOOR AIR ANALYTICAL RESULTS

Laboratory analytical results for indoor air samples collected at Building 4810 are presented in Tables 13 through 16 and Appendix D and discussed in the following subsections. As noted in Section 1.3.1, results are first given for indicator chemicals TCE and benzene, followed by results for other VOCs detected in indoor air samples.

3.3.3.1 TCE and Benzene

March 2013

TCE was not detected above the 1.1 $\mu g/m^3$ reporting limit in any indoor air samples collected in Building 4810.

The benzene concentrations detected in indoor air samples were 1.2 $\mu g/m^3$ (N7-4810IA1), 0.81 $\mu g/m^3$ (N7-4810IA2), 0.39 $\mu g/m^3$ (N7-4810IA3), and 0.38 $\mu g/m^3$ (N7-4810IA4). The concentrations detected in the samples collected at N3-4810IA1 and N3-4810IA2 exceeded the CA-IASL (0.42 $\mu g/m^3$). None of the detected concentrations exceeded the IASL (1.6 $\mu g/m^3$).

August 2013

TCE was not detected above the 1.1 $\mu g/m^3$ reporting limit in any indoor air samples collected in Building 4810.

The benzene concentrations detected in indoor air samples were 2.0 $\mu g/m^3$ (N7-4810IA1), 1.2 $\mu g/m^3$ (N7-4810IA2), 1.1 $\mu g/m^3$ (N7-4810IA3), and 0.54 $\mu g/m^3$ (N7-4810IA4). Although all of these concentrations exceeded the CA-IASL (0.42 $\mu g/m^3$), only the concentration in the sample collected at N3-4810IA1 exceeded the IASL (1.6 $\mu g/m^3$).

3.3.3.2 Other Chemicals Detected in Indoor Air

March 2013

The following VOCs were detected in all four indoor air samples:

- Acetone – concentrations ranged from 18 $\mu g/m^3$ (N7-4810IA4) to 120 $\mu g/m^3$ (N7-4810IA4 duplicate);
- 2-Butanone – concentrations ranged from 2.0 $\mu g/m^3$ (N7-4810IA3) to 4.2 $\mu g/m^3$ (N7-4810IA1);
- Carbon disulfide – concentrations ranged from 0.45 $\mu g/m^3$ (N7-4810IA1) to 4.7 $\mu g/m^3$ (N7-4810IA4);
- CT – concentrations ranged from 0.4 $\mu g/m^3$ (N7-4810IA3) to 0.66 $\mu g/m^3$ (N7-4810IA1);

- Chloromethane – concentrations ranged from 1.3 $\mu g/m^3$ (N7-4810IA4) to 1.9 $\mu g/m^3$ (N7-4810IA1);
- Ethanol – concentrations ranged from 12 $\mu g/m^3$ (N7-4810IA4) to 220 $\mu g/m^3$ (N7-4810IA1);
- Ethylbenzene - concentrations ranged from 0.13 $\mu g/m^3$ (N7-4810IA4) to 4.4 $\mu g/m^3$ (N7-4810IA3);
- Isopropanol - concentrations ranged from 9.8 $\mu g/m^3$ (N7-4810IA4) to 68 $\mu g/m^3$ (N7-4810IA3);
- Naphthalene concentrations ranged from 0.51 $\mu g/m^3$ (N7-4810IA2) to 0.74 $\mu g/m^3$ (N7-4810IA1);
- n-hexane - concentrations ranged from 0.15 $\mu g/m^3$ (N7-4810IA4) to 1.9 $\mu g/m^3$ (N7-4810IA2);
- p-isopropyltoluene - concentrations ranged from 0.61 $\mu g/m^3$ (N7-4810IA3) to 1.3 $\mu g/m^3$ (N7-4810IA4);
- Tetrahydrofuran - concentrations ranged from 0.2 $\mu g/m^3$ (N7-4810IA4) to 2.0 $\mu g/m^3$ (N7-4810IA3);
- Toluene - concentrations ranged from 0.41 $\mu g/m^3$ (N7-4810IA4) to 13 $\mu g/m^3$ (N7-4810IA3);
- Trichlorofluoromethane - concentrations ranged from 1.2 $\mu g/m^3$ (N7-4810IA3) to 1.9 $\mu g/m^3$ (N7-4810IA1);
- 1,1,2-trichlorotrifluoroethane - concentrations ranged from 0.54 $\mu g/m^3$ (N7-4810IA4) to 0.94 $\mu g/m^3$ (N7-4810IA1);
- 1,2,4-TMB - concentrations ranged from 0.07 $\mu g/m^3$ (N7-4810IA4) to 1.1 $\mu g/m^3$ (N7-4810IA1);
- 1,3,5-TMB - concentrations ranged from 0.21 $\mu g/m^3$ (N7-4810IA2) to 0.34 $\mu g/m^3$ (N7-4810IA1); and
- Total xylenes – concentrations ranged from 0.3 $\mu g/m^3$ (N7-4810IA4) to 13.2 $\mu g/m^3$ (N7-4810IA3).

Only benzene and naphthalene were detected above respective IASLs in indoor air during the March 2013 event at Building 4810.

August 2013

The following VOCs were detected in all four indoor air samples:

- 2-Butanone – concentrations ranged from 1.9 $\mu g/m^3$ (N7-4810IA4) to 63 $\mu g/m^3$ (N7-4810IA1);
- CT – concentrations ranged from 0.38 $\mu g/m^3$ (N7-4810IA4) to 0.46 $\mu g/m^3$ (N7-4810IA2);
- Dichlorodifluoromethane – concentrations ranged from 2.3 $\mu g/m^3$ (N7-4810IA1) to 2.4 $\mu g/m^3$ (N7-4810IA2 and N7-4810IA3);
- Ethanol – concentrations ranged from 16 $\mu g/m^3$ (N7-4810IA4) to 1,800 $\mu g/m^3$ (N7-4810IA1);
- Ethylbenzene - concentrations ranged from 0.17 $\mu g/m^3$ (N7-4810IA4) to 2.4 $\mu g/m^3$ (N7-4810IA1);
- 4-ethyltoluene - concentrations ranged from 0.16 $\mu g/m^3$ (N7-4810IA4) to 2.6 $\mu g/m^3$ (N7-4810IA1);
- n-hexane - concentrations ranged from 0.47 $\mu g/m^3$ (N7-4810IA4) to 3.4 $\mu g/m^3$ (N7-4810IA1);
- Naphthalene - concentrations ranged from 0.14 $\mu g/m^3$ (N7-4810IA4) to 1.1 $\mu g/m^3$ (N7-4810IA1);
- p-isopropyltoluene - concentrations ranged from 0.24 $\mu g/m^3$ (N7-4810IA4) to 3.8 $\mu g/m^3$ (N7-4810IA1);
- Toluene - concentrations ranged from 1.0 $\mu g/m^3$ (N7-4810IA4) to 10 $\mu g/m^3$ (N7-4810IA1);
- Trichlorofluoromethane - concentrations ranged from 1.2 $\mu g/m^3$ (N7-4810IA4) to 1.4 $\mu g/m^3$ (N7-4810IA3);
- 1,1,2-trichlorotrifluoroethane - concentrations ranged from 0.51 $\mu g/m^3$ (N7-4810IA4) to 0.53 $\mu g/m^3$ (N7-4810IA1 and N7-4810IA3);
- 1,2,4-TMB - concentrations ranged from 0.18 $\mu g/m^3$ (N7-4810IA4) to 2.9 $\mu g/m^3$ (N7-4810IA1);
- 1,3,5-TMB - concentrations ranged from 0.48 $\mu g/m^3$ (N7-4810IA3) to 2.9 $\mu g/m^3$ (N7-4810IA1); and
- Total xylenes – concentrations ranged from 0.88 $\mu g/m^3$ (N7-4810IA4) to 14.5 $\mu g/m^3$ (N7-4810IA1).

1,2,4-trichlorobenzene, benzene, benzyl chloride, ethylene dibromide, and naphthalene were detected above respective IASLs in indoor air during the August 2013 event at Building 4810.

3.4 OUTDOOR AIR ANALYTICAL RESULTS

Outdoor air samples were collected on 5 and 6 March 2013 and 21 and 22 August 2013. The laboratory analytical results are discussed in the following subsections. The complete laboratory analytical results, qualifiers, and reporting limits are presented in Appendix D. Because the purpose for collecting outdoor air samples is for comparison to indoor air sample concentrations as presented in Section 3.5.3, no comparisons to screening levels were performed.

3.4.1 BUILDING 4806/4807 OUTDOOR AIR ANALYTICAL RESULTS

Laboratory analytical results for outdoor air samples collected at Buildings 4806 and 4807 are discussed in the following subsections. As noted in Section 1.3.1, results are first given for indicator chemicals TCE and benzene, followed by results for other VOCs detected in outdoor air samples.

3.4.1.1 TCE and Benzene

March 2013

TCE was not detected above the 1.1 $\mu g/m^3$ reporting limit in any outdoor air samples collected at Building 4806/4807. The benzene concentrations detected in outdoor air samples were 0.43 $\mu g/m^3$ (N3-4806OA1), 0.48 $\mu g/m^3$ (N3-4806OA2), and 0.79 $\mu g/m^3$ (N3-4806OA3).

August 2013

TCE was not detected above the 1.1 $\mu g/m^3$ reporting limit in any outdoor air samples collected at Building 4806/4807. Benzene was detected at two locations, the concentrations in outdoor air samples were 0.80 $\mu g/m^3$ (N3-4806OA2) and 0.95 $\mu g/m^3$ (N3-4806OA3).

3.4.1.2 Other Chemicals Detected in Outdoor Air

March 2013

The following VOCs were detected at all three outdoor air sample locations:

- Acetone – concentrations ranged from 12 $\mu g/m^3$ (N3-4806OA3) to 15 $\mu g/m^3$ (N3-4806OA2);
- 2-Butanone – concentrations ranged from 2.2 $\mu g/m^3$ (N3-4806OA1) to 4 $\mu g/m^3$ (N3-4806OA3);
- Bromomethane – concentrations ranged from 0.15 $\mu g/m^3$ (N3-4806OA2) to 0.24 $\mu g/m^3$ (N3-4806OA1);
- Carbon disulfide – concentrations ranged from 0.41 $\mu g/m^3$ (N3-4806OA1) to 2.2 $\mu g/m^3$ (N3-4806OA3);
- CT – concentrations ranged from 0.43 $\mu g/m^3$ (N3-4806OA1) to 0.46 $\mu g/m^3$ (N3-4806OA3);
- Chloromethane – concentrations ranged from 1.4 $\mu g/m^3$ (N3-4806OA1 normal sample and N3-4806OA2 and N3-4806OA3) to 1.5 $\mu g/m^3$ (N3-4806OA1 duplicate);
- Cyclohexane – concentrations ranged from 0.15 $\mu g/m^3$ (N3-4806OA1) to 0.38 $\mu g/m^3$ (N3-4806OA3);
- Dichlorodifluoromethane – concentrations ranged from 2.5 $\mu g/m^3$ (N3-4806OA1) to 2.8 $\mu g/m^3$ (N3-4806OA3);
- Ethanol – concentrations ranged from 6.1 $\mu g/m^3$ (N3-4806OA1) to 12 $\mu g/m^3$ (N3-4806OA3);
- Ethylbenzene - concentrations ranged from 0.17 $\mu g/m^3$ (N3-4806OA1) to 0.46 $\mu g/m^3$ (N3-4806OA3);
- 4-ethyltoluene - concentrations ranged from 0.14 $\mu g/m^3$ (N3-4806OA1) to 0.54 $\mu g/m^3$ (N3-4806OA3);
- Isopropanol - concentrations ranged from 0.84 $\mu g/m^3$ (N3-4806OA1 normal sample) to 1.5 $\mu g/m^3$ (N3-4806OA1 duplicate);
- n-heptane - concentrations ranged from 0.19 $\mu g/m^3$ (N3-4806OA1) to 0.62 $\mu g/m^3$ (N3-4806OA3);
- n-hexane - concentrations ranged from 0.36 $\mu g/m^3$ (N3-4806OA1) to 1.2 $\mu g/m^3$ (N3-4806OA3);
- Styrene - concentrations were 0.16 $\mu g/m^3$ in samples from all three locations;
- Tetrahydrofuran - concentrations ranged from 0.18 $\mu g/m^3$ (N3-4806OA2) to 0.41 $\mu g/m^3$ (N3-4806OA3);

- Trichlorofluoromethane - concentrations ranged from 1.2 $\mu g/m^3$ (N3-4806OA1 duplicate and N3-4806OA2) to 1.3 $\mu g/m^3$ (N3-4806OA3 normal sample and N3-4806OA3);

- 1,1,2-trichlorotrifluoroethane - concentrations ranged from 0.56 $\mu g/m^3$ (N3-4806OA2) to 0.63 $\mu g/m^3$ (N3-4806OA3);

- 1,2,4-TMB - concentrations ranged from 0.17 $\mu g/m^3$ (N3-4806OA1) to 0.61 $\mu g/m^3$ (N3-4806OA3); and

- Total xylenes – concentrations ranged from 0.6 $\mu g/m^3$ (N3-4806OA1) to 2.2 $\mu g/m^3$ (N3-4806OA4).

August 2013

The following VOCs were detected at all three outdoor air sample locations:

- Acetone – concentrations ranged from 8.5 $\mu g/m^3$ (N3-4806OA2) to 20 $\mu g/m^3$ (N3-4806OA1);

- 2-Butanone – concentrations ranged from 3.2 $\mu g/m^3$ (N3-4806OA3) to 8.3 $\mu g/m^3$ (N3-4806OA1);

- Carbon disulfide – concentrations ranged from 2.3 $\mu g/m^3$ (N3-4806OA1 normal sample) to 3.4 $\mu g/m^3$ (N3-4806OA1 duplicate);

- CT– concentrations ranged from 0.4 $\mu g/m^3$ (N3-4806OA2) to 0.44 $\mu g/m^3$ (N3-4806OA1);

- Chloromethane – concentrations ranged from 1.2 $\mu g/m^3$ (N3-4806OA1) to 1.3 $\mu g/m^3$ (N3-4806OA3);

- Dichlorodifluoromethane – concentrations ranged from 2.3 $\mu g/m^3$ (N3-4806OA1 duplicate) to 2.4 $\mu g/m^3$ (N3-4806OA1 normal sample, N3-4806OA2, and N3-4806OA3);

- Ethanol – concentrations ranged from 5.4 $\mu g/m^3$ (N3-4806OA2) to 9.4 $\mu g/m^3$ (N3-4806OA1);

- 4-ethyltoluene - concentrations ranged from 0.15 $\mu g/m^3$ (N3-4806OA2) to 0.29 $\mu g/m^3$ (N3-4806OA3);

- Isopropanol - concentrations ranged from 0.94 $\mu g/m^3$ (N3-4806OA3) to 5.1 $\mu g/m^3$ (N3-4806OA1);

- n-hexane - concentrations ranged from 0.56 $\mu g/m^3$ (N3-4806OA1) to 2.8 $\mu g/m^3$ (N3-4806OA2);

- Naphthalene - concentrations ranged from 0.18 $\mu g/m^3$ (N3-4806OA1) to 0.81 $\mu g/m^3$ (N3-4806OA2);
- p-isopropyltoluene ranged from 0.46 $\mu g/m^3$ (N3-4806OA2) to 1.1 $\mu g/m^3$ (N3-4806OA3);
- Toluene - concentrations ranged from 0.69 $\mu g/m^3$ (N3-4806OA1) to 1.4 $\mu g/m^3$ (N3-4806OA3);
- Trichlorofluoromethane - concentrations were 1.2 $\mu g/m^3$ in all samples;
- 1,1,2-trichlorotrifluoroethane - concentrations ranged from 0.51 $\mu g/m^3$ (N3-4806OA1 duplicate) to 0.57 $\mu g/m^3$ (N3-4806OA2 normal sample);
- 1,2,4-TMB - concentrations ranged from 0.21 $\mu g/m^3$ (N3-4806OA2) to 0.72 $\mu g/m^3$ (N3-4806OA1); and
- Total xylenes – concentrations ranged from 0.61 $\mu g/m^3$ (N3-4806OA2) to 1.0 $\mu g/m^3$ (N3-4806OA3).

3.4.2 BUILDING 4810 OUTDOOR AIR ANALYTICAL RESULTS

Laboratory analytical results for outdoor air samples collected at Building 4810 are discussed in the following subsections. As noted in Section 1.3.1, results are first given for indicator chemicals TCE and benzene, followed by results for other VOCs detected in outdoor air samples.

3.4.2.1 TCE and Benzene

March 2013

TCE was not detected above the 1.1 $\mu g/m^3$ reporting limit in any outdoor air samples collected at Building 4810.

The benzene concentrations detected in outdoor air samples were 0.52 $\mu g/m^3$ (N7-4810OA1), 0.48 $\mu g/m^3$ (N7-4810OA2), and 0.44 $\mu g/m^3$ (N7-4810OA3).

August 2013

TCE was not detected above the 1.1 $\mu g/m^3$ reporting limit in any outdoor air samples collected outside of Building 4810.

Benzene was detected in one outdoor air sample, the concentration was 1.7 $\mu g/m^3$ at the N7-4810OA2 location.

3.4.2.2 Other Chemicals Detected in Outdoor Air

March 2013

The following VOCs were detected at all three outdoor air sample locations:

- Acetone – concentrations ranged from 6.5 $\mu g/m^3$ (N7-4810OA1) to 10 $\mu g/m^3$ (N7-4810OA3);
- 2-Butanone – concentrations ranged from 3.1 $\mu g/m^3$ (N7-4810OA2) to 5.4 $\mu g/m^3$ (N7-4810OA3);
- Bromomethane – concentrations ranged from 0.15 $\mu g/m^3$ (N7-4810OA3) to 0.21 $\mu g/m^3$ (N7-4810OA2);
- Carbon disulfide – concentrations ranged from 2.7 $\mu g/m^3$ (N7-4810OA3 duplicate) to 7.4 $\mu g/m^3$ (N7-4810OA3 normal sample);
- CT– concentrations ranged from 0.42 $\mu g/m^3$ (N7-4810OA1) to 0.46 $\mu g/m^3$ (N7-4810OA2);
- Chloromethane – concentrations ranged from 1.3 $\mu g/m^3$ (N7-4810OA3 duplicate) to 1.4 $\mu g/m^3$ (N7-4810OA1, N7-4810OA2, and N7-4810OA3 normal sample);
- Dichlorodifluoromethane - concentrations ranged from 2.5 $\mu g/m^3$ (N7-4810OA3 normal sample) to 2.6 $\mu g/m^3$ (N7-4810OA1, N7-4810OA2, and N7-4810OA3 duplicate);
- Ethanol – concentrations ranged from 2.7 $\mu g/m^3$ (N7-4810OA2) to 66 $\mu g/m^3$ (N7-4810OA3);
- Ethylbenzene - concentrations ranged from 0.21 $\mu g/m^3$ (N7-4810OA3) to 0.25 $\mu g/m^3$ (N7-4810OA1);
- n-hexane - concentrations ranged from 0.19 $\mu g/m^3$ (N7-4810OA3) to 0.49 $\mu g/m^3$ (N7-4810OA1);
- p-isopropyltoluene - concentrations ranged from 0.78 $\mu g/m^3$ (N7-4810OA1) to 9.9 $\mu g/m^3$ (N7-4810OA3);
- Toluene - concentrations ranged from 0.7 $\mu g/m^3$ (N7-4810OA3 normal sample) to 1.3 $\mu g/m^3$ (N7-4810OA3 duplicate);
- Trichlorofluoromethane - concentrations were 1.2 $\mu g/m^3$ in all samples;

- 1,1,2-trichlorotrifluoroethane - concentrations ranged from 0.52 $\mu g/m^3$ (N7-4810OA1) to 0.59 $\mu g/m^3$ (N7-4810OA3);
- 1,2,4-TMB - concentrations ranged from 0.11 $\mu g/m^3$ (N7-4810OA3) to 0.41 $\mu g/m^3$ (N7-4810OA1); and
- Total xylenes – concentrations ranged from 0.65 $\mu g/m^3$ (N7-4810OA3) to 1.11 $\mu g/m^3$ (N7-4810OA1).

August 2013

The following VOCs were detected at all three outdoor air sample locations:

- Acetone – concentrations ranged from 8.1 $\mu g/m^3$ (N7-4810OA3) to 11 $\mu g/m^3$ (N7-4810OA1);
- 2-Butanone – concentrations ranged from 1.7 $\mu g/m^3$ (N7-4810OA1) to 2.5 $\mu g/m^3$ (N7-4810OA3);
- Carbon disulfide – concentrations ranged from 1.3 $\mu g/m^3$ (N7-4810OA1) to 7.2 $\mu g/m^3$ (N7-4810OA3);
- CT – concentrations ranged from 0.4 $\mu g/m^3$ (N7-4810OA2) to 0.46 $\mu g/m^3$ (N7-4810OA3);
- Chloromethane – concentrations ranged from 1.1 $\mu g/m^3$ (N7-4810OA2 and N7-4810OA3) to 1.2 $\mu g/m^3$ (N7-4810OA1);
- Dichlorodifluoromethane – concentrations ranged from 2.4 $\mu g/m^3$ (N7-4810OA1 and N7-4810OA2) to 2.5 $\mu g/m^3$ (N7-4810OA3);
- Ethanol – concentrations ranged from 4.6 $\mu g/m^3$ (N7-4810OA2) to 8.3 $\mu g/m^3$ (N7-4810OA1);
- Ethylbenzene - concentrations ranged from 0.2 $\mu g/m^3$ (N7-4810OA3) to 0.27 $\mu g/m^3$ (N7-4810OA2);
- 4-ethyltoluene - concentrations ranged from 0.17 $\mu g/m^3$ (N7-4810OA3) to 0.37 $\mu g/m^3$ (N7-4810OA1);
- n-hexane - concentrations ranged from 0.56 $\mu g/m^3$ (N7-4810OA3) to 2 $\mu g/m^3$ (N7-4810OA1);
- Naphthalene - concentrations ranged from 0.16 $\mu g/m^3$ (N7-4810OA1) to 0.25 $\mu g/m^3$ (N7-4810OA2);

- p-isopropyltoluene - concentrations ranged from 0.48 $\mu g/m^3$ (N7-4810OA2) to 1.3 $\mu g/m^3$ (N7-4810OA1);
- Toluene - concentrations ranged from 1.1 $\mu g/m^3$ (N7-4810OA1) to 2.4 $\mu g/m^3$ (N7-4810OA2);
- Trichlorofluoromethane - concentrations ranged from 1.2 $\mu g/m^3$ (N7-4810OA2 and N7-4810OA3) to 1.3 $\mu g/m^3$ (N7-4810OA1);
- 1,1,2-trichlorotrifluoroethane - concentrations ranged from 0.53 $\mu g/m^3$ (N7-4810OA1) to 0.59 $\mu g/m^3$ (N7-4810OA3);
- 1,2,4-TMB - concentrations ranged from 0.22 $\mu g/m^3$ (N7-4810OA3) to 0.53 $\mu g/m^3$ (N7-4810OA1); and
- Total xylenes – concentrations ranged from 0.83 $\mu g/m^3$ (N7-4810OA3) to 1.94 $\mu g/m^3$ (N7-4810OA2).

3.5 EVALUATION OF THE INDOOR AIR SAMPLING RESULTS

3.5.1 INDOOR AIR RISK CALCULATION

The indoor air risk associated with each detected chemical in the indoor air samples as well as the associated cumulative risk under the current industrial land use scenario was calculated on a sample-by-sample basis. Potential cancer risks were calculated as the ratio of the measured concentration of each detected VOC to its IASL corresponding to a cancer risk of 1 x 10^{-6} and then multiplied by 1 x 10^{-6}. Non-cancer risks (or HQs) were calculated as the ratio of the measured concentration of each detected VOC to its IASL corresponding to a HQ of 1. Both the USAF/CERCLA and DTSC-preferred IASLs were used for these calculations. The results for the March 2013 indoor air sampling event are presented in Tables 5, 6, 9, 10, 13, and 14 for the USAF/CERCLA approach and DTSC-preferred approach. The results for the August 2013 indoor air sampling event are presented in Tables 7, 8, 11, 12, 15, and 16 for the USAF/CERCLA approach and DTSC-preferred approach. In accordance with the *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual* (USEPA 1989), the calculated cancer risks were reported to one significant digit. The guidance recommends summing the individual HQs, with the assumption that if the total Hazard Index (HI) exceeds 1 there may be concern for potential health effects. Because the summation of HQs resulted in HIs of less than, or near 1, HQs were not expressed on a target organ basis and the non-cancer risks are likely over-estimated.

Assessment using the USAF/CERCLA approach of the laboratory analytical results for indoor air samples collected at Building 4806 indicated that total cancer risks ranged from 2×10^{-6} to 4×10^{-5} and total non-cancer HIs ranged from 0.1 to 0.3 during the March 2013 event; and total cancer risks ranged from 3×10^{-6} to 2×10^{-5} and total non-cancer HIs ranged from 0.07 to 0.3 during the August 2013 event. Using the DTSC-preferred approach, total cancer risks ranged from 5×10^{-6} to 5×10^{-5} and total non-cancer HIs ranged from 0.2 to 0.5 during the March 2013 event; and total cancer risks ranged from 6×10^{-6} to 2×10^{-5} and total non-cancer HIs ranged from 0.1 to 0.3 during the August 2013 event.

Assessment using the USAF/CERCLA approach of the laboratory analytical results for indoor air samples collected at Building 4807 indicated that total cancer risks ranged from 2×10^{-6} to 1×10^{-5} and total non-cancer HIs ranged from 0.1 to 0.7 during the March 2013 event; and total cancer risks ranged from 3×10^{-6} to 2×10^{-5} and total non-cancer HIs ranged from 0.1 to slightly below 2 (based on sample N3-4807IA3 results) during the August 2013 event. Using the DTSC-preferred approach, total cancer risks ranged from 6×10^{-6} to 6×10^{-5} and total non-cancer HIs ranged from 0.3 to 2 during the March 2013 event; and total cancer risks ranged from 5×10^{-6} to 7×10^{-5} and total non-cancer HIs ranged from 0.2 to 3 (based on sample N3-4807IA3 results) during the August 2013 event.

When a HQ is less than one (where the average daily exposure is less than the RfC), adverse toxic non-carcinogenic effects are unlikely. The sum of all of the chemical- and route-specific HQs is called the HIs. A HI of less than one indicates that non-carcinogenic effects from all the site contaminants are unlikely. The only summed HQ that exceeded 1 was based on the results for sample N3-4807IA3, when expressed without target organ specificity. The primary hazard driver is 1,2,4-TMB (HQ slightly exceeding 1) and the target upon which the 1,2,4-TMB RfC is based is the hematopoietic system (specifically blood clotting ability). The next highest HQs (for sample N3-4807IA3) were xylenes (exhibiting a HQ of slightly less than 0.2 for m,p-xylenes and 0.06 for o-xylene), and naphthalene (exhibiting a HQ of slightly above 0.1). The target organ system for xylenes is the respiratory system, and the target organ system for naphthalene is the nervous system. Since each target-organ specific HQ acts upon different organ systems, non-carcinogenic effects from site contaminants are unlikely.

Assessment using the USAF/CERCLA approach of the laboratory analytical results for indoor air samples collected at Building 4810 indicated that total cancer risks ranged from 5×10^{-7} to 5×10^{-6} and total non-cancer HIs ranged from 0.03 to 0.2 during the March 2013 event; and total cancer risks

ranged from 6×10^{-7} to 1×10^{-4} and total non-cancer HIs ranged from 0.04 to 0.8 during the August 2013 event. Using the DTSC-preferred approach, total cancer risks ranged from 2×10^{-6} to 9×10^{-6} and total non-cancer HIs ranged from 0.06 to 0.2 during the March 2013 event; and total cancer risks ranged from 2×10^{-6} to 1×10^{-4} and total non-cancer HIs ranged from 0.04 to 0.9 during the August 2013 event.

In Building 4806, chloroform and naphthalene exhibited cancer risks exceeding 1×10^{-6} employing the USAF/CERCLA risk assessment approach and benzene, chloroform, CT, and naphthalene exhibited cancer risks exceeding 1×10^{-6} employing the DTSC-preferred approach risk assessment approach. None of the other chemicals detected at Building 4806 exhibited a cancer risk exceeding 1×10^{-6} and no chemicals exhibited a non-cancer HI above 1 using either the USAF/CERCLA approach or the DTSC-preferred approach.

In Building 4807, acrylonitrile, benzene, ethylbenzene, and naphthalene exhibited cancer risks exceeding 1×10^{-6} employing the USAF/CERCLA risk assessment approach and acrylonitrile, benzene, CT, ethylbenzene, and naphthalene exhibited cancer risks exceeding 1×10^{-6} employing the DTSC-preferred approach risk assessment approach. None of the other chemicals detected at Building 4807 exhibited a cancer risk exceeding 1×10^{-6}. The chemical 1,2,4-TMB exhibited a non-cancer HI of slightly above 1, using either the USAF/CERCLA or DTSC-preferred approaches.

In Building 4810, benzyl chloride, ethylene dibromide, and naphthalene exhibited cancer risks exceeding 1×10^{-6} employing the USAF/CERCLA risk assessment approach and benzene, benzyl chloride, CT, ethylene dibromide and naphthalene exhibited cancer risks exceeding 1×10^{-6} employing the DTSC-preferred approach risk assessment approach. None of the other chemicals detected at Building 4810 exhibited a cancer risk exceeding 1×10^{-6} and no chemicals exhibited a non-cancer HI above 1 using either the USAF/CERCLA approach or the DTSC-preferred approach.

3.5.2 VIP-RELATED INDOOR AIR RISK CALCULATION

The VOCs detected in the indoor air samples were assessed using database queries to determine the likelihood of originating from the subsurface via the VIP based upon the interpretation of several lines of evidence (Appendix F), including:

- Detection in the groundwater;
- Detection in the outdoor air, and the outdoor air concentrations compared to those in the indoor air at one order of magnitude higher; and
- Detection in the sub-slab vapor, and the sub-slab vapor concentrations compared to those in indoor air at 10 times higher (equivalent to a 0.1 attenuation factor from sub-slab into indoor air, a more conservative approach than the DTSC-preferred 0.05 attenuation factor).

Based upon the laboratory analytical results, the scenarios derived from the above lines of evidence are:

1. The VOC is considered not VIP-related if:
   - The VOC was detected only in indoor air (i.e., not detected in groundwater, not detected in outdoor air, and not detected in sub-slab vapor).
   - The VOC was detected in indoor air and outdoor air, but not in the groundwater and not detected in sub-slab vapor.
2. The VOC is considered likely not VIP-related if:
   - The VOC was detected in indoor air and sub-slab vapor, but not in groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.
   - The VOC was detected in indoor air and groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations, and the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.
3. The VOC is considered likely VIP-related if:
   - The VOC was detected in indoor air and sub-slab vapor, but not in groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were at least 10 times higher than those detected in the indoor air.
   - The VOC was detected in indoor air and groundwater. Additionally, the indoor air concentrations were higher than, or lower than but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were at least 10 times higher than those detected in the indoor air.
4. The VOC is considered VIP-related if:
   - The VOC is detected in indoor air, groundwater, and sub-slab vapor. In addition, the indoor air concentrations were higher than, or lower than but within the same order of

magnitude as, the outdoor air concentrations, and the sub-slab vapor concentrations were 10 times higher than those detected in the indoor air.

Assessment of the laboratory analytical results from the March 2013 event indicated that two VOCs (acetone and benzene) out of 32 VOCs detected in indoor air in Building 4806 were VIP-related and two VOCs (n-heptane and n-hexane) were likely VIP-related. However, n-heptane and n-hexane have not been identified as groundwater COCs. Assessment of the results from the August 2013 event indicated that one VOC (benzene) out of 34 VOCs detected in indoor air in Building 4806 was VIP-related and no VOCs were likely VIP-related.

Assessment of the laboratory analytical results from the March 2013 event indicated that two VOCs (acetone and PCE) out of 34 VOCs detected in indoor air in Building 4807 were VIP-related and no VOCs were likely VIP-related. Assessment of the results from the August 2013 event indicated that two VOCs (1,4-dichlorobenzene and 4-methyl-2-pentanone) out of 36 VOCs detected in indoor air in Building 4807 were VIP-related and no VOCs were likely VIP-related.

Assessment of the laboratory analytical results from the March 2013 event indicated that five VOCs (1,1,2-trichlorotrifluoroethane, 2-butanone, 4-methyl-2-pentanone, isopropylbenzene, and PCE) out of 38 VOCs detected in indoor air in Building 4810 were VIP-related and one VOC (cyclohexane) was likely VIP-related. However cyclohexane has not been identified as a groundwater COC. Assessment of the results from the August 2013 event indicated that no VOCs were VIP-related or likely VIP-related.

The assessment results for the VIP-related and likely VIP-related VOCs for Building 4806 were generally consistent between the March and August 2013 sampling events, which indicates that the samples collected during this VIP investigation were representative of building conditions throughout the year, because these two sampling events occurred during winter/spring and summer conditions. The assessment results for the VIP-related and likely VIP-related VOCs for Buildings 4807 and 4810 differed between the March and August 2013 sampling events. For Building 4807, acetone and PCE were identified as VIP-related VOCs in the March 2013 assessment results, but were not detected in indoor air or not detected in sub-slab vapor samples at concentrations 10 times greater than indoor air concentrations in August 2013. By contrast, 1,4-dichlorobenzene and 4-methyl-2-pentanone were identified as VIP-related VOCs in the August 2013 assessment results, but were not detected in indoor

air samples in March 2013. This variance may be attributable to changes in chemical usage patterns by building occupants although none were identified during the building surveys. Differential pressures were neutral in March 2013 and mostly positive in August 2013, a condition that impedes VI. For Building 4810, five VOCs were identified as VIP-related VOCs in the March 2013 assessment results when differential pressures were negative, a condition that promotes VI. By comparison, no VIP-related VOCs were identified in the August 2013 assessment results; differential pressures during this sampling event were mostly neutral.

VIP-Related Indoor Air Risk Calculations

The VIP-related indoor air risk calculation results for the March and August 2013 events are presented in Tables 17 through 28 for both the USAF/CERCLA approach and DTSC-preferred approaches.

Assessment of VIP-related and likely VIP-related analytes detected in the individual samples from Building 4806 using the USAF/CERCLA approach indicated that the total cancer risk was 1×10^{-6} and total non-cancer HIs ranged from less than 0.01 to 0.02 during the March 2013 event. Total cancer risks ranged from 5×10^{-7} to 1×10^{-6} and the total non-cancer HIs ranged from less than 0.01 to 0.04 during the August 2013 event. Using the DTSC-preferred approach, total cancer risk was 4×10^{-6} and total non-cancer HIs ranged from less than 0.01 to 0.1 during the March 2013 event. Total cancer risks ranged from 1×10^{-6} to 2×10^{-6} and the total non-cancer HIs ranged from less than 0.01 to 0.08 during the August 2013 event.

Assessment of VIP-related and likely VIP-related analytes detected in the individual samples from Building 4807 using the USAF/CERCLA approach did not identify cancer risks and indicated that total non-cancer HIs were less than 0.01 for all samples during the March 2013 event. Total cancer risks were up to 8×10^{-7} and total non-cancer HIs were 0.01 or less for all samples during the August 2013 event. Using the DTSC-preferred approach, no cancer risks or non-cancer hazards were identified for samples collected during the March 2013 event. Using the DTSC-preferred approach for the samples collected during the August 2013 event, total cancer risks were up to 3×10^{-6} and total non-cancer HIs were 0.09 or less.

Assessment of VIP-related and likely VIP-related analytes detected in the individual samples from Building 4810 using the USAF/CERCLA approach indicated that total cancer risks were up to 3×10^{-7}

and total non-cancer HIs were less than 0.02 for all samples during the March 2013 event. Using the DTSC approach, total cancer risks were up to 9 x 10^{-7} and total non-cancer HIs ranged from less than 0.01 to 0.04 during the March 2013 event. Total cancer risks were up to 4 x 10^{-7} and total non-cancer HIs ranged from less than 0.01 to 0.02 during the August 2013 event.

3.5.3 UNCERTAINTIES

Inherent in the screening level evaluation of the potential indoor air risk included in this report are uncertainties associated with the various processes that contribute to the final risk result. Understanding the major uncertainties assists with the interpretation of the risk characterization results. In general, the risk assessment process operated in a "cascade" fashion, whereby each phase relies on information generated in the previous phase. If an uncertainty is introduced, for example, during the data collection phase, it will be carried through each successive risk assessment phase. When successive uncertainties introduce biases, the final health risk estimates may overestimate or underestimate actual risks and hazards.

Uncertainties Introduced by Sampling Design

The assumptions used in this screening-level risk evaluation are intended to approximate actual exposure conditions. However, these conditions are often difficult to represent, and entail uncertainties in some of the choices made in the collection of the samples. These choices include, but are not limited to, the location of the sampling device, how long to collect air samples, and when and how often to collect the samples. For example, indoor air samples were collected over an 8-hour period to represent a "normal" work day; however, in rare cases, the operation hours during missions may be extended. Because these events are rare, it was considered appropriate to design sampling around the more typical 8–hour work day for evaluating long-term exposures.

Access to the area is restricted to assigned personnel and subcontractors, and is secured by NASA. In general, sampling locations were selected to represent occupied spaces within the buildings, and some sampling locations (e.g., in the bathroom near points of potential soil vapor entry [e.g., floor drain and utility pipelines]) were in areas that are not regularly occupied or are only occasionally or intermittently occupied. Inclusion of these samples in the risk evaluation overestimates the risk to actual receptors potentially exposed to indoor air in these buildings.

To evaluate the potential impact on indoor VOC levels resulting from sample collection during different times of the year (i.e., including effects on vapor intrusion from climatic differences and varying HVAC conditions), indoor and outdoor sampling events were performed in March 2013 (winter to spring season) and August 2013 (summer season), followed by sub-slab vapor sampling within 24 hours of the events for comparison purposes. Due to delays caused by implementing the *Vapor Intrusion Pathway Communication Plan for Edwards Air Force Base* (USAF 2013), the VIP sampling event could not be scheduled before March 2013 (nearer to the winter season) when the HVAC system was mostly operating in the heating mode, which tended to induce a negative pressure differential inside Building 4810 in relation to the outside air. Pressure differentials tended to be mostly positive in Building 4810 in the summer season event. No clear pressure differential trends were apparent in Buildings 4806 and 4807 during either season, possibly due to large roll-up doors being open during operating hours in both seasons. Therefore, the sampling times under this VIP investigation appear to be representative of the special building conditions.

Uncertainties Introduced by Exposure Assumptions

The exposure assumptions (frequency, time, and duration) used to calculate potential intake rates are another source of uncertainty. For example, the estimated indoor air risks for all of the VOCs detected in the indoor air and for the VIP-related and likely VIP-related VOCs were based on a screening risk evaluation using the USEPA default industrial reasonable maximum exposure parameters of 8 hours per day for 250 days per year and for 25 years. For some sampling locations (e.g., in the bathroom near the points of potential soil vapor entry [e.g., floor drain and utility pipelines]) that were in areas that are not regularly occupied or are only occasionally or intermittently occupied, the screening risk evaluation appears to overestimate the actual indoor air risks. Additionally the assumption of a 25-year exposure period likely overestimates the typical time personnel work in these buildings. Thus, while health-protective this assumption increases uncertainty. However, because the VIP-related indoor air risks (e.g. total cancer risks slightly above, at, or below 1×10^{-6} using the DTSC-preferred approach in Buildings 4806, 4807, and 4810; and the HI below 1) are within the CERCLA risk management criteria (1×10^{-6} to 1×10^{-4} and an HI below 1), assessing risks using site-specific central tendency exposure parameters was not pursued.

Uncertainties as to Sources of Chemicals Detected in the Indoor Air

Additional uncertainties are introduced when evaluating whether a VOC is VIP-related. Despite the project team's attempt to remove any known indoor sources, the indoor air can still be impacted by a variety of indoor sources (including consumer products, occupant activities, tap water off-gassing, and releases from interior building materials) and outdoor sources (including vehicle exhaust, paint or pesticide applications, and regional and global sources). However, the conservative assessment procedure described in Section 3.5.2 did not consider these potential sources, and the VOCs determined as VIP-related and likely VIP-related may have originated from some of them. As a result, the VIP-related risks may be overestimated. Because the VIP-related indoor air risks (e.g. total cancer risks slightly above, at, or below 1×10^{-6} using the DTSC-preferred approach in Buildings 4806, 4807, and 4810; and the HI below 1) are within the CERCLA risk management criteria (1×10^{-6} to 1×10^{-4} and an HI below 1), the actual sources of these likely VIP-related VOCs were not further studied.

Additional uncertainty related to the assessment procedure described in Section 3.5.2 includes the application of the 10-time ratio. One of the lines of evidence in determining if a VOC is VIP-related is whether the sub-slab vapor concentrations compared to those in indoor air are 10 times higher. The 10-time ratio is equivalent to an attenuation factor of 0.1, which is 2 times the attenuation factor of 0.05 recommended by DTSC. Therefore, combined with other lines of evidence, it is reasonable to consider that the indoor air VOCs are not VIP-related if the sub-slab vapor concentrations are not 10 times higher than those detected in the indoor air. Application of 2 times the DTSC-recommended attenuation factor may overestimate the cancer risks and noncancer hazards. However, because the evaluation is applied on a point by point basis, it is possible that a VOC could be determined to be VIP-related at one sampling point within a building but not at another sampling point within the same building, potentially resulting in an underestimate of cancer risks and noncancer hazards.

Uncertainties Inherent in Toxicity Values

Uncertainty is also inherent in toxicity values established to evaluate cancer risks and non-cancer HIs. Such uncertainty is chemical-specific, and is incorporated into the toxicity value during its development. For example, an uncertainty factor is applied for interspecies and intra-human

variability, for extrapolation from sub-chronic to chronic exposures, or for epidemiological data limitations. Application of uncertainty factors is expected to overestimate risks.

3.6 QUALITY ASSURANCE/QUALITY CONTROL

Sample collection, laboratory analyses, and data validation were performed according to procedures in the *Base-wide SAP* (AECOM 2012a). A QASR prepared by AECOM's quality assurance manager is included in Appendix E. The QASR indicates that the sampling data included in this report met the quality objectives for precision, accuracy, representativeness, comparability, and completeness.

4.0 CONCLUSIONS AND RECOMMENDATIONS

This project was designed to meet the four objectives outlined in Section 1.6.2. The following sections summarize how each objective was met.

4.1 CONCLUSIONS

The following is a summary of the conclusions for the VIP investigation in Buildings 4806, 4807, and 4810 from March through August 2013:

- (Met Objectives Number [No.] 1 and No. 2) Upon the completion of the initial building surveys in June 2012, five sub-slab vapor and indoor air sampling points were proposed for Building 4806, and four sub-slab vapor and indoor air sampling points were proposed for each of Buildings 4807 and 4810. Three outdoor air sampling locations were proposed each for Buildings 4806/4807 and 4810. The sampling event buildings surveys in March 2013 confirmed these proposed sampling locations.

  Sub-slab vapor and indoor and outdoor air samples were collected from all three buildings during the weeks of 4 March and 19 August 2013. Sub-slab vapor sample results served as a line of evidence for comparison to indoor air and were not used for VIP risk calculations.

- (Met Objectives No. 3 and No. 4) The estimated indoor air risks are summarized below. As discussed in Section 3.5.1, the hazard quotients were not expressed on a target organ basis and therefore the non-cancer risks are likely over-estimated.

  - Using the USAF/CERCLA approach for the selection of toxicity criteria, the total cancer industrial risk for individual samples ranged from 5×10^{-7} to 1×10^{-4} and the HIs ranged from 0.03 to slightly below 2 in Buildings 4806, 4807, and 4810 for the VOCs detected during the March and August 2013 sampling events.

  - Using the DTSC-preferred approach for the selection of toxicity criteria, the total cancer industrial risk for individual samples ranged from 2×10^{-6} to 1×10^{-4} and the HIs ranged from 0.04 to 3 in Buildings 4806, 4807, and 4810 for the VOCs detected during the March and August 2013 sampling events.

  - Using various lines of evidence and the USAF/CERCLA approach for the selection of toxicity criteria, the total cancer industrial risks were up to 1×10^{-6} and the HIs ranged from less than 0.01 to 0.04 in Buildings 4806, 4807, and 4810 for VOCs considered VIP-related or likely to be VIP-related.

- Using various lines of evidence and the DTSC-preferred approach for the selection of toxicity criteria, the total cancer industrial risks were up to 4 x 10^{-6} and the HIs ranged from less than 0.01 to 0.09 in Buildings 4806, 4807, and 4810 for VOCs considered VIP-related or likely to be VIP-related.

- TCE was not detected above the 1.1-μg/m^3 reporting limit in indoor air, which is below the 8.8-µg/m^3 concentration estimated to represent an HQ of 1 for any exposure over an 8-hour day. The (USEPA-calculated) industrial worker May 2014 RSL for TCE in air uses the USEPA IRIS RfC to calculate a scenario-specific (industrial worker) concentration that is protective of both genders (and an unborn fetus) as 8.8 μg/m^3.

4.2 RECOMMENDATIONS

The following is a summary of the recommendations for future VIP monitoring in Buildings 4806, 4807, and 4810:

1. Based upon the results of the indoor air sampling that (1) the potential cancer risks for all VOCs detected in indoor air were at, or less than, 1 x 10^{-4}, and no cumulative HI for chemicals potentially impacting the same target organ exceeded unity (1.0); and (2) the potential cancer risks from VIP-related and likely VIP-related indoor air VOCs were less than 1 x 10^{-6} (except for risks calculated using DTSC-preferred toxicity values which were 4 x 10^{-6} in Building 4806 for the March 2013 sampling event, 2 x 10^{-6} in Building 4806 for the August 2013 sampling event, and 3 x 10^{-6} in Building 4807 for the August 2013 sampling event), and the HIs were less than 1, no further action appeared to be necessary. However, due to a demolition delay and to confirm seasonal observations (as further discussed below), an additional winter sampling event was performed in February 2016 at Buildings 4806 and 4807. Results of the sampling event will be included in the Second Five-Year Review Report.

2. Although the HVAC system is mostly operating in the heating mode during the winter season and tends to induce a negative pressure differential inside the buildings in relation to the outside air, the measurements during this VIP investigation exhibited that negative pressure differentials are as likely to be present as positive pressure differentials during either winter or summer months. Therefore, the results from the March and August 2013 sampling events appear to be representative of building conditions in the "winter to spring" and "summer" seasons, respectively. To confirm these findings, an additional winter sampling event was performed in February 2016.

3. Although a VIP exists in Buildings 4806, 4807, and 4810 (particularly in Building 4806 for benzene, a known site contaminant in groundwater), a VIP monitoring program does not appear to be necessary due to the estimated indoor air risks (for VIP-related and likely VIP-related indoor air VOCs) being well within the CERCLA risk management range for cancer risks (1 x 10^{-6} to 1 x 10^{-4}) and non-cancer hazards being well below 1. Although the

benzene plume is likely under Buildings 4806 and 4807 and is projected to continue to migrate beneath the buildings, Buildings 4806 and 4807 are slated for demolition in Fiscal Year 2018 and no replacement structures are planned. To confirm the seasonal findings and to account for a delay in demolition of Buildings 4806 and 4807 (Building 4810 was demolished in September 2014), an additional winter sampling event was performed at Buildings 4806 and 4807 in February 2016. Results of the sampling event will be included in the Second Five-Year Review Report. Buildings 4806 and 4807 were selected for this investigation due in part to their proximity to the benzene and TCE plumes. No other current or planned occupied buildings are, or will be, closer to the plumes; therefore, Buildings 4806 and 4807 are the most likely buildings to have VIP-related indoor air risks outside of the risk management range. Based on this investigation which demonstrated that VIP-related indoor air risks are well within the risk management range and that TCE was not detected in any indoor air samples, an indoor air monitoring program is not recommended at any other NASA buildings in the path of the benzene and TCE plumes. This recommendation will be re-evaluated in the Second Five Year Review pending the results of the February 2016 sampling event.

Unlike Buildings 4806 and 4807, a replacement building is planned near the former location of Building 4810. As presented in Section 3.2, in order to evaluate whether sub-slab vapor sources have the potential to pose unacceptable health risks due to vapor intrusion in the future if site conditions were to change such as new building construction, the sub-slab vapor sampling results were compared on a sample-by-sample basis to the respective SVSLs. Although no VOCs detected in the sub-slab vapor samples collected during either season from Building 4810 exceeded the respective SVSLs or California-SVSLs, NASA has included a vapor barrier in the construction specifications such as the inclusion of vapor barriers are warranted for the Building 4810 replacement due to its downgradient location relative to the plumes.

4. Because the indoor risks associated with the VOCs that are VIP-related and likely VIP-related are within the CERCLA risk management cancer range (1×10^{-6} to 1×10^{-4}) while the HI is below 1, the actual sources of the likely VIP-related VOCs were not further studied.

5. Although the purpose of this report is to assess risk to workers under current conditions assuming the industrial exposure scenario, indoor air risks should be re-assessed in a manner similar to that described in Recommendation 3, if site conditions change. Such changes may include new building construction or alteration of existing building foundations.

6. If, during any future investigations, TCE is detected in indoor air, the receptor pathway for short-term exposure of developing fetuses and related uncertainty regarding residential and industrial exposure durations should be addressed.

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TABLE 1. VOLATILE ORGANIC COMPOUNDS DETECTED ABOVE MCLS OR RSLS IN GROUNDWATER NEAR BUILDINGS 4806, 4807 AND 4810 FROM 2006 TO 2012
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Chemical	Highest Level through June 2012 (μg/L)	Detected in Well	MCL[a] (μg/L)	Tap Water RSL[b] (μg/L)
1,1-dichloroethene	38	N3-MW21	6	260
1,1,2,2-tetrachloroethane	42	N3-MW22	1	0.067
1,1,2-trichloroethane	3.3	N3-MW15	5	0.24
1,2,3-trichlorobenzene	15	N3-MW20	NE	5.2
1,2,4-trichlorobenzene	13	N3-MW20	5	0.99
1,2,4-trimethylbenzene	2,000	N3-MW21	NE	15
1,2-dichloroethane	130	N3-ASW02B	0.5	0.15
1,2-dichloropropane	0.64	N3-MW23	5	0.38
1,3,5-trimethylbenzene	840	N3-MW13	NE	87
1,4-dichlorobenzene	11	N3-DEW02	5	0.42
2-hexanone	520	N3-MW16	NE	34
benzene	9,800	N3-MW14	1	0.39
bromodichloromethane	49	N7-MW01	NE	0.12
bromoform	110	N3-NW05	NE	7.9
carbon tetrachloride	7,500	N3-MW22	0.5	0.39
chloroform	3,600	N3-MW22	NE	0.19
cis-1,2-dichloroethene	14,000	N3-MW21	6	28
dibromochloromethane	55	N3-NW05	NE	0.15
ethylbenzene	1,700	N3-MW13	300	1.3
ethylene dibromide (EDB)	19	N3-MW16	0.05	0.0065
hexachlorobutadiene	10	N3-MW20	NE	0.26
methylene chloride	65,000	N3-MW08	5	9.9
naphthalene	1,100	N3-MW13	NE	0.014
tetrachloroethene (PCE)	10	N3-MW15	5	9.7
toluene	6,300	N3-MW21	150	860
trans-1,2-dichloroethene	17	N7-MW16	10	86
trichloroethene (TCE)	66,000	N3-MW22	5	0.44
vinyl chloride	0.5	N3-MW07	0.5	0.015
xylenes, total	7,300	N3-MW21	1,750	190
o-xylene	3,500	N3-MW21	NE	190

TABLE 1. VOLATILE ORGANIC COMPOUNDS DETECTED ABOVE MCLS OR RSLS IN GROUNDWATER NEAR BUILDINGS 4806, 4807 AND 4810 FROM 2006 TO 2012

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Notes:

[a] California Department of Public Health (2011).
[b] United States Environmental Protection Agency (2013b).

μg/L	micrograms per liter
MCL	Maximum Contaminant Level
NE	not established
RSL	Regional Screening Level

TABLE 2. INDOOR AIR SCREENING LEVELS - CURRENT INDUSTRIAL LAND USE SCENARIO
(Page 1 of 3)

		USAF/CERCLA Approach[a]					DTSC-Preferred Approach[b]				
Analyte	CAS	IUR ($\mu g/m^3)^{-1}$	Source	RfC (mg/m^3)	Source	IASL[c] ($\mu g/m^3$)	IUR ($\mu g/m^3)^{-1}$	Source	RfC (mg/m^3)	Source	CA-IASL[c] ($\mu g/m^3$)
1,1,1,2-tetrachloroethane	630-20-6	7.40E-06	IRIS	---	---	1.66					Same as USAF/CERCLA approach
1,1,1-trichloroethane	71-55-6	---	---	5.0E+00	IRIS	22,000	---	---	1.0E+00	OEHHA	4,400
1,1,2,2-tetrachloroethane	**79-34-5**	**5.8E-05**	**OEHHA**	**---**	**---**	**0.21**	**5.8E-05**	**OEHHA**	**7.0E-02**	**OEHHA**	**0.21**
1,1,2-trichloroethane	**79-00-5**	**1.6E-05**	**OEHHA**	**2.0E-04**	**PPRTV**	**0.77**					**Same as USAF/CERCLA approach**
1,1,2-trichlorotrifluoroethane	76-13-1	---	---	3.0E+01	HEAST	130,000					Same as USAF/CERCLA approach
1,1-dichloroethane	75-34-3	1.6E-06	OEHHA	---	---	7.66					Same as USAF/CERCLA approach
1,1-dichloroethene	**75-35-4**	**---**	**---**	**2.0E-01**	**IRIS**	**880**			**7.0E-02**	**OEHHA**	**310**
1,2,4-trichlorobenzene	**120-82-1**	**---**	**---**	**2.0E-03**	**PPRTV**	**8.8**	**1.0E-05**	**OEHHA**	**2.0E-03**	**PPRTV**	**1.2**
1,2,4-trimethylbenzene	**95-63-6**	**---**	**---**	**7.0E-03**	**PPRTV**	**31**					**Same as USAF/CERCLA approach**
1,2-dichlorobenzene	95-50-1	---	---	2.0E-01	HEAST	880					Same as USAF/CERCLA approach
1,2-dichloroethane	**107-06-2**	**2.6E-05**	**IRIS**	**7.0E-03**	**PPRTV**	**0.47**					**Same as USAF/CERCLA approach**
1,2-dichloropropane	**78-87-5**	**1.0E-05**	**OEHHA**	**4.0E-03**	**IRIS**	**1.23**					**Same as USAF/CERCLA approach**
1,2-dichlorotetrafluoroethane	76-14-2	---	---	3.0E+01	HEAST	130,000					Same as USAF/CERCLA approach
1,3,5-trimethylbenzene	**108-67-8**	**---**	**---**	**7.0E-03**	**PPRTV**	**153**			**3.5E-02**	**OEHHA**	**Same as USAF/CERCLA approach**
1,3-butadiene	106-99-0	3.0E-05	IRIS	2.0E-03	IRIS	0.41	1.7E-04	OEHHA	2.0E-03	IRIS	0.070
1,3-dichlorobenzene	541-73-1	---	---	2.0E-01	HEAST	880					Same as USAF/CERCLA approach
1,4-dichlorobenzene	**106-46-7**	**1.1E-05**	**OEHHA**	**8.0E-01**	**OEHHA**	**1.11**					**Same as USAF/CERCLA approach**
2-butanone (MEK)	78-93-3	---	---	5.0E+00	IRIS	22,000					Same as USAF/CERCLA approach
2-hexanone	**591-78-6**	**---**	**---**	**3.0E-02**	**IRIS**	**130**					**Same as USAF/CERCLA approach**
4-ethyltoluene	622-96-8	---	---	1.0E-01	IRIS	440			1.0E-01	IRIS	Same as USAF/CERCLA approach
4-methyl-2-pentanone (MIBK)	108-10-1	---	---	3.0E+00	IRIS	13,000					Same as USAF/CERCLA approach
acetone	67-64-1	---	---	3.1E+01	ATSDR	140,000					Same as USAF/CERCLA approach
acrylonitrile	1424-48-2	6.8E-05	IRIS	2.0E-03	IRIS	0.18	2.9E-04	OEHHA	5.0E-03	OEHHA	0.040
benzene	**71-43-2**	**7.8E-06**	**IRIS**	**3.0E-02**	**IRIS**	**1.57**	**2.9E-05**	**OEHHA**	**3.0E-03**	**OEHHA**	**0.42**
benzyl chloride	100-44-7	4.9E-05	OEHHA	1.0E-03	PPRTV	0.25					Same as USAF/CERCLA approach
bromodichloromethane	**75-27-4**	**3.7E-05**	**OEHHA**	**---**	**---**	**0.33**	**3.7E-05**	**OEHHA**	**7.0E-02**	**OEHHA**	**Same as USAF/CERCLA approach**
bromoform	**75-25-2**	**1.1E-06**	**IRIS**	**---**	**---**	**11.15**					**Same as USAF/CERCLA approach**
bromomethane	74-83-9	---	---	5.0E-03	OEHHA	22					Same as USAF/CERCLA approach
carbon disulfide	75-15-0	---	---	7.0E-01	IRIS	3,100					Same as USAF/CERCLA approach
carbon tetrachloride	**56-23-5**	**6.0E-06**	**IRIS**	**1.0E-01**	**IRIS**	**2.04**	**4.2E-05**	**OEHHA**	**4.0E-02**	**OEHHA**	**0.29**
chlorobenzene	108-90-7	---	---	5.0E-02	PPRTV	220					Same as USAF/CERCLA approach
chloroethane	75-00-3	---	---	1.0E+01	IRIS	44,000					Same as USAF/CERCLA approach
chloroform	**67-66-3**	**2.3E-05**	**IRIS**	**9.8E-02**	**ATSDR**	**0.53**					**Same as USAF/CERCLA approach**
chloromethane	74-87-3	---	---	9.0E-02	IRIS	390					Same as USAF/CERCLA approach
cis-1,2-dichloroethene	**156-59-2**	**---**	**---**	**6.0E-02**	**PPRTV**	**260**	**---**	**---**	**7.0E-03**	**OEHHA**	**31**

TABLE 2. INDOOR AIR SCREENING LEVELS - CURRENT INDUSTRIAL LAND USE SCENARIO
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		USAF/CERCLA Approach[a]					DTSC-Preferred Approach[b]				
Analyte	CAS	IUR $(\mu g/m^3)^{-1}$	Source	RfC (mg/m^3)	Source	IASL[c] $(\mu g/m^3)$	IUR $(\mu g/m^3)^{-1}$	Source	RfC (mg/m^3)	Source	CA-IASL[c] $(\mu g/m^3)$
cis-1,3-dichloropropene	10061-01-5	4.0E-06	IRIS	2.0E-02	IRIS	3.07	1.6E-05	OEHHA	2.0E-02	IRIS	0.77
cyclohexane	110-82-7	---	---	6.0E+00	IRIS	26,000					Same as USAF/CERCLA approach
dibromochloromethane	**124-48-1**	**2.7E-05**	**OEHHA**	**---**	**---**	**0.45**					**Same as USAF/CERCLA approach**
dichlorodifluoromethane	75-71-8	---	---	1.0E-01	PPRTV	440					Same as USAF/CERCLA approach
ethanol	64-17-5	---	---	7.0E+00	OEHHA	31,000					Same as USAF/CERCLA approach
ethyl acetate	141-78-6	---	---	7.0E+00	OEHHA	31,000					Same as USAF/CERCLA approach
ethylbenzene	**100-41-4**	**2.5E-06**	**OEHHA**	**1.0E+00**	**IRIS**	**4.90**					**Same as USAF/CERCLA approach**
ethylene dibromide (EDB)	**106-93-4**	**6.0E-04**	**IRIS**	**9.0E-03**	**IRIS**	**0.02**					**Same as USAF/CERCLA approach**
hexachlorobutadiene	**87-68-3**	**2.2E-05**	**IRIS**			**0.56**	**2.20E-05**	**IRIS**	**3.5E-03**	**OEHHA**	**Same as USAF/CERCLA approach**
hexane	110-54-3	---	---	7.0E-01	IRIS	3,100					Same as USAF/CERCLA approach
isopropyl alcohol	67-63-0	---	---	7.0E+00	OEHHA	31,000					Same as USAF/CERCLA approach
isopropylbenzene	98-82-8	---	---	4.0E-01	IRIS	1,800					Same as USAF/CERCLA approach
m- & p-xylene	**179601-23-1**	**---**	**---**	**1.0E-01**	**IRIS**	**440**					**Same as USAF/CERCLA approach**
methyl tert-butyl ether (MTBE)	1634-04-4	2.6E-07	OEHHA	3.0E+00	IRIS	47					Same as USAF/CERCLA approach
methylene chloride	**75-09-2**	**1.0E-08**	**IRIS**	**6.0E-01**	**IRIS**	**1,200**	**1.0E-06**	**OEHHA**	**4.0E-01**	**OEHHA**	**12**
naphthalene	**91-20-3**	**3.4E-05**	**OEHHA**	**3.0E-03**	**IRIS**	**0.36**					**Same as USAF/CERCLA approach**
n-butylbenzene	104-51-8	---	---	1.0E+00	IRIS	1,800			**1.8E-01**	**OEHHA**	770
n-heptane	142-82-5	---	---	7.0E-01	IRIS	3,100					Same as USAF/CERCLA approach
o-xylene	**95-47-6**	**---**	**---**	**1.0E-01**	**IRIS**	**440**					**Same as USAF/CERCLA approach**
p-isopropyltoluene	99-87-6	---	---	4.0E-01	IRIS	1,800					Same as USAF/CERCLA approach
propene	115-07-1	---	---	3.0E+00	OEHHA	13,000					Same as USAF/CERCLA approach
sec-butylbenzene	135-98-8	---	---	4.0E-01	IRIS	1,800					Same as USAF/CERCLA approach
styrene	100-42-5	---	---	1.0E+00	IRIS	4,400	---	---	9.0E-01	OEHHA	3,900
tetrachloroethene (PCE)	**127-18-4**	**2.6E-07**	**IRIS**	**4.0E-02**	**IRIS**	**47.15**	**5.6E-06**	**OEHHA**	**3.5E-02**	**OEHHA**	**2.1**
tetrahydrofuran	109-99-9	---	---	2.0E+00	IRIS	8,800					Same as USAF/CERCLA approach
toluene	**108-88-3**	**---**	**---**	**5.0E+00**	**IRIS**	**22,000**	**---**	**---**	**3.0E-01**	**OEHHA**	**1,300**
trans-1,2-dichloroethene	**156-60-5**	**---**	**---**	**6.0E-02**	**PPRTV**	**260**					**Same as USAF/CERCLA approach**
trans-1,3-dichloropropene	10061-02-6	4.0E-06	IRIS	2.0E-02	IRIS	3.07	1.6E-05	OEHHA	2.0E-02	IRIS	0.77
trichloroethene (TCE)	**79-01-6**	**4.1E-06**	**IRIS**	**2.0E-03**	**IRIS**	**2.99**					**Same as USAF/CERCLA approach**
trichlorofluoromethane	75-69-4	---	---	7.0E-01	HEAST	3,100					Same as USAF/CERCLA approach
vinyl chloride	**75-01-4**	**4.4E-06**	**IRIS**	**1.0E-01**	**IRIS**	**2.79**	**7.8E-05**	**OEHHA**	**1.0E-01**	**IRIS**	**0.16**

TABLE 2. INDOOR AIR SCREENING LEVELS - CURRENT INDUSTRIAL LAND USE SCENARIO
(Page 3 of 3)

Notes:

Chemicals shown in bold are those detected in groundwater monitoring wells near Buildings 4806, 4807, and 4810 from 2006 to 2012 (see Table 1 for details).

[a] Screening levels based on USAF/CERCLA approach (i.e., OSWER directive 9285.7-53 [USEPA 2003] as cited in DoD Instruction 4715.18 [DoD 2009b]).
[b] Screening levels based on DTSC-preferred approach (i.e., OEHHA toxicity criteria rather than USEPA IRIS or Tier 2 source). However, if OEHHA toxicity criteria are less health protective than those from USEPA IRIS or Tier 2 source, the more health protective toxicity values from the USEPA IRIS or Tier 2 source were used.
[c] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} or a Hazard Quotient of 1 (whichever is smaller) under the current industrial land use scenario.

----	not available
#	number
µg/m³	micrograms per cubic meter
ATSDR	Agency for Toxic Substances and Disease Registry
CA-IASL	California indoor air screening level
CAS	Chemical Abstract Service
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DoD	Department of Defense
DTSC	California Department of Toxic Substances Control
HEAST	Health Effects Assessment Summary Tables
i.e.	that is (*id est*)
IASL	indoor air screening level
IRIS	Integrated Risk Information System
OEHHA	Office of Environmental Health Hazard Assessment
OSWER	Office of Solid Waste and Emergency Response
PPRTV	Provisional Peer-Reviewed Toxicity Values
USAF	United States Air Force
USEPA	United States Environmental Protection Agency

Surrogate List:

1,3-dichloropropene used as surrogate for 1,1-dichloropropene and trans -1,3-dichloropropene

1,2-dichlorobenzene used as surrogate for 1,3-dichlorobenzene

total xylenes is the surrogate for m, p, and o-xylenes

p-isopropyl benzene is the surrogate for p-isopropyl toluene, n-butyl benzene, and sec-butyl benzene

1,1,2-trichloro-2,2,1-trifluoroethane is the surrogate for 1,2-dichloro-1,1,2,2-tetrafluoroethane

trans -1,2-dichloroethene used as the surrogate for cis -1,2-dichloroethene

isopropyl alcohol used as a surrogate for ethanol

m,p-xylenes used as surrogate for 4-ethyltoluene

n-hexane used as a surrogate for n-heptane

Both sets of indoor air screening levels derived using the following equations:

For carcinogens

$$IASL = \frac{TR \times CF1 \times ATc}{ET \times EF \times ED \times IUR}$$

Where:

IASL	=	Indoor air screening level, $\mu g/m^3$
TR	=	Target risk, unitless (1 x 10^{-6})
CF1	=	Conversion factor, hours/day (24)
ATc	=	Averaging time for carcinogens, days (25,550)
ET	=	Exposure time, hours/day (8 for industrial exposure)
EF	=	Exposure frequency, days/year (250 for industrial exposure)
ED	=	Exposure duration, years (25 for industrial exposure)
IUR	=	Inhalation unit risk, $(\mu g/m^3)^{-1}$ (chemical-specific)

For non-carcinogens

$$IASL = \frac{THQ \times RfC \times ATnc \times CF1 \times CF2}{ET \times EF \times ED}$$

Where:

THQ	=	Target Hazard Quotient, unitless (1)
RfC	=	Reference concentration, mg/m^3
ATnc	=	Averaging time for non-carcinogens, days (9,125 for industrial exposure)
CF2	=	Conversion factor, $\mu g/mg$ (1,000)

TABLE 3. HELIUM CONCENTRATIONS IN SUB-SLAB VAPOR

Sample ID	Sample Date	Helium Concentration Field Reading (percent)	Helium Concentration Laboratory Analysis (percent)
N3-4806-SS01-VS01	3/6/13	<0.01	<0.20
N3-4806-SS02-VS01		1.73	3.6
N3-4806-SS03-VS01		<0.01	0.38
N3-4806-SS03-VS02*		0.06	0.35
N3-4806-SS04-VS01		<0.01	0.09
N3-4806-SS05-VS01		0.02	0.12
N3-4807-SS01-VS01	3/6/13	0.34	0.30
N3-4807-SS02-VS01	3/7/13	0.02	<0.17
N3-4807-SS03-VS01		1.03	**5.2**
N3-4807-SS04-VS01	3/6/13	0.05	0.23
N7-4810-SS01-VS01	3/7/13	0.18	0.15
N7-4810-SS02-VS01		0.09	0.09
N7-4810-SS03-VS01		0.06	0.15
N7-4810-SS04-VS01		0.05	0.14
N7-4810-SS04-VS02*		0.37	0.34
N3-4806-SS01-VS02	8/22/13	<0.01	0.09
N3-4806-SS02-VS02		2.3	**12**
N3-4806-SS03-VS02		0.03	0.82
N3-4806-SS04-VS02		0.09	<0.21
N3-4806-SS05-VS02		0.07	0.14
N3-4807-SS01-VS02		0.81	0.79
N3-4807-SS02-VS02		0.13	0.08
N3-4807-SS03-VS02		0.08	0.16
N3-4807-SS04-VS02		0.04	0.21
N7-4810-SS01-VS02	8/23/13	<0.01	0.24
N7-4810-SS02-VS02		<0.01	<0.20
N7-4810-SS03-VS02		0.04	<0.22
N7-4810-SS04-VS02		0.61	2.3

Notes:

Bold indicates a concentration above the 5 percent project goal.
*Duplicate sample.
< less than the concentration indicated

TABLE 4. INDOOR AND OUTDOOR TEMPERATURES
(Page 1 of 5)

Date	Sample Location or Room Number	Temperature (Degrees Celsius)
Building 4806		
3/4/13	1	71.5
	2	71.4
	3	71.5
	4	71.3
	5	70.4
	6	70.6
	7	70.6
	8	68.1
	9	70.2
	10	69.3
	11 (Building 4807)	66.7
	12	61.4
	Outdoor	71.0
3/6/13	IA01	72.4
	IA02	69.7
	IA03	59.8
	IA04	59.8
	Outdoor	61.0
8/20/13	1	66.0
	2	67.0
	3	67.0
	4	68.0
	5	77.0
	6	76.0
	7	74.0
	8	79.0
	9	75.0
	10	76.0
	11 (Building 4807)	90.0
	12	87.0
	Outdoor	98.0
8/21/13	IA01	80.0
	IA02	77.0
	IA03	81.0
	IA04	70.0
	IA05	79.0
	Outdoor	99.0
8/22/13	IA01	83.0
	IA02	75.0
	IA03	74.0
	IA04	68.0
	IA05	79.0
	Outdoor	99.0

TABLE 4. INDOOR AND OUTDOOR TEMPERATURES
(Page 2 of 5)

Date	Sample Location or Room Number	Temperature (Degrees Celsius)
Building 4806 (continued)		
8/28/13	3	70.0
	5	79.0
	8	80.0
	10	77.0
	12	83.0
	Outdoor	97.0
Building 4807		
3/4/13	1	70.1
	2	69.8
	3	68.4
	4	68.2
	5	72.1
	6	77.1
	7	71.7
	8	71.0
	Outdoor	71.0
3/6/13	IA01	71.3
	IA04	62.7
	IA05	61.5
	Outdoor	51.0
3/7/13	IA02	63.0
	IA03	64.0
	Outdoor	54.0
8/20/13	1	76
	2	75
	4	76
	5	72
	6	72
	7	77
	Outdoor	98.0
8/22/13	IA01	71
	IA02	74
	IA03	77
	IA04	80
	Outdoor	99.0
8/28/13	1	72
	6	72
	8	82
	11	75
	Outdoor	97.0

TABLE 4. INDOOR AND OUTDOOR TEMPERATURES
(Page 3 of 5)

Date	Sample Location or Room Number	Temperature (Degrees Celsius)
Building 4810		
3/5/13	Break Room	73.6
	Crew Crib	74.2
	Crew Crib Restroom	73.2
	Kitchen	74.7
	Locker Room	74.2
	Men's Restroom	77.0
	North Women's Restroom	75.1
	Restroom	74.2
	1	75.2
	1a	75.1
	1c	77.0
	2	79.1
	2a	78.7
	2b	77.7
	2c	77.6
	3	77.5
	3c	77.5
	4	74.5
	4a	75.5
	5	77.0
	6	77.5
	7	78.0
	8	77.9
	9	78.0
	10	77.9
	11	77.4
	12	77.0
	13	76.7
	14	75.4
	15	74.1
	15a	74.8
	15b	74.4
	16	71.2
	16a	71.2
	17	73.3
	18	73.4

TABLE 4. INDOOR AND OUTDOOR TEMPERATURES
(Page 4 of 5)

Date	Sample Location or Room Number	Temperature (Degrees Celsius)
Building 4810 (continued)		
3/5/13	19	73.6
	20	73.6
	Outdoor	70.0
3/7/13	IA01	76.1
	IA02	72.0
	IA03	69.3
	IA04	68.4
	Outdoor	54.0
8/21/13	Kitchen	82
	Men's Restroom	78.0
	North Women's Restroom	75.0
	Restroom	73.0
	1	73.0
	1a	75.0
	1c	73.0
	4	72.0
	4a	70.0
	5	76.0
	6	72.0
	7	72.0
	8	73.0
	9	73.0
	10	73.0
	11	73.0
	12	75.0
	13	73.0
	15	74.0
	15a	71.0
	15b	72.0
	16a	74.0
	Outdoor	99.0
8/22/13	IA01	71.0
	IA02	74.0
	IA03	81.0
	IA04	82.0
	Outdoor	99.0

TABLE 4. INDOOR AND OUTDOOR TEMPERATURES
(Page 5 of 5)

Date	Sample Location or Room Number	Temperature (Degrees Celsius)
Building 4810 (continued)		
8/23/13	IA01	75.0
	IA02	76.0
	IA03	80.0
	IA04	75.0
	Outdoor	82.0
8/28/13	2	71.0
	16	82.0
	Crew Crib	83.0
	Outdoor	97.0

TABLE 5. INDOOR AIR RISK CALCULATION BUILDING 4806 (USAF/CERCLA APPROACH) - MARCH 2013

(Page 1 of 2)

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[(a)]	Non-Cancer[(b)]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		22,000															
1,1,1,2-tetrachloroethane	1.66																
1,1,2,2-tetrachlorethane	0.21																
1,1,2-trichoroethane	0.77	1															
1,1,2-trichlorotrifluoroethane		130,000	0.56		<0.01	0.6		<0.01	0.56		<0.01	0.57		<0.01	0.57		<0.01
1,1-dichloroethane	7.66																
1,1-dichloroethene		880															
1,2,4-trichlorobenzene		8.8															
1,2,4-trimethylbenzene		31	1.7		0.06	2.7		0.09	3.4		0.1	3.9		0.1	3.8		0.1
1,2-dichlorobenzene		880															
1,2-dichloroethane	0.47	31															
1,2-dichloropropane	1.23	18															
1,2-dichlorotetrafluoroethane		130,000															
1,3,5-trimethylbenzene		153	0.54		<0.01	0.75		<0.01	0.92		<0.01	1.1		<0.01	1		<0.01
1,3-butadiene	0.41	9															
1,3-dichlorobenzene		880															
1,4-dichlorobenzene	1.11	3,504	0.14	1E-07	<0.01												
2-butanone (MEK)		22,000	6.5		<0.01	2.8		<0.01	2.5		<0.01	2.6		<0.01	2.8		<0.01
2-hexanone		130															
4-ethyltoluene		440	1.7		<0.01	2.4		<0.01	3.0		<0.01	3.3		<0.01	3.2		<0.01
4-methyl-2-pentanone (MIBK)		13,000															
acetone		140,000	18		<0.01	17		<0.01	17		<0.01	19		<0.01	12		<0.01
acrylonitrile	0.18	9															
benzene	1.57	131	1.1	7E-07	<0.01	1.3	8E-07	<0.01	1.5	1E-06	0.01	1.8	1E-06	0.01	1.8	1E-06	0.01
benzyl chloride	0.25	4															
bromodichloromethane	0.33																
bromoform	11.15																
bromomethane		22	0.17		<0.01	0.19		<0.01	0.18		<0.01	0.22		0.01	0.21		<0.01
carbon disulfide		3,100	2.2		<0.01	0.69		<0.01	0.46		<0.01	0.28		<0.01	1.5		<0.01
carbon tetrachloride	2.04	438	0.46	2E-07	<0.01	0.42	2E-07	<0.01	0.43	2E-07	<0.01	0.44	2E-07	<0.01	0.41	2E-07	<0.01
chlorobenzene		220															
chloroethane		44,000															
chloroform	0.53	1,314										20	4E-05	0.02			
chloromethane		390	1.3		<0.01	1.3		<0.01	1.3		<0.01	1.4		<0.01	1.2		<0.01
cis -1,2-dichloroethene		31															
cis -1,3-dichloropropene	3.07	88	0.28	9E-08	<0.01	0.077	3E-08	<0.01	0.06	2E-08	<0.01	0.071	2E-08	<0.01			
cyclohexane		26,000	0.64		<0.01	1.2		<0.01	1.4		<0.01	1.6		<0.01	1.3		<0.01
dibromochloromethane	0.45	310															
dichlorodifluoromethane		440	2.5		<0.01	2.7		<0.01	2.7		<0.01	2.8		<0.01	2.8		<0.01
ethanol		31,000	37		<0.01	21		<0.01	23		<0.01	30		<0.01	27		<0.01
ethyl acetate		31,000				0.69		<0.01	0.9			0.9			1.1		
ethylbenzene	4.9	4,380	1.9	4E-07	<0.01	1.6	3E-07	<0.01	2.0	4E-07	<0.01	2.2	4E-07	<0.01	2.0	4E-07	<0.01
ethylene dibromide (EDB)	0.02	39															
hexachlorobutadiene	0.56																
isopropanol		31,000	4		<0.01	2		<0.01	2.6			11			3.9		
isopropylbenzene		1,800	0.56		<0.01				0.14		<0.01	0.17		<0.01	0.14		<0.01
m- & p-xylene		440	5.1		0.01159	6.7		0.02	8.1		0.02	9.0		0.02	8.7		0.02

TABLE 5. INDOOR AIR RISK CALCULATION BUILDING 4806 (USAF/CERCLA APPROACH) - MARCH 2013

(Page 2 of 2)

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47.0	13,140															
methylene chloride	1,200	2,628															
naphthalene	0.36	13				0.63	2E-06	0.05	0.83	2E-06	0.06	0.94	3E-06	0.07	0.89	2E-06	0.07
n-butyl benzene		1,800	0.36		<0.01	0.35		<0.01	0.45		<0.01	0.72		<0.01	0.52		<0.01
n-heptane		3,100	1.2		<0.01	1.8		<0.01	2		<0.01	2.1		<0.01	2		<0.01
n-hexane		3,100	2.1		<0.01	4.0		<0.01	5.4		<0.01	8.2		<0.01	10		<0.01
o-xylene		440	1.9		<0.01	2.5		<0.01	3.0		<0.01	3.3		<0.01	3.1		<0.01
p-isopropyltoluene		1,800	0.87		<0.01				0.55		<0.01	0.16		<0.01	0.42		<0.01
propene		13,000															
sec-butyl benzene		1,800															
styrene		4,400	0.22		<0.01	0.15		<0.01	0.15		<0.01	0.19		<0.01	0.21		<0.01
tetrachloroethene (PCE)	47.2	175															
tetrahydrofuran		8,800	0.56		<0.01	0.28		<0.01	0.18		<0.01	0.19		<0.01	0.53		<0.01
toluene		22,000	6		<0.01	8.5		<0.01	9.3		<0.01	10		<0.01	10		<0.01
trans-1,2-dichloroethene		880															
trans-1,3-dichloropropene	3.07	88															
trichloroethene (TCE)	2.99	8.8															
trichlorofluoromethane		3,100	2.5		<0.01	1.7		<0.01	1.8		<0.01	1.5		<0.01	1.3		<0.01
vinyl chloride	2.79	438															
Cumulative Risks and Hazard Indices:				2E-06	0.1		3E-06	0.2		4E-06	0.2		4E-05	0.3		4E-06	0.3

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United State Air Force

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

TABLE 6. INDOOR AIR RISK CALCULATION BUILDING 4806 (DTSC APPROACH) - MARCH 2013

(Page 1 of 2)

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		4,400															
1,1,1,2-tetrachloroethane	1.66	482															
1,1,2,2-tetrachlorethane	0.21	310															
1,1,2-trichoroethane	0.77	1															
1,1,2-trichlorotrifluoroethane		130,000	0.56		<0.01	0.6		<0.01	0.56		<0.01	0.57		<0.01	0.57		<0.01
1,1-dichloroethane	7.66	3,100															
1,1-dichloroethene		310															
1,2,4-trichlorobenzene	1.23	8.8															
1,2,4-trimethylbenzene		31	1.7		0.06	2.7		0.09	3.4		0.1	3.9		0.1	3.8		0.1
1,2-dichlorobenzene		880															
1,2-dichloroethane	0.47	1,752															
1,2-dichloropropane	1.23	18															
1,2-dichlorotetrafluoroethane		130,000															
1,3,5-trimethylbenzene		153	0.54		<0.01	0.75		<0.01	0.92		<0.01	1.1		<0.01	1		<0.01
1,3-butadiene	0.07	9															
1,3-dichlorobenzene		880															
1,4-dichlorobenzene	1.11	3,504	0.14	1E-07	<0.01												
2-butanone (MEK)		21,900	6.5		<0.01	2.8		<0.01	2.5		<0.01	2.6		<0.01	2.8		<0.01
2-hexanone		130															
4-ethyltoluene		440	1.7		<0.01	2.4		<0.01	3.0		<0.01	3.3		<0.01	3.2		<0.01
4-methyl-2-pentanone (MIBK)		13,000															
acetone		140,000	18		<0.01	17		<0.01	17		<0.01	19		<0.01	12		<0.01
acrylonitrile	0.04	9															
benzene	0.42	13	1.1	3E-06	0.08	1.3	3E-06	0.1	1.5	4E-06	0.1	1.8	4E-06	0.1	1.8	4E-06	0.1
benzyl chloride	0.25	4															
bromodichloromethane	0.33	310															
bromoform	11.15																
bromomethane		22	0.17		<0.01	0.19		<0.01	0.18		<0.01	0.22		0.01	0.21		<0.01
carbon disulfide		3,100	2.2		<0.01	0.69		<0.01	0.46		<0.01	0.28		<0.01	1.5		<0.01
carbon tetrachloride	0.29	175	0.46	2E-06	<0.01	0.42	1E-06	<0.01	0.43	1E-06	<0.01	0.44	2E-06	<0.01	0.41	1E-06	<0.01
chlorobenzene		220															
chloroethane		44,000															
chloroform	0.53	429										20	4E-05	0.05			
chloromethane		394	1.3		<0.01	1.3		<0.01	1.3		<0.01	1.4		<0.01	1.2		<0.01
cis -1,2-dichloroethene		31															
cis -1,3-dichloropropene	0.77	88	0.28	4E-07	<0.01	0.077	1E-07	<0.01	0.06	8E-08	<0.01	0.071	9E-08	<0.01			
cyclohexane		26,000	0.64		<0.01	1.2		<0.01	1.4		<0.01	1.6		<0.01	1.3		<0.01
dibromochloromethane	0.45	310															
dichlorodifluoromethane		440	2.5		<0.01	2.7		<0.01	2.7		<0.01	2.8		<0.01	2.8		<0.01
ethanol		31,000	37		<0.01	21		<0.01	23		<0.01	30		<0.01	27		<0.01
ethyl acetate		31,000				0.69		<0.01	0.9			0.9			1.1		
ethylbenzene	4.90	4,380	1.9	4E-07	<0.01	1.6	3E-07	<0.01	2.0	4E-07	<0.01	2.2	4E-07	<0.01	2.0	4E-07	<0.01
ethylene dibromide (EDB)	0.02	39															
hexachlorobutadiene	0.56	15															
isopropanol		31,000	4		<0.01	2		<0.01	2.6			11			3.9		
isopropylbenzene		1,800	0.56		<0.01				0.14		<0.01	0.17		<0.01	0.14		<0.01
m- & p-xylene		440	5.1		0.01	6.7		0.02	8.1		0.02	9.0		0.02	8.7		0.02

TABLE 6. INDOOR AIR RISK CALCULATION BUILDING 4806 (DTSC APPROACH) - MARCH 2013

(Page 2 of 2)

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[(a)]	Non-Cancer[(b)]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47	13,140															
methylene chloride	12	1,752															
naphthalene	0.36	13				0.63	2E-06	0.05	0.83	2E-06	0.06	0.94	3E-06	0.07	0.89	2E-06	0.07
n -butyl benzene		770	0.36		<0.01	0.35		<0.01	0.45		<0.01	0.72		<0.01	0.52		<0.01
n-heptane		3,100	1.2		<0.01	1.8		<0.01	2		<0.01	2.1		<0.01	2		<0.01
n-hexane		3,100	2.1		<0.01	4.0		<0.01	5.4		<0.01	8.2		<0.01	10		<0.01
o-xylene		440	1.9		<0.01	2.5		<0.01	3.0		<0.01	3.3		<0.01	3.1		<0.01
p-isopropyltoluene		1,800	0.87		<0.01				0.55		<0.01	0.16		<0.01	0.42		<0.01
propene		13,140															
sec-butyl benzene		1,800															
styrene		4,400	0.22		<0.01	0.15		<0.01	0.15		<0.01	0.19		<0.01	0.21		<0.01
tetrachloroethene (PCE)	2.08	153															
tetrahydrofuran		8,800	0.56		<0.01	0.28		<0.01	0.18		<0.01	0.19		<0.01	0.53		<0.01
toluene		1,300	6		<0.01	8.5		<0.01	9.3		<0.01	10		<0.01	10		<0.01
trans-1,2-dichloroethene		310															
trans-1,3-dichloropropene	0.77	876,000															
trichloroethene (TCE)	2.99	8.8															
trichlorofluoromethane		3,100	2.5		<0.01	1.7		<0.01	1.8		<0.01	1.5		<0.01	1.3		<0.01
vinyl chloride	0.16	438						<0.01									
Cumulative Risks and Hazard Indices:				5E-06	0.2		7E-06	0.3		8E-06	0.4		5E-05	0.5		9E-06	0.4

Notes:

[(a)] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[(b)] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
DTSC Department of Toxic Substances Control
HQ Hazard Quotient

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

TABLE 7. INDOOR AIR RISK CALCULATION BUILDING 4806 (USAF/CERCLA APPROACH) - AUGUST 2013

(Page 1 of 2)

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[(a)]	Non-Cancer[(b)]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		22,000															
1,1,1,2-tetrachloroethane	1.66																
1,1,2,2-tetrachlorethane	0.21																
1,1,2-trichoroethane	0.77	1															
1,1,2-trichlorotrifluoroethane		130,000	0.59		<0.01	0.6		<0.01	0.56		<0.01	0.58		<0.01	0.59		<0.01
1,1-dichloroethane	7.66																
1,1-dichloroethene		880															
1,2,4-trichlorobenzene		8.8															
1,2,4-trimethylbenzene		31	2.7		0.09	0.38		0.01	0.35		0.01	0.51		0.02	0.61		0.02
1,2-dichlorobenzene		880															
1,2-dichloroethane	0.47	31															
1,2-dichloropropane	1.23	18															
1,2-dichlorotetrafluoroethane		130,000															
1,3,5-trimethylbenzene		153	0.71		<0.01										0.23		<0.01
1,3-butadiene	0.41	9															
1,3-dichlorobenzene		880															
1,4-dichlorobenzene	1.11	3,504				0.15	1E-07	<0.01									
2-butanone (MEK)		22,000	4.5		<0.01	5.0		<0.01	1.8		<0.01	2.6		<0.01	6.4		<0.01
2-hexanone		130							0.28		<0.01						
4-ethyltoluene		440	2.2		<0.01	0.27		<0.01	0.21		<0.01	0.36		<0.01	0.55		<0.01
4-methyl-2-pentanone (MIBK)		13,000															
acetone		140,000	110		<0.01	21		<0.01	14		<0.01	12		<0.01	20		<0.01
acrylonitrile	0.18	9															
benzene	1.57	131	1.2	8E-07	<0.01	0.91	6E-07	<0.01	0.93	6E-07	<0.01	0.77	5E-07	<0.01	0.94	6E-07	<0.01
benzyl chloride	0.25	4													0.24	1E-06	0.05
bromodichloromethane	0.33					0.49	1E-06		0.15	5E-07							
bromoform	11.15								0.34	3E-08							
bromomethane		22															
carbon disulfide		3,100	8.1		<0.01	0.72		<0.01	0.41		<0.01	2.2		<0.01	140		0.05
carbon tetrachloride	2.04	438	0.43	2E-07	<0.01	0.48	2E-07	<0.01	0.46	2E-07	<0.01	0.39	2E-07	<0.01	0.43	2E-07	<0.01
chlorobenzene		220															
chloroethane		44,000															
chloroform	0.53	1,314				0.21	4E-07	<0.01	0.14	3E-07	<0.01	7.9	1E-05	<0.01	1.1	2E-06	<0.01
chloromethane		390	1.4		<0.01	1.6		<0.01	1.3		<0.01	1.2		<0.01	1.6		<0.01
cis -1,2-dichloroethene		31															
cis -1,3-dichloropropene	3.07	88													0.097	3E-08	<0.01
cyclohexane		26,000	0.67		<0.01										1.1		<0.01
dibromochloromethane	0.45	310							0.42	9E-07							
dichlorodifluoromethane		440	8.8		0.02	10		0.02	13		0.03	3.1		<0.01	3.9		<0.01
ethanol		31,000	20		<0.01	28		<0.01	5.4		<0.01	20		<0.01	14		<0.01
ethyl acetate		31,000						<0.01									
ethylbenzene	4.90	4,380	1.5	3E-07	<0.01	0.29	6E-08	<0.01	0.15	3E-08	<0.01	0.22	4E-08	<0.01	0.29	6E-08	<0.01
ethylene dibromide (EDB)	0.02	39															
hexachlorobutadiene	0.56																
isopropanol		31,000	3.0		<0.01	24		<0.01	1.9			5.3			64		
isopropylbenzene		1,800															
m- & p-xylene		440	7.1		0.02	0.99		<0.01	0.77		<0.01	0.87		<0.01	1.2		<0.01

TABLE 7. INDOOR AIR RISK CALCULATION BUILDING 4806 (USAF/CERCLA APPROACH) - AUGUST 2013

(Page 2 of 2)

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[(a)]	Non-Cancer[(b)]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47	13,140															
methylene chloride	1200	2,628															
naphthalene	0.36	13	0.46	1E-06	0.04	0.72	2E-06	0.05	0.22	6E-07	0.02	0.26	7E-07	0.02	1	3E-06	0.08
n -butyl benzene		1,800	0.39		<0.01	0.77		<0.01	0.25		<0.01	0.33		<0.01			
n-heptane		3,100	0.97		<0.01												
n-hexane		3,100	9.4		<0.01	2.8		<0.01	2.3		<0.01	5.7		<0.01	220		0.07
o-xylene		440	2.4		<0.01	0.35		<0.01	0.21		<0.01	0.32		<0.01	1.2		<0.01
p-isopropyltoluene		1,800	0.64		<0.01	0.41		<0.01				0.38		<0.01	3.3		<0.01
propene		13,000															
sec-butyl benzene		1,800															
styrene		4,400	0.51		<0.01	0.16		<0.01							0.13		<0.01
tetrachloroethene (PCE)	47.15	175															
tetrahydrofuran		8,800				0.52		<0.01							0.36		<0.01
toluene		22,000	83		<0.01	3.0		<0.01	2.2		<0.01	1.3		<0.01	1.6		<0.01
trans-1,2-dichloroethene		880															
trans-1,3-dichloropropene	3.07	88															
trichloroethene (TCE)	2.99	8.8															
trichlorofluoromethane		3,100	6.4		<0.01	2.3		<0.01	2.6		<0.01	1.4		<0.01	1.9		<0.01
vinyl chloride	2.79	438															
Cumulative Risks and Hazard Indices:				3E-06	0.2		5E-06	0.1		3E-06	0.08		2E-05	0.07		7E-06	0.3

Notes:

[(a)] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[(b)] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United State Air Force

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

TABLE 8. INDOOR AIR RISK CALCULATION BUILDING 4806 (DTSC APPROACH) - AUGUST 2013

(Page 1 of 2)

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		4,400															
1,1,1,2-tetrachloroethane	1.66	482															
1,1,2,2-tetrachlorethane	0.21	310															
1,1,2-trichoroethane	0.77	1															
1,1,2-trichlorotrifluoroethane		130,000	0.59		<0.01	0.6		<0.01	0.56		<0.01	0.58		<0.01	0.59		<0.01
1,1-dichloroethane	7.66	3,100															
1,1-dichloroethene		310															
1,2,4-trichlorobenzene	1.23	8.8															
1,2,4-trimethylbenzene		31	2.7		0.09	0.38		0.01	0.35		0.01	0.51		0.02	0.61		0.02
1,2-dichlorobenzene		880															
1,2-dichloroethane	0.47	1,752															
1,2-dichloropropane	1.23	18															
1,2-dichlorotetrafluoroethane		130,000															
1,3,5-trimethylbenzene		153	0.71		<0.01										0.23		<0.01
1,3-butadiene	0.07	9															
1,3-dichlorobenzene		880															
1,4-dichlorobenzene	1.11	3,504				0.15	1E-07	<0.01									
2-butanone (MEK)		21,900	4.5		<0.01	5.0		<0.01	1.8		<0.01	2.6		<0.01	6.4		<0.01
2-hexanone		130							0.28		<0.01						
4-ethyltoluene		440	2.2		<0.01	0.27		<0.01	0.21		<0.01	0.36		<0.01	0.55		<0.01
4-methyl-2-pentanone (MIBK)		13,000															
acetone		140,000	110		<0.01	21		<0.01	14		<0.01	12		<0.01	20		<0.01
acrylonitrile	0.04	9															
benzene	0.42	13	1.2	3E-06	0.09	0.91	2E-06	0.07	0.93	2E-06	0.07	0.77	2E-06	0.06	0.94	2E-06	0.07
benzyl chloride	0.25	4													0.24	1E-06	0.06
bromodichloromethane	0.33	310				0.49	1E-06	<0.01	0.15	5E-07	<0.01						
bromoform	11.15								0.34	3E-08							
bromomethane		22															
carbon disulfide		3,100	8.1		<0.01	0.72		<0.01	0.41		<0.01	2.2		<0.01	140		0.05
carbon tetrachloride	0.29	175	0.43	1E-06	<0.01	0.48	2E-06	<0.01	0.46	2E-06	<0.01	0.39	1E-06	<0.01	0.43	1E-06	<0.01
chlorobenzene		220															
chloroethane		44,000															
chloroform	0.53	429				0.21	4E-07	<0.01	0.14	3E-07	<0.01	7.9	1E-05	0.02	1.1	2E-06	<0.01
chloromethane		394	1.4		<0.01	1.6		<0.01	1.3		<0.01	1.2		<0.01	1.6		<0.01
cis -1,2-dichloroethene		31															
cis -1,3-dichloropropene	0.77	88													0.097	1E-07	<0.01
cyclohexane		26,000	0.67		<0.01										1.1		<0.01
dibromochloromethane	0.45	310							0.42	9E-07							
dichlorodifluoromethane		440	8.8		0.02	10		0.02	13		0.03	3.1		<0.01	3.9		<0.01
ethanol		31,000	20		<0.01	28		<0.01	5.4		<0.01	20		<0.01	14		<0.01
ethyl acetate		31,000															
ethylbenzene	4.90	4,380	1.5	3E-07	<0.01	0.29	6E-08	<0.01	0.15	3E-08	<0.01	0.22	4E-08	<0.01	0.29	6E-08	<0.01
ethylene dibromide (EDB)	0.02	39															
hexachlorobutadiene	0.56	15															
isopropanol		31,000	3.0		<0.01	24		<0.01	1.9			5.3			64		
isopropylbenzene		1,800															
m- & p-xylene		440	7.1		0.02	0.99		<0.01	0.77		<0.01	0.87		<0.01	1.2		<0.01

TABLE 8. INDOOR AIR RISK CALCULATION BUILDING 4806 (DTSC APPROACH) - AUGUST 2013

(Page 2 of 2)

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[(a)]	Non-Cancer[(b)]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47	13,140															
methylene chloride	12	1,752															
naphthalene	0.36	13	0.46	1E-06	0.04	0.72	2E-06	0.05	0.22	6E-07	0.02	0.26	7E-07	0.02	1	3E-06	0.08
n -butyl benzene		770	0.39		<0.01	0.77		<0.01	0.25		<0.01	0.33		<0.01			
n-heptane		3,100	0.97		<0.01												
n-hexane		3,100	9.4		<0.01	2.8		<0.01	2.3		<0.01	5.7		<0.01	220		0.07
o-xylene		440	2.4		<0.01	0.35		<0.01	0.21		<0.01	0.32		<0.01	1.2		<0.01
p-isopropyltoluene		1,800	0.64		<0.01	0.41		<0.01				0.38		<0.01	3.3		<0.01
propene		13,140															
sec-butyl benzene		1,800															
styrene		4,400	0.51		<0.01	0.16		<0.01							0.13		<0.01
tetrachloroethene (PCE)	2.08	153															
tetrahydrofuran		8,800				0.52		<0.01							0.36		<0.01
toluene		1,300	83		0.06	3.0		<0.01	2.2		<0.01	1.3		<0.01	1.6		<0.01
trans-1,2-dichloroethene		310															
trans-1,3-dichloropropene	0.77	876,000															
trichloroethene (TCE)	2.99	8.8															
trichlorofluoromethane		3,100	6.4		<0.01	2.3		<0.01	2.6		<0.01	1.4		<0.01	1.9		<0.01
vinyl chloride	0.16	438															
Cumulative Risks and Hazard Indices:				6E-06	0.3		8E-06	0.2		6E-06	0.1		2E-05	0.1		1E-05	0.4

Notes:

[(a)] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[(b)] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

DTSC Department of Toxic Substances Control

HQ Hazard Quotient

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

TABLE 9. INDOOR AIR RISK CALCULATION BUILDING 4807 (USAF/CERCLA APPROACH) - MARCH 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		21,900												
1,1,1,2-tetrachloroethane	1.66													
1,1,2,2-tetrachlorethane	0.21													
1,1,2-trichoroethane	0.77	1												
1,1,2-trichlorotrifluoroethane		130,000	0.64		<0.01	0.59		<0.01	0.6		<0.01	0.6		<0.01
1,1-dichloroethane	7.66													
1,1-dichloroethene		880												
1,2,4-trichlorobenzene		8.8												
1,2,4-trimethylbenzene		31	2.0		0.07	2.4		0.08	8.2		0.3	8.2		0.3
1,2-dichlorobenzene		880												
1,2-dichloroethane	0.47	31												
1,2-dichloropropane	1.23	18												
1,2-dichlorotetrafluoroethane		130,000						<0.01						
1,3,5-trimethylbenzene		153	0.59		<0.01	0.7		<0.01	2.5		0.02	2.5		0.02
1,3-butadiene	0.41	9												
1,3-dichlorobenzene		880												
1,4-dichlorobenzene	1.11	3,504												
2-butanone (MEK)		22,000	3.0		<0.01	2.3		<0.01	2.6		<0.01	2.6		<0.01
2-hexanone		130												
4-ethyltoluene		440	1.7		<0.01	2.1		<0.01	6.5		0.01	6.5		0.01
4-methyl-2-pentanone (MIBK)		13,000												
acetone		140,000	18		<0.01	16		<0.01	19		<0.01	19		<0.01
acrylonitrile	0.18	9							1.3		0.1			
benzene	1.57	131	1.7	1E-06	0.01	2.0	1E-06	0.02	8.3	5E-06	0.06	4.8	3E-06	0.04
benzyl chloride	0.25	4												
bromodichloromethane	0.33													
bromoform	11.15													
bromomethane		22	0.2		<0.01	0.21		<0.01	0.17		<0.01	0.17		<0.01
carbon disulfide		3,100	0.75		<0.01	2.1		<0.01	1.1		<0.01	1.1		<0.01
carbon tetrachloride	2.04	438	0.42	2E-07	<0.01	0.42	2E-07	<0.01	0.39	2E-07	<0.01	0.39	2E-07	<0.01
chlorobenzene		220												
chloroethane		44,000												
chloroform	0.53	1,314												
chloromethane		390	1.5		<0.01	1.3		<0.01	1.3		<0.01	1.3		<0.01
cis -1,2-dichloroethene		31												
cis -1,3-dichloropropene	3.07	88	0.11	4E-08	<0.01	0.056	2E-08	<0.01						
cyclohexane		26,000	1.3		<0.01	1.6		<0.01	3.7		<0.01	3.7		<0.01
dibromochloromethane	0.45	310												
dichlorodifluoromethane		440	2.7		<0.01	2.7		<0.01	2.7		<0.01	2.7		<0.01
ethanol		31,000	25		<0.01	23		<0.01	47		<0.01	47		<0.01
ethyl acetate		31,000	1.2		<0.01	0.86		<0.01	1.9			1.9		
ethylbenzene	4.90	4,380	1.4	3E-07	<0.01	1.6	3E-07	<0.01	4.3	9E-07	<0.01	4.3	9E-07	<0.01
ethylene dibromide (EDB)	0.02	39												
hexachlorobutadiene	0.56													
isopropanol		31,000	240		<0.01	38		<0.01	5.3			5.3		
isopropylbenzene		1,800							0.39		<0.01	0.39		<0.01
m- & p-xylene		440	5.3		0.01	6.5		0.01	18		0.04	18		0.04

TABLE 9. INDOOR AIR RISK CALCULATION BUILDING 4807 (USAF/CERCLA APPROACH) - MARCH 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47	13,140												
methylene chloride	1200	2,628												
naphthalene	0.36	13							1.5	4E-06	0.1	1.5	4E-06	0.1
n -butyl benzene		1,800	0.33		<0.01	0.26		<0.01	1.4		<0.01	1.4		<0.01
n-heptane		3,100	1.8		<0.01	2.1		<0.01	4.9		<0.01	4.9		<0.01
n-hexane		3,100	3.7		<0.01	4.3		<0.01	11		<0.01	11		<0.01
o-xylene		440	1.9		<0.01	2.4		<0.01	6.4		0.01	6.4		0.01
p-isopropyltoluene		1,800				0.17		<0.01	0.61		<0.01	0.61		<0.01
propene		13,000												
sec-butyl benzene		1,800							0.35		<0.01	0.35		<0.01
styrene		4,400	0.23		<0.01	0.26		<0.01	0.62		<0.01	0.62		<0.01
tetrachloroethene (PCE)	47.15	175												
tetrahydrofuran		8,800	1.7		<0.01				0.24		<0.01	0.24		<0.01
toluene		22,000	7.6		<0.01	8.9		<0.01	24		<0.01	24		<0.01
trans-1,2-dichloroethene		880												
trans-1,3-dichloropropene	3.07	88												
trichloroethene (TCE)	2.99	8.8												
trichlorofluoromethane		3,100	2.8		<0.01	3.4		<0.01	3.2		<0.01	3.2		<0.01
vinyl chloride	2.79	438						<0.01						
Cumulative Risks and Hazard Indices:				2E-06	0.1		2E-06	0.1		1E-05	0.7		8E-06	0.5

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United State Air Force

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

TABLE 10. INDOOR AIR RISK CALCULATION BUILDING 4807 (DTSC APPROACH) - MARCH 2013

(Page 1 of 2)

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		4,400												
1,1,1,2-tetrachloroethane	1.66	482												
1,1,2,2-tetrachlorethane	0.21	310												
1,1,2-trichoroethane	0.77	1												
1,1,2-trichlorotrifluoroethane		130,000	0.64		<0.01	0.59		<0.01	0.56		<0.01	0.6		<0.01
1,1-dichloroethane	7.66	3,100												
1,1-dichloroethene		310												
1,2,4-trichlorobenzene	1.23	8.8												
1,2,4-trimethylbenzene		31	2.0		0.07	2.4		0.08	13		0.4	8.2		0.3
1,2-dichlorobenzene		880												
1,2-dichloroethane	0.47	1,752												
1,2-dichloropropane	1.23	18												
1,2-dichlorotetrafluoroethane		130,000						<0.01						
1,3,5-trimethylbenzene		153	0.59		<0.01	0.7		<0.01	3.9		0.03	2.5		0.02
1,3-butadiene	0.07	9												
1,3-dichlorobenzene		880												
1,4-dichlorobenzene	1.11	3,504												
2-butanone (MEK)		21,900	3.0		<0.01	2.3		<0.01	6.1		<0.01	2.6		<0.01
2-hexanone		130												
4-ethyltoluene		440	1.7		<0.01	2.1		<0.01	11		0.03	6.5		0.01
4-methyl-2-pentanone (MIBK)		13,000												
acetone		140,000	18		<0.01	16		<0.01	30		<0.01	19		<0.01
acrylonitrile	0.04	9							1.3	3E-05	0.1			
benzene	0.42	13	1.7	4E-06	0.1	2.0	5E-06	0.2	8.3	2E-05	0.6	4.8	1E-05	0.4
benzyl chloride	0.25	4												
bromodichloromethane	0.33	310												
bromoform	11.15													
bromomethane		22	0.2		<0.01	0.21		<0.01	0.28		0.01	0.17		<0.01
carbon disulfide		3,100	0.75		<0.01	2.1		<0.01	1.6		<0.01	1.1		<0.01
carbon tetrachloride	0.29	175	0.42	1E-06	<0.01	0.42	1E-06	<0.01	0.42	1E-06	<0.01	0.39	1E-06	<0.01
chlorobenzene		220												
chloroethane		44,000												
chloroform	0.53	429							0.18	3E-07	<0.01			
chloromethane		394	1.5		<0.01	1.3		<0.01	1.4		<0.01	1.3		<0.01
cis-1,2-dichloroethene		31												
cis-1,3-dichloropropene	0.77	88	0.11	1E-07	<0.01	0.056	7E-08	<0.01	0.16	2E-07	<0.01			
cyclohexane		26,000	1.3		<0.01	1.6		<0.01	11		<0.01	3.7		<0.01
dibromochloromethane	0.45	310												
dichlorodifluoromethane		440	2.7		<0.01	2.7		<0.01	2.8		<0.01	2.7		<0.01
ethanol		31,000	25		<0.01	23		<0.01	150		<0.01	47		<0.01
ethyl acetate		31,000	1.2		<0.01	0.86		<0.01	7.3			1.9		
ethylbenzene	4.90	4,380	1.4	3E-07	<0.01	1.6	3E-07	<0.01	8.3	2E-06	<0.01	4.3	9E-07	<0.01
ethylene dibromide (EDB)	0.02	39												
hexachlorobutadiene	0.56	15												
isopropanol		31,000	240		<0.01	38		<0.01	4.3			5.3		
isopropylbenzene		1,800							0.63		<0.01	0.39		<0.01
m- & p-xylene		440	5.3		0.01	6.5		0.01	34		0.08	18		0.04

TABLE 10. INDOOR AIR RISK CALCULATION BUILDING 4807 (DTSC APPROACH) - MARCH 2013

(Page 2 of 2)

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47	13,140												
methylene chloride	12	1,752												
naphthalene	0.36	13							1.9	5E-06	0.1	1.5	4E-06	0.1
n -butyl benzene		770	0.33		<0.01	0.26		<0.01	1.4		<0.01	1.4		<0.01
n-heptane		3,100	1.8		<0.01	2.1		<0.01	11		<0.01	4.9		<0.01
n-hexane		3,100	3.7		<0.01	4.3		<0.01	34		0.01	11		<0.01
o-xylene		440	1.9		<0.01	2.4		<0.01	12		0.03	6.4		0.01
p-isopropyltoluene		1,800				0.17		<0.01	0.63		<0.01	0.61		<0.01
propene		13,140												
sec-butyl benzene		1,800							0.21		<0.01	0.35		<0.01
styrene		4,400	0.23		<0.01	0.26		<0.01	0.55		<0.01	0.62		<0.01
tetrachloroethene (PCE)	2.08	153							0.27	1E-07	<0.01			
tetrahydrofuran		8,800	1.7		<0.01				0.17		<0.01	0.24		<0.01
toluene		1,300	7.6		<0.01	8.9		<0.01	43		0.03	24		0.02
trans-1,2-dichloroethene		310												
trans-1,3-dichloropropene	0.77	876,000												
trichloroethene (TCE)	2.99	8.8												
trichlorofluoromethane		3,100	2.8		<0.01	3.4		<0.01	5.0		<0.01	3.2		<0.01
vinyl chloride	0.16	438						<0.01						
Cumulative Risks and Hazard Indices:				6E-06	0.3		7E-06	0.3		6E-05	2		2E-05	0.9

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

DTSC Department of Toxic Substances Control

HQ Hazard Quotient

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

TABLE 11. INDOOR AIR RISK CALCULATION BUILDING 4807 (USAF/CERCLA APPROACH) - AUGUST 2013

(Page 1 of 2)

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4806IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		22,000												
1,1,1,2-tetrachloroethane	1.66		0.17	1E-07										
1,1,2,2-tetrachlorethane	0.21													
1,1,2-trichoroethane	0.77	1												
1,1,2-trichlorotrifluoroethane		130,000	0.59		<0.01	0.58		<0.01	0.51		<0.01	0.53		<0.01
1,1-dichloroethane	7.66													
1,1-dichloroethene		880												
1,2,4-trichlorobenzene		8.8												
1,2,4-trimethylbenzene		31	3.6		0.1	5.1		0.2	33		1.1	1.1		0.04
1,2-dichlorobenzene		880												
1,2-dichloroethane	0.47	31												
1,2-dichloropropane	1.23	18												
1,2-dichlorotetrafluoroethane		130,000						<0.01						
1,3,5-trimethylbenzene		153	1.1		<0.01	1.5		<0.01	11		0.07	0.28		<0.01
1,3-butadiene	0.41	9												
1,3-dichlorobenzene		880												
1,4-dichlorobenzene	1.11	3,504										0.14	1E-07	<0.01
2-butanone (MEK)		22,000	2.9		<0.01	3.0		<0.01	170		<0.01	3.6		<0.01
2-hexanone		130							1.9		0.01			
4-ethyltoluene		440	3.2		<0.01	4.5		0.01	32		0.07	0.84		<0.01
4-methyl-2-pentanone (MIBK)		13,000										0.62		<0.01
acetone		140,000	17		<0.01	19		<0.01	72		<0.01	19		<0.01
acrylonitrile	0.18	9							2	1E-05	0.2			
benzene	1.57	131	1.6	1E-06	0.01	1.2	8E-07	<0.01	7.4	5E-06	0.06	0.93	6E-07	<0.01
benzyl chloride	0.25	4												
bromodichloromethane	0.33					0.14	4E-07							
bromoform	11.15													
bromomethane		22												
carbon disulfide		3,100	9.9		<0.01	2.3		<0.01	13		<0.01	2.7		<0.01
carbon tetrachloride	2.04	438	0.44	2E-07	<0.01	0.41	2E-07	<0.01	0.37	2E-07	<0.01	0.43	2E-07	<0.01
chlorobenzene		220												
chloroethane		44,000												
chloroform	0.53	1,314	0.24	5E-07	<0.01	0.28	5E-07	<0.01				0.38	7E-07	<0.01
chloromethane		390	0.7		<0.01	1.3		<0.01	4.7		0.01	1.2		<0.01
cis -1,2-dichloroethene		31												
cis -1,3-dichloropropene	3.07	88	0.057	2E-08	<0.01									
cyclohexane		26,000				1.4		<0.01	11		<0.01	0.52		<0.01
dibromochloromethane	0.45	310												
dichlorodifluoromethane		440	0.24		<0.01	7.8		0.02	16		0.04	3.7		<0.01
ethanol		31,000	25		<0.01	30		<0.01	430		0.01	18		<0.01
ethyl acetate		31,000						<0.01						
ethylbenzene	4.90	4,380	1.9	4E-07	<0.01	2.4	5E-07	<0.01	18	4E-06	<0.01	0.6	1E-07	<0.01
ethylene dibromide (EDB)	0.02	39												
hexachlorobutadiene	0.56													
isopropanol		31,000	27		<0.01	14		<0.01	17			19		
isopropylbenzene		1,800	0.17		<0.01	0.2		<0.01	1.3		<0.01			
m- & p-xylene		440	7.8		0.02	10		0.02	74		0.2	2.3		<0.01

TABLE 11. INDOOR AIR RISK CALCULATION BUILDING 4807 (USAF/CERCLA APPROACH) - AUGUST 2013

(Page 2 of 2)

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4806IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47	13,140												
methylene chloride	1200	2,628												
naphthalene	0.36	13	0.56	2E-06	0.04	0.58	2E-06	0.04	1.7	5E-06	0.1	0.3	8E-07	0.02
n -butyl benzene		1,800	0.41		<0.01	0.82		<0.01	3.2		<0.01	0.49		<0.01
n-heptane		3,100	1.5		<0.01	1.7		<0.01	14		<0.01	0.52		<0.01
n-hexane		3,100	25		<0.01	34		0.01	41		0.01	55		0.02
o-xylene		440	2.8		<0.01	3.9		<0.01	28		0.06	0.76		<0.01
p-isopropyltoluene		1,800	0.43		<0.01	0.39		<0.01	0.41		<0.01	0.38		<0.01
propene		13,000												
sec-butyl benzene		1,800							0.46		<0.01			
styrene		4,400	0.27		<0.01	0.27		<0.01	1.9		<0.01	0.19		<0.01
tetrachloroethene (PCE)	47.15	175												
tetrahydrofuran		8,800	1		<0.01	0.14		<0.01						
toluene		22,000	11		<0.01	11		<0.01	58		<0.01	4.5		<0.01
trans-1,2-dichloroethene		880												
trans-1,3-dichloropropene	3.07	88												
trichloroethene (TCE)	2.99	8.8												
trichlorofluoromethane		3,100	6.7		<0.01	7.1		<0.01	3.9		<0.01	5.3		<0.01
vinyl chloride	2.79	438						<0.01						
Cumulative Risks and Hazard Indices:				4E-06	0.2		4E-06	0.3		2E-05	2		3E-06	0.1

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United State Air Force

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

TABLE 12. INDOOR AIR RISK CALCULATION BUILDING 4807 (DTSC APPROACH) - AUGUST 2013

(Page 1 of 2)

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		4,400												
1,1,1,2-tetrachloroethane	1.66	482	0.17	1E-07										
1,1,2,2-tetrachlorethane	0.21	310												
1,1,2-trichoroethane	0.77	1												
1,1,2-trichlorotrifluoroethane		130,000	0.59		<0.01	0.58		<0.01	0.51		<0.01	0.53		<0.01
1,1-dichloroethane	7.66	3,100												
1,1-dichloroethene		310												
1,2,4-trichlorobenzene	1.23	8.8												
1,2,4-trimethylbenzene		31	3.6		0.1	5.1		0.2	33		1.1	1.1		0.04
1,2-dichlorobenzene		880												
1,2-dichloroethane	0.47	1,752												
1,2-dichloropropane	1.23	18												
1,2-dichlorotetrafluoroethane		130,000						<0.01						
1,3,5-trimethylbenzene		153	1.1		<0.01	1.5		<0.01	11		0.07	0.28		<0.01
1,3-butadiene	0.07	9												
1,3-dichlorobenzene		880												
1,4-dichlorobenzene	1.11	3,504										0.14	1E-07	<0.01
2-butanone (MEK)		21,900	2.9		<0.01	3.0		<0.01	170		<0.01	3.6		<0.01
2-hexanone		130							1.9		0.01			
4-ethyltoluene		440	3.2		<0.01	4.5		0.01	32		0.07	0.84		<0.01
4-methyl-2-pentanone (MIBK)		13,000										0.62		<0.01
acetone		140,000	17		<0.01	19		<0.01	72		<0.01	19		<0.01
acrylonitrile	0.04	9							2	5E-05	0.2			
benzene	0.42	13	1.6	4E-06	0.1	1.2	3E-06	0.09	7.4	2E-05	0.6	0.93	2E-06	0.07
benzyl chloride	0.25	4												
bromodichloromethane	0.33	310				0.14	4E-07	<0.01						
bromoform	11.15													
bromomethane		22												
carbon disulfide		3,100	9.9		<0.01	2.3		<0.01	13		<0.01	2.7		<0.01
carbon tetrachloride	0.29	175	0.44	2E-06	<0.01	0.41	1E-06	<0.01	0.37	1E-06	<0.01	0.43	1E-06	<0.01
chlorobenzene		220												
chloroethane		44,000												
chloroform	0.53	429	0.24	5E-07	<0.01	0.28	5E-07	<0.01				0.38	7E-07	<0.01
chloromethane		394	0.7		<0.01	1.3		<0.01	4.7		0.01	1.2		<0.01
cis -1,2-dichloroethene		31												
cis -1,3-dichloropropene	0.77	88	0.057	7E-08	<0.01									
cyclohexane		26,000				1.4		<0.01	11		<0.01	0.52		<0.01
dibromochloromethane	0.45	310												
dichlorodifluoromethane		440	0.24		<0.01	7.8		0.02	16		0.04	3.7		<0.01
ethanol		31,000	25		<0.01	30		<0.01	430		0.01	18		<0.01
ethyl acetate		31,000						<0.01						
ethylbenzene	4.90	4,380	1.9	4E-07	<0.01	2.4	5E-07	<0.01	18	4E-06	<0.01	0.6	1E-07	<0.01
ethylene dibromide (EDB)	0.02	39												
hexachlorobutadiene	0.56	15												
isopropanol		31,000	27		<0.01	14		<0.01	17			19		
isopropylbenzene		1,800	0.17		<0.01	0.2		<0.01	1.3		<0.01			
m- & p-xylene		440	7.8		0.02	10		0.02	74		0.2	2.3		<0.01

TABLE 12. INDOOR AIR RISK CALCULATION BUILDING 4807 (DTSC APPROACH) - AUGUST 2013
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	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47	13,140												
methylene chloride	12	1,752												
naphthalene	0.36	13	0.56	2E-06	0.04	0.58	2E-06	0.04	1.7	5E-06	0.1	0.3	8E-07	0.02
n -butyl benzene		770	0.41		<0.01	0.82		<0.01	3.2		<0.01	0.49		<0.01
n-heptane		3,100	1.5		<0.01	1.7		<0.01	14		<0.01	0.52		<0.01
n-hexane		3,100	25		<0.01	34		0.01	41		0.01	55		0.02
o-xylene		440	2.8		<0.01	3.9		<0.01	28		0.06	0.76		<0.01
p-isopropyltoluene		1,800	0.43		<0.01	0.39		<0.01	0.41		<0.01	0.38		<0.01
propene		13,140												
sec-butyl benzene		1,800							0.46		<0.01			
styrene		4,400	0.27		<0.01	0.27		<0.01	1.9		<0.01	0.19		<0.01
tetrachloroethene (PCE)	2.08	153												
tetrahydrofuran		8,800	1		<0.01	0.14		<0.01						
toluene		1,300	11		<0.01	11		<0.01	58		0.04	4.5		<0.01
trans-1,2-dichloroethene		310												
trans-1,3-dichloropropene	0.77	876,000												
trichloroethene (TCE)	2.99	8.8												
trichlorofluoromethane		3,100	6.7		<0.01	7.1		<0.01	3.9		<0.01	5.3		<0.01
vinyl chloride	0.16	438						<0.01						
Cumulative Risks and Hazard Indices:				8E-06	0.4		7E-06	0.4		7E-05	3		5E-06	0.2

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
DTSC Department of Toxic Substances Control
HQ Hazard Quotient

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

TABLE 13. INDOOR AIR RISK CALCULATION BUILDING 4810 (USAF/CERCLA APPROACH) - MARCH 2013

(Page 1 of 2)

	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		22,000												
1,1,1,2-tetrachloroethane	1.66		0.52	3E-07		0.37	2E-07							
1,1,2,2-tetrachlorethane	0.21													
1,1,2-trichoroethane	0.77	1												
1,1,2-trichlorotrifluoroethane		130,000	0.94		<0.01	0.78		<0.01	0.56		<0.01	0.57		<0.01
1,1-dichloroethane	7.66													
1,1-dichloroethene		880												
1,2,4-trichlorobenzene		8.8												
1,2,4-trimethylbenzene		31	1.1		0.04	0.64		0.02	0.23		<0.01	0.095		<0.01
1,2-dichlorobenzene		880												
1,2-dichloroethane	0.47	31	0.19	4E-07	<0.01									
1,2-dichloropropane	1.23	18												
1,2-dichlorotetrafluoroethane		130,000	0.45		<0.01	0.51		<0.01						
1,3,5-trimethylbenzene		153	0.34		<0.01	0.21		<0.01						
1,3-butadiene	0.41	9												
1,3-dichlorobenzene		880												
1,4-dichlorobenzene	1.11	3,504	0.15	1E-07	<0.01	0.11	1E-07	<0.01						
2-butanone (MEK)		22,000	4.2		<0.01	3.0		<0.01	2.0		<0.01	2.5		<0.01
2-hexanone		130												
4-ethyltoluene		440	0.97		<0.01	0.58		<0.01	0.22		<0.01			
4-methyl-2-pentanone (MIBK)		13,000	0.94		<0.01	0.66		<0.01						
acetone		140,000	32		<0.01	25		<0.01	31		<0.01	120		<0.01
acrylonitrile	0.18	9												
benzene	1.57	131	1.2	8E-07	<0.01	0.81	5E-07	<0.01	0.39	2E-07	<0.01	0.38	2E-07	<0.01
benzyl chloride	0.25	4												
bromodichloromethane	0.33													
bromoform	11.15													
bromomethane		22				0.21		<0.01	0.13		<0.01	0.22		0.01
carbon disulfide		3,100	0.45		<0.01	2.1		<0.01	0.65		<0.01	4.7		<0.01
carbon tetrachloride	2.04	438	0.66	3E-07	<0.01	0.54	3E-07	<0.01	0.4	2E-07	<0.01	0.43	2E-07	<0.01
chlorobenzene		220												
chloroethane		44,000												
chloroform	0.53	1,314	0.35	7E-07	<0.01	0.21	4E-07	<0.01						
chloromethane		390	1.9		<0.01	1.7		<0.01	1.4		<0.01	1.8		<0.01
cis -1,2-dichloroethene		31												
cis -1,3-dichloropropene	3.07	88												
cyclohexane		26,000	0.76		<0.01	0.48		<0.01						
dibromochloromethane	0.45	310												
dichlorodifluoromethane		440	3.9		<0.01	3.3		<0.01				2.6		<0.01
ethanol		31,000	220		<0.01	120		<0.01	33		<0.01	16		<0.01
ethyl acetate		31,000	1.7		<0.01	0.73		<0.01						
ethylbenzene	4.90	4,380	1.8	4E-07	<0.01	1.6	3E-07	<0.01	4.4	9E-07	<0.01	0.13	3E-08	<0.01
ethylene dibromide (EDB)	0.02	39												
hexachlorobutadiene	0.56													
isopropanol		31,000	21		<0.01	18		<0.01	68			28		
isopropylbenzene		1,800	0.19		<0.01									
m- & p-xylene		440	4.2		<0.01	4.0		<0.01	11		0.03	0.33		<0.01

TABLE 13. INDOOR AIR RISK CALCULATION BUILDING 4810 (USAF/CERCLA APPROACH) - MARCH 2013

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	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47	13,140	0.69	1E-08	<0.01	0.43	9E-09	<0.01						
methylene chloride	1200	2,628	1.3	1E-09	<0.01	0.81	7E-10	<0.01						
naphthalene	0.36	13	0.74	2E-06	0.06	0.51	1E-06	0.04						
n-butyl benzene		1,800				0.14		<0.01	0.24		<0.01			
n-heptane		3,100	0.9		<0.01	0.52		<0.01						
n-hexane		3,100	1.5		<0.01	1.9		<0.01	0.35		<0.01	0.15		<0.01
o-xylene		440	1.3		<0.01	1.1		<0.01	2.2		<0.01	0.097		<0.01
p-isopropyltoluene		1,800	1.1		<0.01	0.81		<0.01	0.61		<0.01	1.3		<0.01
propene		13,000												
sec-butyl benzene		1,800												
styrene		4,400	2.0		<0.01	1.0		<0.01	0.14		<0.01			
tetrachloroethene (PCE)	47.15	175	0.66	1E-08	<0.01									
tetrahydrofuran		8,800	0.5		<0.01	0.65		<0.01	2		<0.01	0.2		<0.01
toluene		22,000	9.6		<0.01	6.9		<0.01	13		<0.01	0.66		<0.01
trans-1,2-dichloroethene		880												
trans-1,3-dichloropropene	3.07	88												
trichloroethene (TCE)	2.99	8.8												
trichlorofluoromethane		3,100	1.9		<0.01	1.5		<0.01	1.2		<0.01	1.3		<0.01
vinyl chloride	2.79	438						<0.01						
Cumulative Risks and Hazard Indices:				5E-06	0.2		3E-06	0.1		1E-06	0.1		5E-07	0.03

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United State Air Force

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

TABLE 14. INDOOR AIR RISK CALCULATION BUILDING 4810 (DTSC APPROACH) - MARCH 2013

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	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		4,400												
1,1,1,2-tetrachloroethane	1.66	482	0.52	3E-07		0.37	2E-07	<0.01						
1,1,2,2-tetrachlorethane	0.21	310												
1,1,2-trichoroethane	0.77	1												
1,1,2-trichlorotrifluoroethane		130,000	0.94		<0.01	0.78		<0.01	0.56		<0.01	0.57		<0.01
1,1-dichloroethane	7.66	3,100												
1,1-dichloroethene		310												
1,2,4-trichlorobenzene	1.23	8.8												
1,2,4-trimethylbenzene		31	1.1		0.04	0.64		0.02	0.23		<0.01	0.095		<0.01
1,2-dichlorobenzene		880												
1,2-dichloroethane	0.47	1,752	0.19	4E-07	<0.01									
1,2-dichloropropane	1.23	18												
1,2-dichlorotetrafluoroethane		130,000	0.45		<0.01	0.51		<0.01						
1,3,5-trimethylbenzene		153	0.34		<0.01	0.21		<0.01						
1,3-butadiene	0.07	9												
1,3-dichlorobenzene		880												
1,4-dichlorobenzene	1.11	3,504	0.15	1E-07	<0.01	0.11	1E-07	<0.01						
2-butanone (MEK)		21,900	4.2		<0.01	3.0		<0.01	2.0		<0.01	2.5		<0.01
2-hexanone		130												
4-ethyltoluene		440	0.97		<0.01	0.58		<0.01	0.22		<0.01			
4-methyl-2-pentanone (MIBK)		13,000	0.94		<0.01	0.66		<0.01						
acetone		140,000	32		<0.01	25		<0.01	31		<0.01	120		<0.01
acrylonitrile	0.04	9												
benzene	0.42	13	1.2	3E-06	0.09	0.81	2E-06	0.06	0.39	9E-07	0.03	0.38	9E-07	0.03
benzyl chloride	0.25	4												
bromodichloromethane	0.33	310												
bromoform	11.15													
bromomethane		22				0.21		<0.01	0.13		<0.01	0.22		0.01
carbon disulfide		3,100	0.45		<0.01	2.1		<0.01	0.65		<0.01	4.7		<0.01
carbon tetrachloride	0.29	175	0.66	2E-06	<0.01	0.54	2E-06	<0.01	0.4	1E-06	<0.01	0.43	1E-06	<0.01
chlorobenzene		220												
chloroethane		44,000												
chloroform	0.53	429	0.35	7E-07	<0.01	0.21	4E-07	<0.01						
chloromethane		394	1.9		<0.01	1.7		<0.01	1.4		<0.01	1.8		<0.01
cis-1,2-dichloroethene		31												
cis-1,3-dichloropropene	0.77	88												
cyclohexane		26,000	0.76		<0.01	0.48		<0.01						
dibromochloromethane	0.45	310												
dichlorodifluoromethane		440	3.9		<0.01	3.3		<0.01				2.6		<0.01
ethanol		31,000	220		<0.01	120		<0.01	33		<0.01	16		<0.01
ethyl acetate		31,000	1.7		<0.01	0.73		<0.01						
ethylbenzene	4.90	4,380	1.8	4E-07	<0.01	1.6	3E-07	<0.01	4.4	9E-07	<0.01	0.13	3E-08	<0.01
ethylene dibromide (EDB)	0.02	39												
hexachlorobutadiene	0.56	15												
isopropanol		31,000	21		<0.01	18		<0.01	68			28		
isopropylbenzene		1,800	0.19		<0.01									
m- & p-xylene		440	4.2		<0.01	4.0		<0.01	11		0.03	0.33		<0.01

TABLE 14. INDOOR AIR RISK CALCULATION BUILDING 4810 (DTSC APPROACH) - MARCH 2013

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	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47	13,140	0.69	1E-08	<0.01	0.43	9E-09	<0.01						
methylene chloride	12	1,752	1.3	1E-07	<0.01	0.81	7E-08	<0.01						
naphthalene	0.36	13	0.74	2E-06	0.06	0.51	1E-06	0.04						
n -butyl benzene		770				0.14		<0.01	0.24		<0.01			
n-heptane		3,100	0.9		<0.01	0.52		<0.01						
n-hexane		3,100	1.5		<0.01	1.9		<0.01	0.35		<0.01	0.15		<0.01
o-xylene		440	1.3		<0.01	1.1		<0.01	2.2		<0.01	0.097		<0.01
p-isopropyltoluene		1,800	1.1		<0.01	0.81		<0.01	0.61		<0.01	1.3		<0.01
propene		13,140												
sec-butyl benzene		1,800												
styrene		4,400	2.0		<0.01	1.0		<0.01	0.14		<0.01			
tetrachloroethene (PCE)	2.08	153	0.66	3E-07	<0.01									
tetrahydrofuran		8,800	0.5		<0.01	0.65		<0.01	2		<0.01	0.2		<0.01
toluene		1,300	9.6		<0.01	6.9		<0.01	13		0.01	0.66		<0.01
trans-1,2-dichloroethene		310												
trans-1,3-dichloropropene	0.77	876,000												
trichloroethene (TCE)	2.99	8.8												
trichlorofluoromethane		3,100	1.9		<0.01	1.5		<0.01	1.2		<0.01	1.3		<0.01
vinyl chloride	0.16	438						<0.01						
Cumulative Risks and Hazard Indices:				9E-06	0.2		6E-06	0.2		3E-06	0.09		2E-06	0.06

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

DTSC Department of Toxic Substances Control

HQ Hazard Quotient

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

TABLE 15. INDOOR AIR RISK CALCULATION BUILDING 4810 (USAF/CERCLA APPROACH) - AUGUST 2013

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	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		22,000												
1,1,1,2-tetrachloroethane	1.66		0.4	2E-07		0.25	2E-07							
1,1,2,2-tetrachlorethane	0.21													
1,1,2-trichoroethane	0.77	1												
1,1,2-trichlorotrifluoroethane		130,000	0.53		<0.01	0.52		<0.01	0.53		<0.01	0.51		<0.01
1,1-dichloroethane	7.66													
1,1-dichloroethene		880												
1,2,4-trichlorobenzene		8.8	1.4		0.2									
1,2,4-trimethylbenzene		31	2.9		0.09	2.0		0.07	1.7		0.06	0.18		<0.01
1,2-dichlorobenzene		880	0.39		<0.01									
1,2-dichloroethane	0.47	31	0.14	3E-07	<0.01									
1,2-dichloropropane	1.23	18												
1,2-dichlorotetrafluoroethane		130,000						<0.01						
1,3,5-trimethylbenzene		153	2.9		0.02	0.55		<0.01	0.48		<0.01			
1,3-butadiene	0.41	9												
1,3-dichlorobenzene		880												
1,4-dichlorobenzene	1.11	3,504	0.43	4E-07	<0.01									
2-butanone (MEK)		22,000	63		<0.01	3.4		<0.01	5.5		<0.01	1.9		<0.01
2-hexanone		130	6.0		0.05									
4-ethyltoluene		440	2.6		<0.01	1.7		<0.01	1.5		<0.01	0.16		<0.01
4-methyl-2-pentanone (MIBK)		13,000												
acetone		140,000				16		<0.01	22		<0.01	11		<0.01
acrylonitrile	0.18	9												
benzene	1.57	131	2	1E-06	0.02	1.2	8E-07	<0.01	1.1	7E-07	<0.01			
benzyl chloride	0.25	4	0.54	2E-06	0.1									
bromodichloromethane	0.33					0.14	4E-07							
bromoform	11.15													
bromomethane		22	0.83		0.04									
carbon disulfide		3,100				19		<0.01	6.3		<0.01	29		<0.01
carbon tetrachloride	2.04	438	0.43	2E-07	<0.01	0.46	2E-07	<0.01	0.43	2E-07	<0.01	0.38	2E-07	<0.01
chlorobenzene		220												
chloroethane		44,000												
chloroform	0.53	1,314												
chloromethane		390				1.3		<0.01	1.8		<0.01	1.1		<0.01
cis -1,2-dichloroethene		31												
cis -1,3-dichloropropene	3.07	88												
cyclohexane		26,000	1.5		<0.01	0.87		<0.01	0.92		<0.01			
dibromochloromethane	0.45	310												
dichlorodifluoromethane		440	2.3		<0.01	2.4		<0.01	2.4		<0.01	2.3		<0.01
ethanol		31,000	1,800		0.06	57		<0.01	31		<0.01	16		<0.01
ethyl acetate		31,000				0.67		<0.01						
ethylbenzene	4.90	4,380	2.4	5E-07	<0.01	1.3	3E-07	<0.01	1.4	3E-07	<0.01	0.17	3E-08	<0.01
ethylene dibromide (EDB)	0.02	39	2.2	1E-04	0.06									
hexachlorobutadiene	0.56													
isopropanol		31,000				5.9		<0.01	58			39		
isopropylbenzene		1,800	0.25		<0.01									
m- & p-xylene		440	11		0.03	5.2		0.01	5.5		0.01	0.66		<0.01

TABLE 15. INDOOR AIR RISK CALCULATION BUILDING 4810 (USAF/CERCLA APPROACH) - AUGUST 2013

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	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47	13,140												
methylene chloride	1200	2,628												
naphthalene	0.36	13	1.1	3E-06	0.08	0.3	8E-07	0.02	0.31	9E-07	0.02	0.14	4E-07	0.01
n -butyl benzene		1,800	0.9		<0.01	0.53		<0.01	0.3		<0.01			
n-heptane		3,100	2.3		<0.01	1.3		<0.01	1.2		<0.01			
n-hexane		3,100	3.4		<0.01	2.2		<0.01	2.6		<0.01	0.47		<0.01
o-xylene		440	3.5		<0.01	1.8		<0.01	1.8		<0.01	0.22		<0.01
p-isopropyltoluene		1,800	3.8		<0.01	3.4		<0.01	1.1		<0.01	0.24		<0.01
propene		13,000												
sec-butyl benzene		1,800												
styrene		4,400	2.0		<0.01	0.2		<0.01	0.16		<0.01			
tetrachloroethene (PCE)	47.15	175												
tetrahydrofuran		8,800				3.4		<0.01	11		<0.01	0.52		<0.01
toluene		22,000	10		<0.01	5.9		<0.01	5.9		<0.01	1.0		<0.01
trans-1,2-dichloroethene		880												
trans-1,3-dichloropropene	3.07	88	0.31	1E-07	<0.01									
trichloroethene (TCE)	2.99	8.8												
trichlorofluoromethane		3,100	1.3		<0.01	1.4		<0.01	1.4		<0.01	1.2		<0.01
vinyl chloride	2.79	438						<0.01						
Cumulative Risks and Hazard Indices:				1E-04	0.8		3E-06	0.1		2E-06	0.1		6E-07	0.04

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United State Air Force

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

TABLE 16. INDOOR AIR RISK CALCULATION BUILDING 4810 (DTSC APPROACH) - AUGUST 2013

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	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		4,400												
1,1,1,2-tetrachloroethane	1.66	482	0.4	2E-07		0.25	2E-07	<0.01						
1,1,2,2-tetrachlorethane	0.21	310												
1,1,2-trichoroethane	0.77	1												
1,1,2-trichlorotrifluoroethane		130,000	0.53		<0.01	0.52		<0.01	0.53		<0.01	0.51		<0.01
1,1-dichloroethane	7.66	3,100												
1,1-dichloroethene		153												
1,2,4-trichlorobenzene	1.23	8.8	1.4	1E-06	0.2									
1,2,4-trimethylbenzene		31	2.9		0.09	2.0		0.1	1.7		0.06	0.18		<0.01
1,2-dichlorobenzene		880	0.39		<0.01									
1,2-dichloroethane	0.47	1,752	0.14	3E-07	<0.01									
1,2-dichloropropane	1.23	18												
1,2-dichlorotetrafluoroethane		130,000						<0.01						
1,3,5-trimethylbenzene		153	2.9		0.02	0.55		<0.01	0.48		<0.01			
1,3-butadiene	0.07	9												
1,3-dichlorobenzene		880												
1,4-dichlorobenzene	1.11	3,504	0.43	4E-07	<0.01									
2-butanone (MEK)		21,900	63		<0.01	3.4		<0.01	5.5		<0.01	1.9		<0.01
2-hexanone		130	6.0		0.05									
4-ethyltoluene		440	2.6		<0.01	1.7		<0.01	1.5		<0.01	0.16		<0.01
4-methyl-2-pentanone (MIBK)		13,000												
acetone		140,000				16		<0.01	22		<0.01	11		<0.01
acrylonitrile	0.04	9												
benzene	0.42	13	2	5E-06	0.2	1.2	3E-06	0.09	1.1	3E-06	0.08			
benzyl chloride	0.25	4	0.54	2E-06	0.1									
bromodichloromethane	0.33	310				0.14	4E-07	<0.01						
bromoform	11.15													
bromomethane		22	0.83		0.04									
carbon disulfide		3,100				19		<0.01	6.3		<0.01	29		<0.01
carbon tetrachloride	0.29	175	0.43	1E-06	<0.01	0.46	2E-06	<0.01	0.43	1E-06	<0.01	0.38	1E-06	<0.01
chlorobenzene		220												
chloroethane		44,000												
chloroform	0.53	429												
chloromethane		394				1.3		<0.01	1.8		<0.01	1.1		<0.01
cis-1,2-dichloroethene		31												
cis-1,3-dichloropropene	0.77	88												
cyclohexane		26,000	1.5		<0.01	0.87		<0.01	0.92		<0.01			
dibromochloromethane	0.45	310												
dichlorodifluoromethane		440	2.3		<0.01	2.4		<0.01	2.4		<0.01	2.3		<0.01
ethanol		31,000	1,800		0.06	57		<0.01	31		<0.01	16		<0.01
ethyl acetate		31,000				0.67		<0.01						
ethylbenzene	4.90	4,380	2.4	5E-07	<0.01	1.3	3E-07	<0.01	1.4	3E-07	<0.01	0.17	3E-08	<0.01
ethylene dibromide (EDB)	0.02	39	2.2	1E-04	0.06									
hexachlorobutadiene	0.56	15												
isopropanol		31,000				5.9		<0.01	58			39		
isopropylbenzene		1,800	0.25		<0.01									
m- & p-xylene		440	11		0.03	5.2		0.01	5.5		0.01	0.66		<0.01

TABLE 16. INDOOR AIR RISK CALCULATION BUILDING 4810 (DTSC APPROACH) - AUGUST 2013
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	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47	13,140												
methylene chloride	12	1,752												
naphthalene	0.36	13	1.1	3E-06	0.08	0.3	8E-07	0.02	0.31	9E-07	0.02	0.14	4E-07	0.01
n-butyl benzene		770	0.9		<0.01	0.53		<0.01	0.3		<0.01			
n-heptane		3,100	2.3		<0.01	1.3		<0.01	1.2		<0.01			
n-hexane		3,100	3.4		<0.01	2.2		<0.01	2.6		<0.01	0.47		<0.01
o-xylene		440	3.5		<0.01	1.8		<0.01	1.8		<0.01	0.22		<0.01
p-isopropyltoluene		1,800	3.8		<0.01	3.4		<0.01	1.1		<0.01	0.24		<0.01
propene		13,140												
sec-butyl benzene		1,800												
styrene		4,400	2.0		<0.01	0.2		<0.01	0.16		<0.01			
tetrachloroethene (PCE)	2.08	153												
tetrahydrofuran		8,800				3.4		<0.01	11		<0.01	0.52		<0.01
toluene		1,300	10		<0.01	5.9		<0.01	5.9		<0.01	1.0		<0.01
trans-1,2-dichloroethene		310												
trans-1,3-dichloropropene	0.77	876,000	0.31	4E-07	<0.01									
trichloroethene (TCE)	2.99	8.8												
trichlorofluoromethane		3,100	1.3		<0.01	1.4		<0.01	1.4		<0.01	1.2		<0.01
vinyl chloride	0.16	438						<0.01						
Cumulative Risks and Hazard Indices:				1E-04	0.9		6E-06	0.2		5E-06	0.2		2E-06	0.04

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
DTSC Department of Toxic Substances Control
HQ Hazard Quotient

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

TABLE 17. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4806 (USAF/CERCLA APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
2-butanone (MEK)		22,000	6.5		<0.01	2.8		<0.01	2.5		<0.01	2.6		<0.01	2.8		<0.01
acetone		140,000	18		<0.01	17		<0.01	17		<0.01	19		<0.01	12		<0.01
benzene	1.57	131	1.1	7E-07	<0.01	1.3	8E-07	<0.01	1.5	1E-06	0.01	1.8	1E-06	0.01	1.8	1E-06	0.01
isopropanol		31,000	4		<0.01	2		<0.01	2.6		<0.01	11		<0.01	3.9		<0.01
isopropylbenzene		1,800	0.56		<0.01				0.14		<0.01	0.17		<0.01	0.14		<0.01
n-heptane		3,100	1.2		<0.01	1.8		<0.01	2		<0.01	2.1		<0.01	2		<0.01
n-hexane		3,100	2.1		<0.01	4.0		<0.01	5.4		<0.01	8.2		<0.01	10		<0.01
p-isopropyltoluene		1,800	0.87		<0.01				0.55		<0.01	0.16		<0.01	0.42		<0.01
Cumulative Risks and Hazard Indices for all Analytes:				7E-07	0.01		8E-07	0.01		1E-06	0.01		1E-06	0.02		1E-06	0.02
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01			<0.01			<0.01		1E-06	0.02			<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

VIP vapor intrusion pathway

USAF United State Air Force

n-hexane is surrogate for n-heptane

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 18. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4806 (DTSC APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
2-butanone (MEK)		21,900	6.5		<0.01	2.8		<0.01	2.5		<0.01	2.6		<0.01	2.8		<0.01
acetone		140,000	18		<0.01	17		<0.01	17		<0.01	19		<0.01	12		<0.01
benzene	0.42	13	1.1	3E-06	0.08	1.3	3E-06	0.1	1.5	4E-06	0.1	1.8	4E-06	0.1	1.8	4E-06	0.1
isopropanol		31,000	4		<0.01	2		<0.01	2.6		<0.01	11		<0.01	3.9		<0.01
isopropylbenzene		1,800	0.56		<0.01				0.14		<0.01	0.17		<0.01	0.14		<0.01
n-heptane		3,100	1.2		<0.01	1.8		<0.01	2		<0.01	2.1		<0.01	2		<0.01
n-hexane		3,100	2.1		<0.01	4.0		<0.01	5.4		<0.01	8.2		<0.01	10		<0.01
p-isopropyltoluene		1,800	0.87		<0.01				0.55		<0.01	0.16		<0.01	0.42		<0.01
Cumulative Risks and Hazard Indices:				3E-06	0.09		3E-06	0.1		4E-06	0.1		4E-06	0.1		4E-06	0.1
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01			<0.01			<0.01		4E-06	0.1			<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

n-hexane is surrogate for n-heptane

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 19. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4806 (USAF/CERCLA APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,2,4-trimethylbenzene		31	2.7		0.09	0.38		0.01	0.35		0.01	0.51		0.02	0.61		0.02
2-butanone (MEK)		22,000	4.5		<0.01	5.0		<0.01	1.8		<0.01	2.6		<0.01	6.4		<0.01
4-ethyltoluene		440	2.2		<0.01	0.27		<0.01	0.21		<0.01	0.36		<0.01	0.55		<0.01
benzene	1.6	131	1.2	8E-07	<0.01	0.91	6E-07	<0.01	0.93	6E-07	<0.01	0.77	5E-07	<0.01	0.94	6E-07	<0.01
carbon disulfide		3,100	8.1		<0.01	0.72		<0.01	0.41		<0.01	2.2		<0.01	140		0.05
ethanol		31,000	20		<0.01	28		<0.01	5.4		<0.01	20		<0.01	14		<0.01
ethylbenzene	4.90	4,380	1.5	3E-07	<0.01	0.29	6E-08	<0.01	0.15	3E-08	<0.01	0.22	4E-08	<0.01	0.29	6E-08	<0.01
naphthalene	0.36	13	0.46	1E-06	0.04	0.72	2E-06	0.05	0.22	6E-07	0.02	0.26	7E-07	0.02	1	3E-06	0.08
o-xylene		440	2.4		<0.01	0.35		<0.01	0.21		<0.01	0.32		<0.01	1.2		<0.01
p-isopropyltoluene		1,800	0.64		<0.01	0.41		<0.01				0.38		<0.01	3.3		<0.01
Cumulative Risks and Hazard Indices:				2E-06	0.1		3E-06	0.1		1E-06	0.04		1E-06	0.05		6E-07	0.2
Cumulative Risks and Hazard Indices for VIP-related Analytes:				1E-06	0.04		6E-07	0.02			<0.01		5E-07	0.01		6E-07	<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 20. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4806 (DTSC APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,2,4-trimethylbenzene		31	2.7		0.09	0.38		0.01	0.35		0.01	0.51		0.02	0.61		0.02
2-butanone (MEK)		21,900	4.5		<0.01	5.0		<0.01	1.8		<0.01	2.6		<0.01	6.4		<0.01
4-ethyltoluene		440	2.2		<0.01	0.27		<0.01	0.21		<0.01	0.36		<0.01	0.55		<0.01
benzene	0.42	13	1.2	3E-06	0.09	0.91	2E-06	0.07	0.93	2E-06	0.07	0.77	2E-06	0.06	0.94	2E-06	0.07
carbon disulfide		3,100	8.1		<0.01	0.72		<0.01	0.41		<0.01	2.2		<0.01	140		0.05
ethanol		31,000	20		<0.01	28		<0.01	5.4		<0.01	20		<0.01	14		<0.01
ethylbenzene	4.90	4,380	1.5	3E-07	<0.01	0.29	6E-08	<0.01	0.15	3E-08	<0.01	0.22	4E-08	<0.01	0.29	6E-08	<0.01
naphthalene	0.36	13	0.46	1E-06	0.04	0.72	2E-06	0.05	0.22	6E-07	0.02	0.26	7E-07	0.02	1	3E-06	0.08
o-xylene		440	2.4		<0.01	0.35		<0.01	0.21		<0.01	0.32		<0.01	1.2		<0.01
p-isopropyltoluene		1,800	0.64		<0.01	0.41		<0.01				0.38		<0.01	3.3		<0.01
Cumulative Risks and Hazard Indices:				4E-06	0.2		4E-06	0.1		3E-06	0.1		3E-06	0.1		5E-06	0.2
Cumulative Risks and Hazard Indices for VIP-related Analytes:				1E-06	0.04		2E-06	0.08			<0.01		2E-06	0.06		2E-06	0.07

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 21. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4807 (USAF/CERCLA APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
2-butanone (MEK)		22,000	3.0		<0.01	2.3		<0.01	2.6		<0.01	2.6		<0.01
acetone		140,000	18		<0.01	16		<0.01	19		<0.01	19		<0.01
tetrahydrofuran		8,800	1.7		<0.01				0.24		<0.01	0.24		<0.01
Cumulative Risks and Hazard Indices:					<0.01			<0.01			<0.01			<0.01
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01			<0.01			<0.01			<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 22. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4807 (DTSC APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
2-butanone (MEK)		21,900	3.0		<0.01	2.3		<0.01	6.1		<0.01	2.6		<0.01
acetone		140,000	18		<0.01	16		<0.01	30		<0.01	19		<0.01
tetrahydrofuran		8,800	1.7		<0.01				0.17		<0.01	0.24		<0.01
Cumulative Risks and Hazard Indices:					<0.01			<0.01			<0.01			<0.01
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01			<0.01			<0.01			<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 23. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4807 (USAF/CERCLA APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4806IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
acetone		140,000	17		<0.01	19		<0.01	72		<0.01	19		<0.01
benzene	1.57	131	1.6	1E-06	0.01	1.2	8E-07	<0.01	7.4	5E-06	0.06	0.93	6E-07	<0.01
carbon disulfide		3,100	9.9		<0.01	2.3		<0.01	13		<0.01	2.7		<0.01
dichlorodifluoromethane		440	0.24		<0.01	7.8		0.02	16		0.04	3.7		<0.01
Cumulative Risks and Hazard Indices:				1E-06	0.02		8E-07	0.03		5E-06	0.1		6E-07	0.02
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01		8E-07	0.01			<0.01			<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 24. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4807 (DTSC APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
acetone		140,000	17		<0.01	19		<0.01	72		<0.01	19		<0.01
benzene	0.42	13	1.6	4E-06	0.1	1.2	3E-06	0.09	7.4	2E-05	0.6	0.93	2E-06	0.07
carbon disulfide		3,100	9.9		<0.01	2.3		<0.01	13		<0.01	2.7		<0.01
dichlorodifluoromethane		440	0.24		<0.01	7.8		0.02	16		0.04	3.7		<0.01
Cumulative Risks and Hazard Indices:				4E-06	0.1		3E-06	0.1		2E-05	0.6		2E-06	0.08
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01		3E-06	0.09			<0.01			<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 25. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4810 (USAF/CERCLA APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,2-trichlorotrifluoroethane		130,000	0.94		<0.01	0.78		<0.01	0.56		<0.01	0.57		<0.01
1,2,4-trimethylbenzene		31	1.1		0.04	0.64		0.02	0.23		<0.01	0.095		<0.01
2-butanone (MEK)		22,000	4.2		<0.01	3.0		<0.01	2.0		<0.01	2.5		<0.01
4-methyl-2-pentanone (MIBK)		13,000	0.94		<0.01	0.66		<0.01						
acetone		140,000	32		<0.01	25		<0.01	31		<0.01	120		<0.01
benzene	1.57	131	1.2	8E-07	<0.01	0.81	5E-07	<0.01	0.39	2E-07	<0.01	0.38	2E-07	<0.01
bromomethane		22				0.21		<0.01	0.13		<0.01	0.22		0.01
cyclohexane		26,000	0.76		<0.01	0.48		<0.01						
ethylbenzene	4.90	4,380	1.8	4E-07	<0.01	1.6	3E-07	<0.01	4.4	9E-07	<0.01	0.13	3E-08	<0.01
isopropanol		31,000	21		<0.01	18		<0.01	68			28		
m- & p-xylene		440	4.2		<0.01	4.0		<0.01	11		0.03	0.33		<0.01
n-hexane		3,100	1.5		<0.01	1.9		<0.01	0.35		<0.01	0.15		<0.01
o-xylene		440	1.3		<0.01	1.1		<0.01	2.2		<0.01	0.097		<0.01
toluene		22,000	9.6		<0.01	6.9		<0.01	13		<0.01	0.66		<0.01
Cumulative Risks and Hazard Indices:				1E-06	0.06		8E-07	0.05		1E-06	0.05		3E-07	0.02
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01			<0.01		2E-07	<0.01		3E-07	0.02

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 26. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4810 (DTSC APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,2-trichlorotrifluoroethane		130,000	0.94		<0.01	0.78		<0.01	0.56		<0.01	0.57		<0.01
1,2,4-trimethylbenzene		31	1.1		0.04	0.64		0.02	0.23		<0.01	0.095		<0.01
2-butanone (MEK)		21,900	4.2		<0.01	3.0		<0.01	2.0		<0.01	2.5		<0.01
4-methyl-2-pentanone (MIBK)		13,000	0.94		<0.01	0.66		<0.01						
acetone		140,000	32		<0.01	25		<0.01	31		<0.01	120		<0.01
benzene	0.42	13	1.2	3E-06	0.09	0.81	2E-06	0.06	0.39	9E-07	0.03	0.38	9E-07	0.03
bromomethane		22				0.21		<0.01	0.13		<0.01	0.22		0.01
cyclohexane		26,000	0.76		<0.01	0.48		<0.01						
ethylbenzene	4.90	4,380	1.8	4E-07	<0.01	1.6	3E-07	<0.01	4.4	9E-07	<0.01	0.13	3E-08	<0.01
isopropanol		31,000	21		<0.01	18		<0.01	68		<0.01	28		<0.01
m- & p-xylene		440	4.2		<0.01	4.0		<0.01	11		0.03	0.33		<0.01
n-hexane		3,100	1.5		<0.01	1.9		<0.01	0.35		<0.01	0.15		<0.01
o-xylene		440	1.3		<0.01	1.1		<0.01	2.2		<0.01	0.097		<0.01
toluene		1,300	9.6		<0.01	6.9		<0.01	13		0.01	0.66		<0.01
Cumulative Risks and Hazard Indices:				3E-06	0.2		2E-06	0.1		2E-06	0.09		9E-07	0.05
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01			<0.01		9E-07	0.03		9E-07	0.04

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 27. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4810 (USAF/CERCLA APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,2,4-trimethylbenzene		31	2.9		0.09	2.0		0.07	1.7		0.06	0.18		<0.01
2-butanone (MEK)		22,000	63		<0.01	3.4		<0.01	5.5		<0.01	1.9		<0.01
4-ethyltoluene		440	2.6		<0.01	1.7		<0.01	1.5		<0.01	0.16		<0.01
carbon disulfide		3,100				19		<0.01	6.3		<0.01	29		<0.01
ethanol		31,000	1,800		0.06	57		<0.01	31		<0.01	16		<0.01
ethylbenzene	4.90	4,380	2.4	5E-07	<0.01	1.3	3E-07	<0.01	1.4	3E-07	<0.01	0.17	3E-08	<0.01
m- & p-xylene		440	11		0.03	5.2		0.01	5.5		0.01	0.66		<0.01
naphthalene	0.36	13	1.1	3E-06	0.08	0.3	8E-07	0.02	0.31	9E-07	0.02	0.14	4E-07	0.01
o-xylene		440	3.5		<0.01	1.8		<0.01	1.8		<0.01	0.22		<0.01
p-isopropyltoluene		1,800	3.8		<0.01	3.4		<0.01	1.1		<0.01	0.24		<0.01
Cumulative Risks and Hazard Indices:				4E-06	0.3		1E-06	0.1		1E-06	0.1		4E-07	0.03
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01			0.01			<0.01		4E-07	0.02

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway-related at this sample locatione. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 28. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4810 (DTSC APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N7-4810IA1			Sample Location N7-4810IA2			Sample Location N7-4810IA3			Sample Location N7-4810IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,2,4-trimethylbenzene		31	2.9		0.09	2.0		0.1	1.7		0.06	0.18		<0.01
2-butanone (MEK)		21,900	63		<0.01	3.4		<0.01	5.5		<0.01	1.9		<0.01
4-ethyltoluene		440	2.6		<0.01	1.7		<0.01	1.5		<0.01	0.16		<0.01
carbon disulfide		3,100				19		<0.01	6.3		<0.01	29		<0.01
ethanol		31,000	1,800		0.06	57		<0.01	31		<0.01	16		<0.01
ethylbenzene	4.90	4,380	2.4	5E-07	<0.01	1.3	3E-07	<0.01	1.4	3E-07	<0.01	0.17	3E-08	<0.01
m- & p-xylene		440	11		0.03	5.2		0.01	5.5		0.01	0.66		<0.01
naphthalene	0.36	13	1.1	3E-06	0.08	0.3	8E-07	0.02	0.31	9E-07	0.02	0.14	4E-07	0.01
o-xylene		440	3.5		<0.01	1.8		<0.01	1.8		<0.01	0.22		<0.01
p-isopropyltoluene		1,800	3.8		<0.01	3.4		<0.01	1.1		<0.01	0.24		<0.01
Cumulative Risks and Hazard Indices:				4E-06	0.3		1E-06	0.1		1E-06	0.1		4E-07	0.03
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01			0.01			<0.01		4E-07	0.02

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

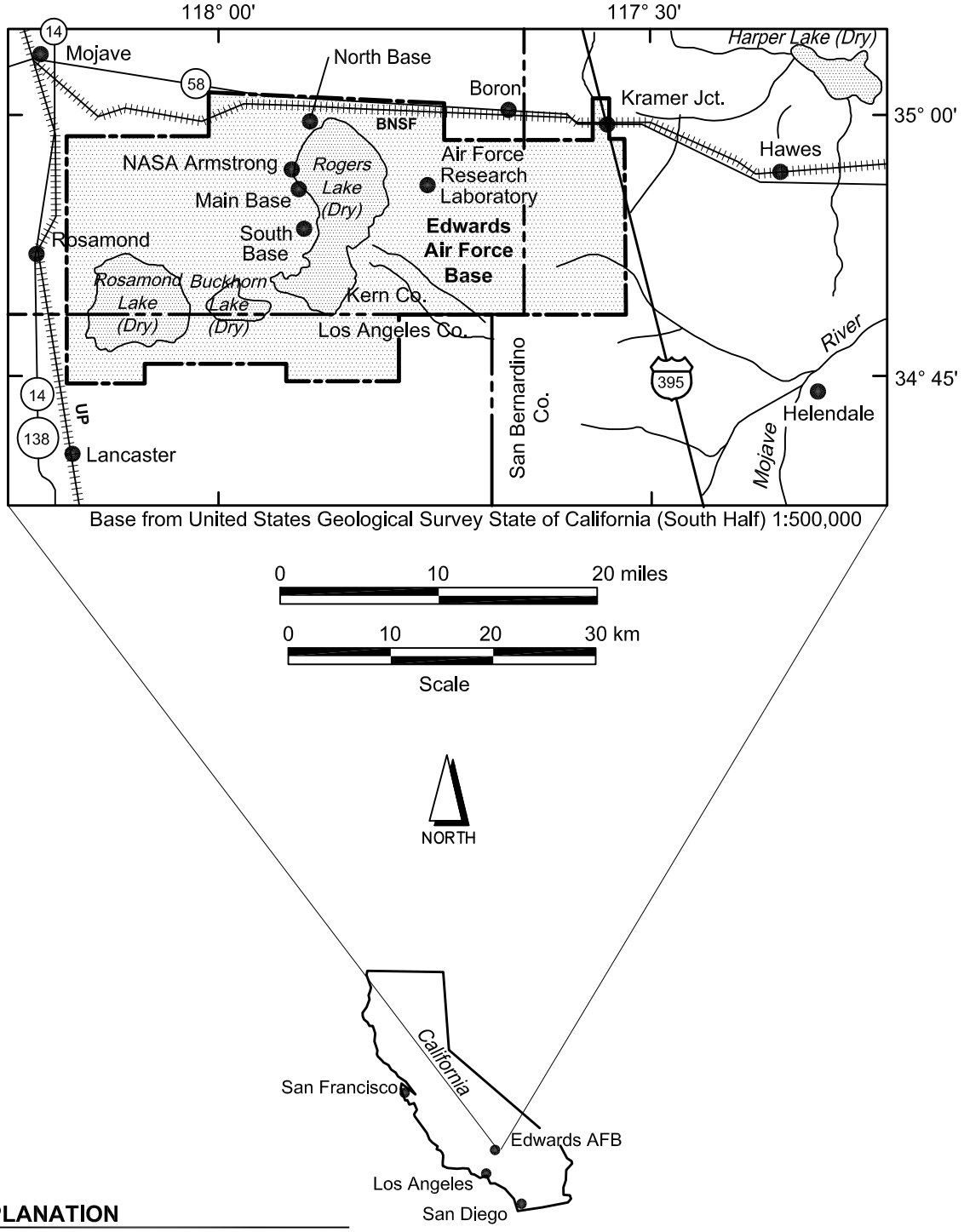
USAF United State Air Force

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

FIGURES

- 1 Edwards Air Force Base Location Map
- 2 Operable Unit Location Map
- 3 Building Locations in Relation to TCE and Benzene Indoor Air RBSLs for the Current Industrial Scenario
- 4 Generalized Conceptual Site Model for Buildings 4806 and 4807
- 5 Generalized Conceptual Site Model for Building 4810
- 6 Buildings 4806 and 4807 and Surrounding Features
- 7 Building 4810 and Surrounding Features
- 8 Buildings 4806 and 4807 Sampling Locations
- 9 Building 4810 Sampling Locations
- 10 Sub-Slab Vapor Sampling Point Construction Diagram and Sampling Set-Up
- 11 Picture of Sampling Shroud Set-up

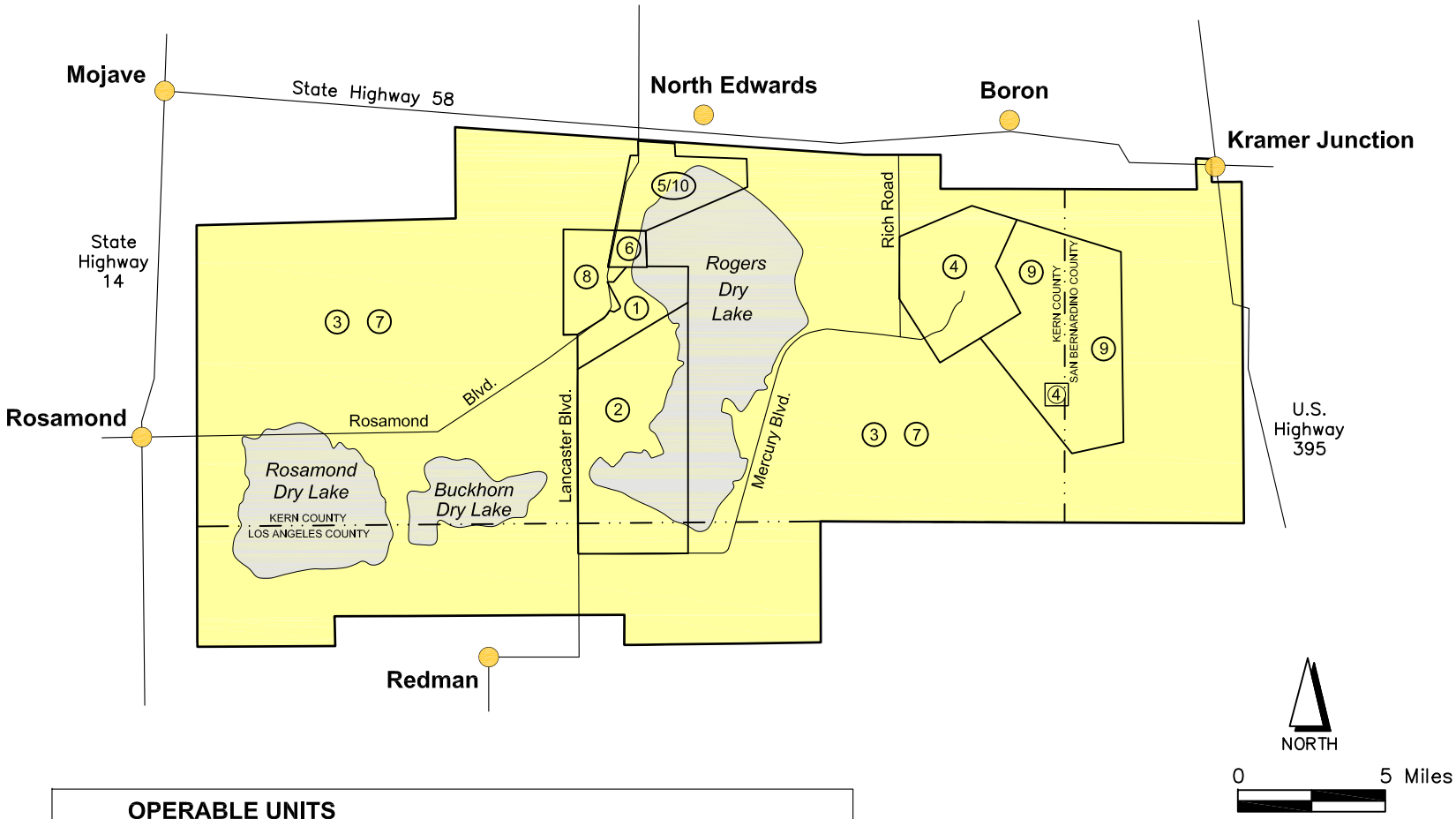


EXPLANATION

AFB = AIR FORCE BASE
BNSF = BURLINGTON NORTHERN SANTA FE
Co. = COUNTY
Jct. = JUNCTION
NASA = NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
UP = UNION PACIFIC
= COUNTY LINE
= RAILROAD
58 = STATE HIGHWAY
395 = INTERSTATE HIGHWAY

Edwards Air Force Base Location Map		
Date 04-2014	VI Investigation Report	Figure
Project No. 60277061	Operable Unit 6 Edwards AFB	1

File: P:\Edwards AFB\60277061 – 0262 VIP Fuel Leak GW Investigation\7.0 Deliverables\7.2 CADD\VI_Report_DRAFT\Figure 1 EAFB Loc Map.dwg
Date: Friday, April 25, 2014



OPERABLE UNITS

1. Main Base Flightline
2. South Base
3. Basewide Water Wells
4. Air Force Research Laboratory
5/10. North Base
6. NASA Armstrong
7. Basewide Miscellaneous
8. Northwest Main Base
9. Air Force Research Laboratory-East

Operable Unit Location Map

Date 04-2014	VI Investigation Report	Figure
Project No. 60277061	Operable Unit 6 Edwards AFB	2

File: P:\Edwards AFB\60277061 – 0262 VIP Fuel Leak GW Investigation\7.0 Deliverables\7.2 CADD\VI_Report_DRAFT\Figure 2 OU Loc Map.dwg
Date: Thursday, April 24, 2014

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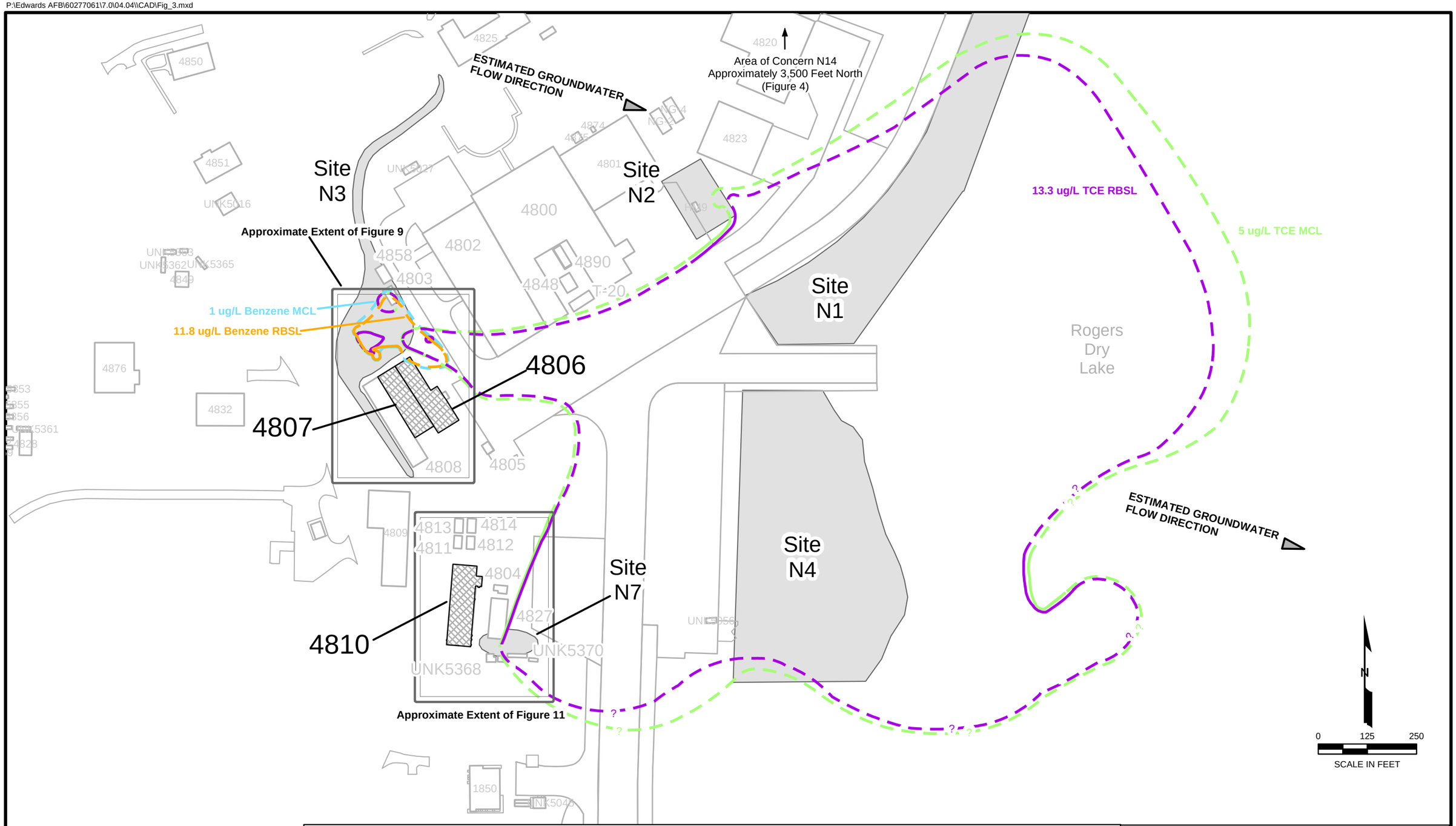


EXPLANATION

BUILDING INCLUDED IN CURRENT STUDY

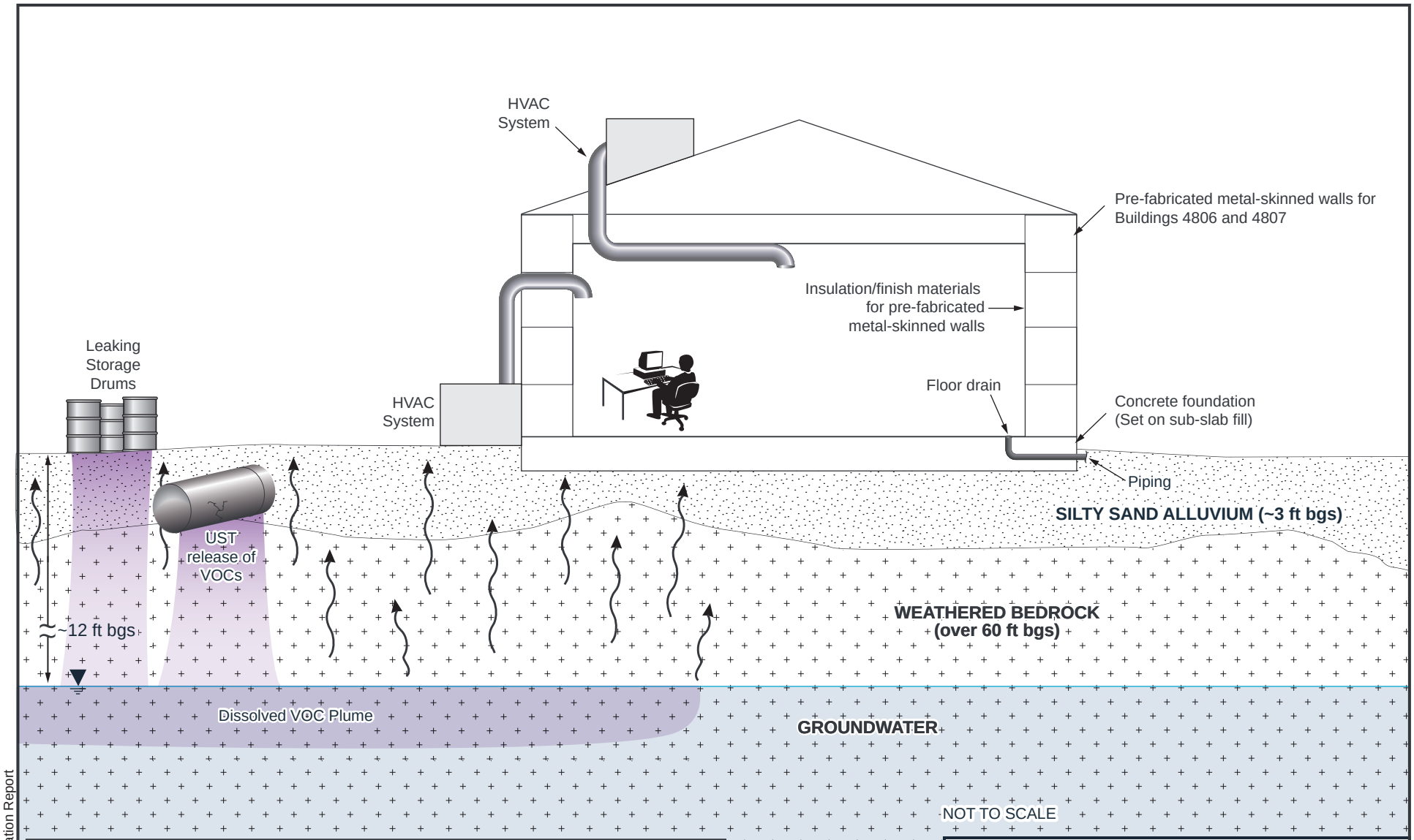
SITE INCLUDED IN GROUNDWATER REMEDIAL ACTION

GROUNDWATER CONTAMINANT CONCENTRATION CONTOURS ARE BASED ON 2012 MONITORING RESULTS, DASHES INDICATE CONTOUR IS INFERRED.

UG/L = MICROGRAMS PER LITER
MCL = MAXIMUM CONTAMINANT LEVEL
RBSL = RISK-BASED SCREENING LEVEL, THE CONCENTRATION CORRESPONDING TO AN INDOOR AIR RISK OF 1.0E-6 IN GROUNDWATER UNDER CURRENT INDUSTRIAL SCENARIO
TCE = TRICHLOROETHENE

Building Locations in Relation to TCE and Benzene Indoor Air RBSLs for the Current Industrial Scenario

Date 04-2014	VI Investigation Report	Figure
Project No. 60277061	Operable Unit 6 Edwards AFB	3

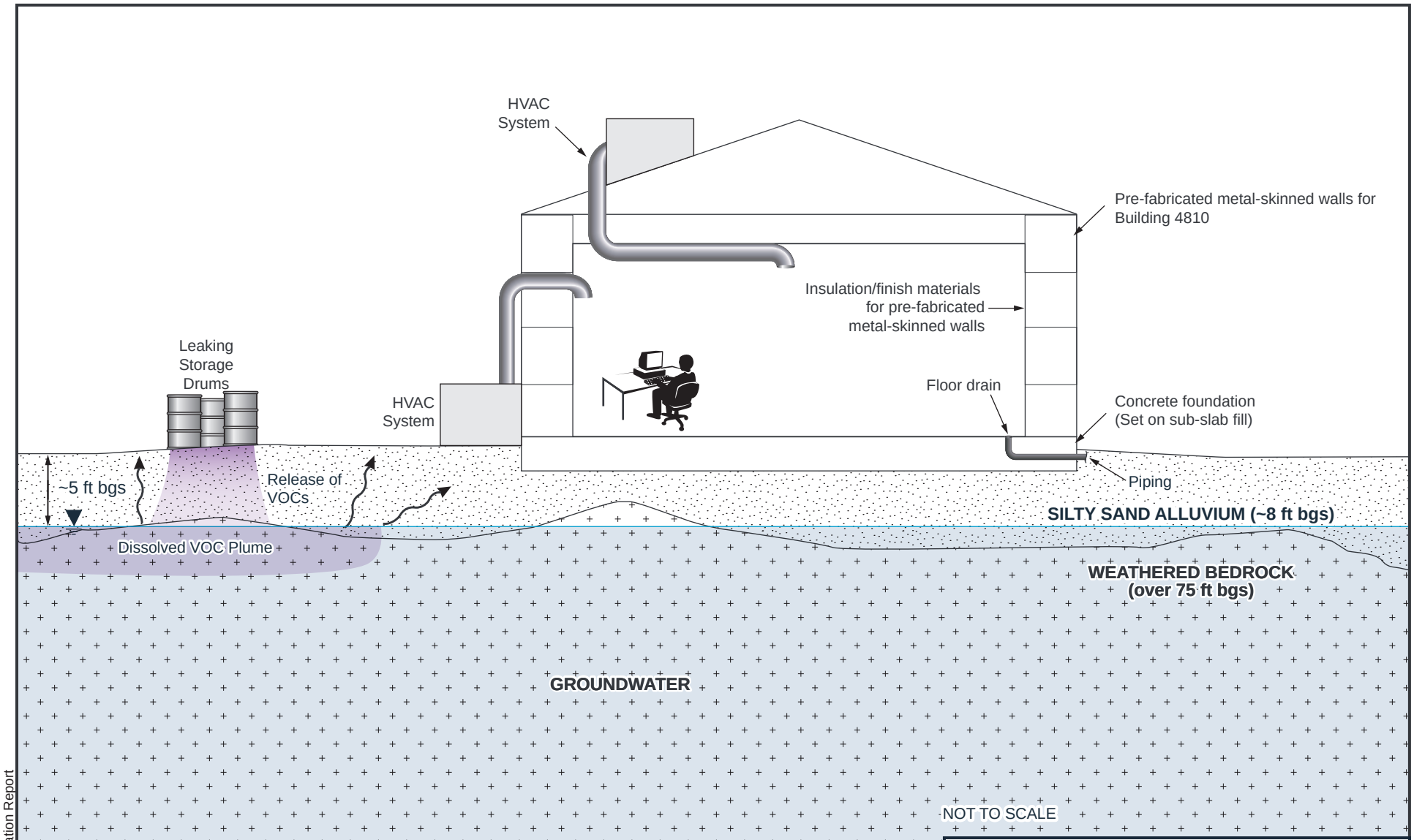


~	Approximate	UST	Underground Storage Tank
AFB	Air Force Base	VOC	Volatile Organic Compound
ft bgs	Feet below ground surface		Volatilization
HVAC	Heating, Ventilating and Air Conditioning		

Lithology data based on the borehole log for N3-MW20, which is 40.5 feet in depth and located ~12 feet north of Buildings 4806 and 4807 and the borehole log for N3-MW12, which is 260 feet in depth and located ~60 feet northeast of Buildings 4806 and 4807.

Generalized Conceptual Site Model for Buildings 4806 and 4807

Date 04-2014	VI Investigation Report	Figure
Project No. 60277061	Operable Unit 6 Edwards AFB	4



~	Approximate	HVAC	Heating, Ventilating and Air Conditioning
AFB	Air Force Base	VOC	Volatile Organic Compound
ft bgs	Feet below ground surface	⤴	Volatilization

Lithology data based on the borehole log for N7-MW07, which is 37 feet in depth and located ~70 feet east of Building 4810 and the borehole log for N7-MW10, which is 37 feet in depth and located ~90 feet east of Building 4810.

Generalized Conceptual Site Model for Building 4810

Date 04-2014	VI Investigation Report	Figure
Project No. 60277061	Operable Unit 6 Edwards AFB	5

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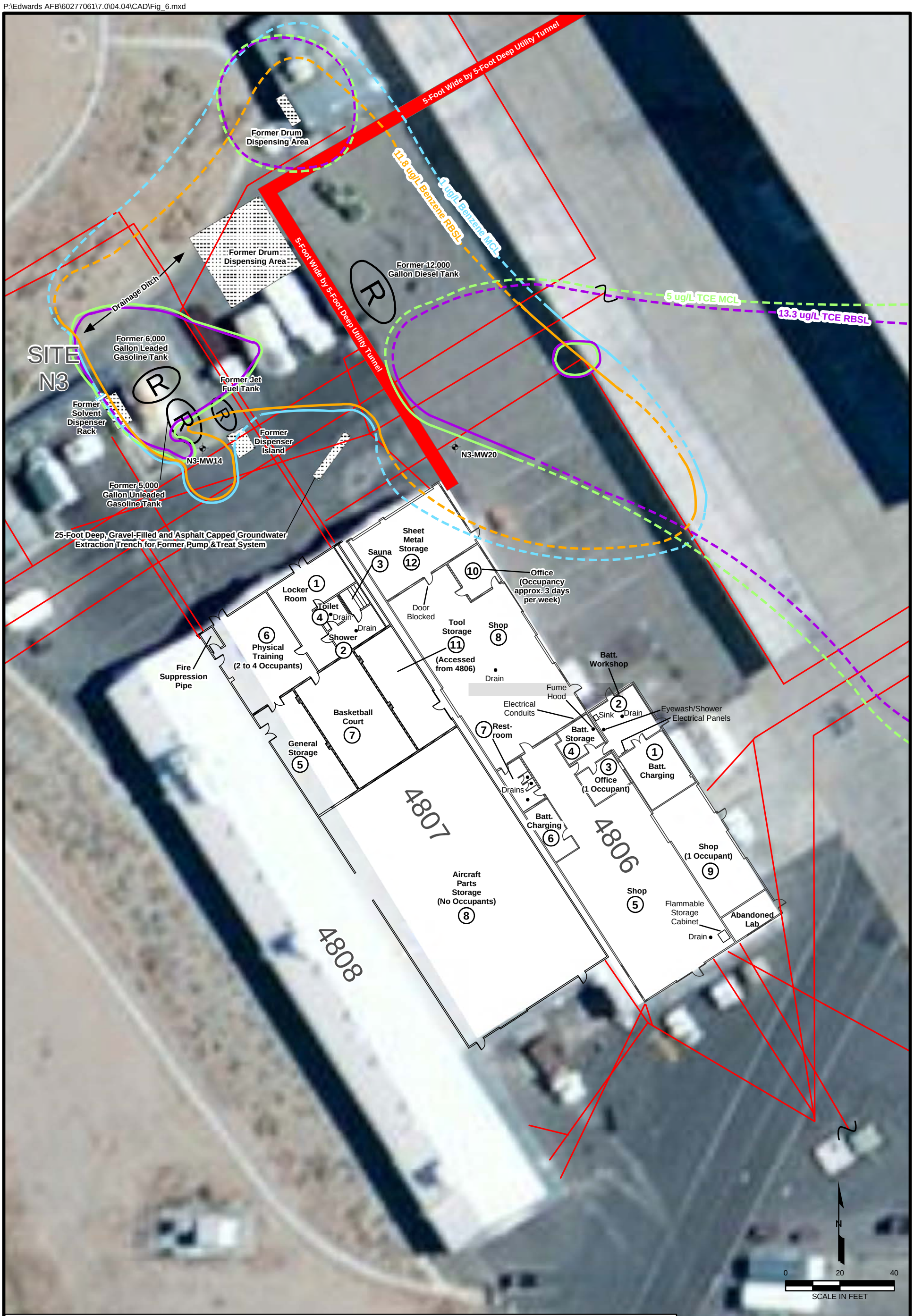

EXPLANATION

- EXISTING GROUNDWATER MONITORING WELL
- ② ROOM NUMBER
- (R) REMOVED UNDERGROUND STORAGE TANK
- UTILITY LINE
- UTILITY LINE MAY EXTEND BEYOND THE DEPICTION BUT NO ADDITIONAL INFORMATION IS AVAILABLE

BUILDING OCCUPANCY

BUILDING 4806 - 2 TO 6
BUILDING 4807 - 4 TO 6

GROUNDWATER CONTAMINANT CONCENTRATION CONTOURS ARE BASED ON 2012 MONITORING RESULTS, DASHES INDICATE CONTOUR IS INFERRED.

UG/L = MICROGRAMS PER LITER
MCL = MAXIMUM CONTAMINANT LEVEL
RBSL = RISK-BASED SCREENING LEVEL, THE CONCENTRATION CORRESPONDING TO AN INDOOR AIR RISK OF 1.0E-6 IN GROUNDWATER UNDER CURRENT INDUSTRIAL SCENARIO
TCE = TRICHLOROETHENE

Buildings 4806 and 4807 and Surrounding Features

Date 04-2014	VI Investigation Report	Figure
Project No. 60277061	Operable Unit 6 Edwards AFB	6

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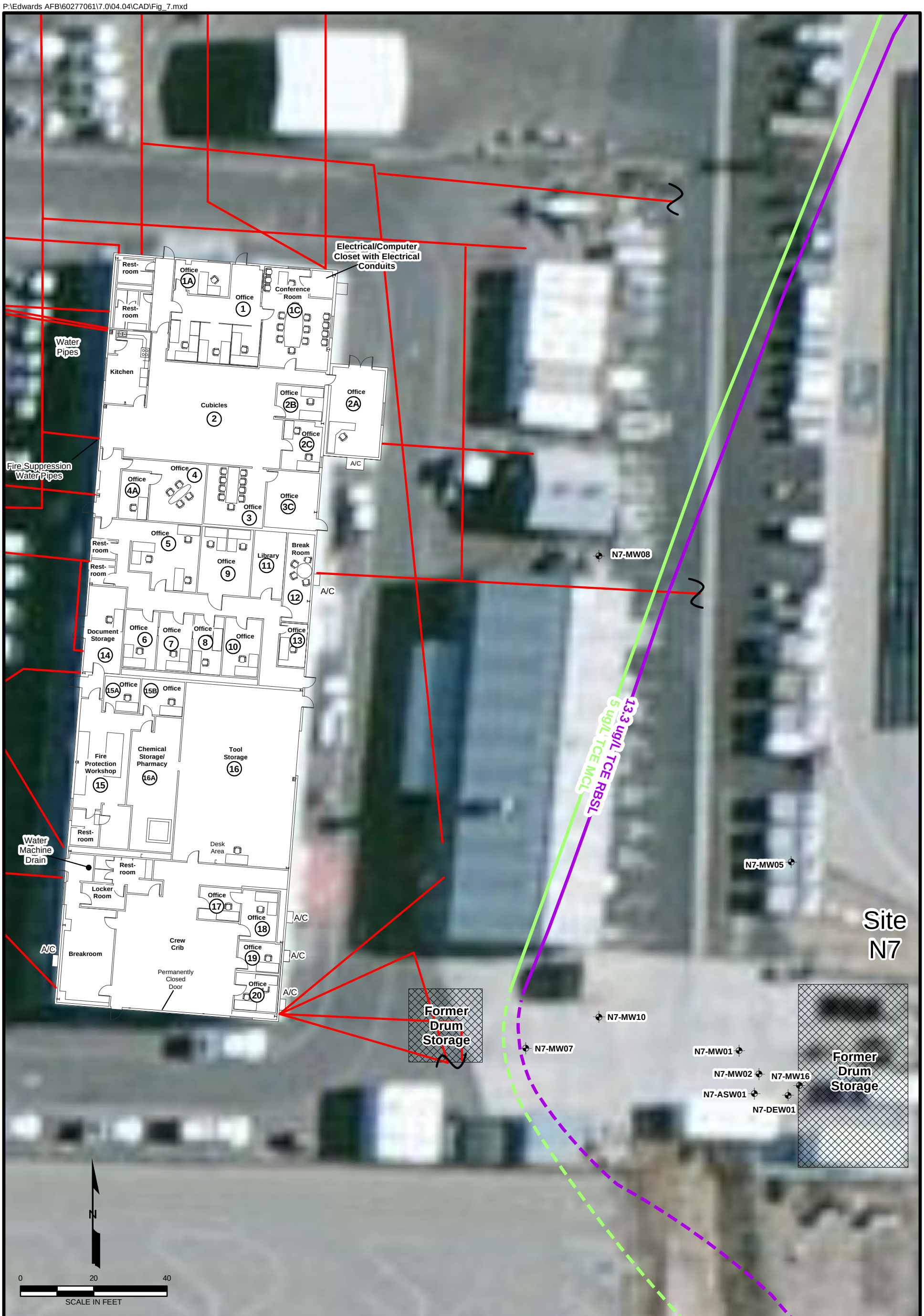

EXPLANATION

BUILDING OCCUPANCY
75 PEOPLE

EXISTING GROUNDWATER MONITORING WELL

ROOM NUMBER

UTILITY LINE

UTILITY LINE MAY EXTEND BEYOND THE DEPICTION BUT NO ADDITIONAL INFORMATION IS AVAILABLE

NOTE:
FLOOR DRAINS ARE PRESENT IN RESTROOMS

GROUNDWATER CONTAMINANT CONCENTRATION CONTOURS ARE BASED ON 2012 MONITORING RESULTS, DASHES INDICATE CONTOUR IS INFERRED.

UG/L = MICROGRAMS PER LITER
MCL = MAXIMUM CONTAMINANT LEVEL
RBSL = RISK-BASED SCREENING LEVEL, THE CONCENTRATION CORRESPONDING TO AN INDOOR AIR RISK OF 1.0E-6 IN GROUNDWATER UNDER CURRENT INDUSTRIAL SCENARIO
TCE = TRICHLOROETHENE

Building 4810 and Surrounding Features

Date 04-2014	VI Investigation Report	Figure
Project No. 60277061	Operable Unit 6 Edwards AFB	7

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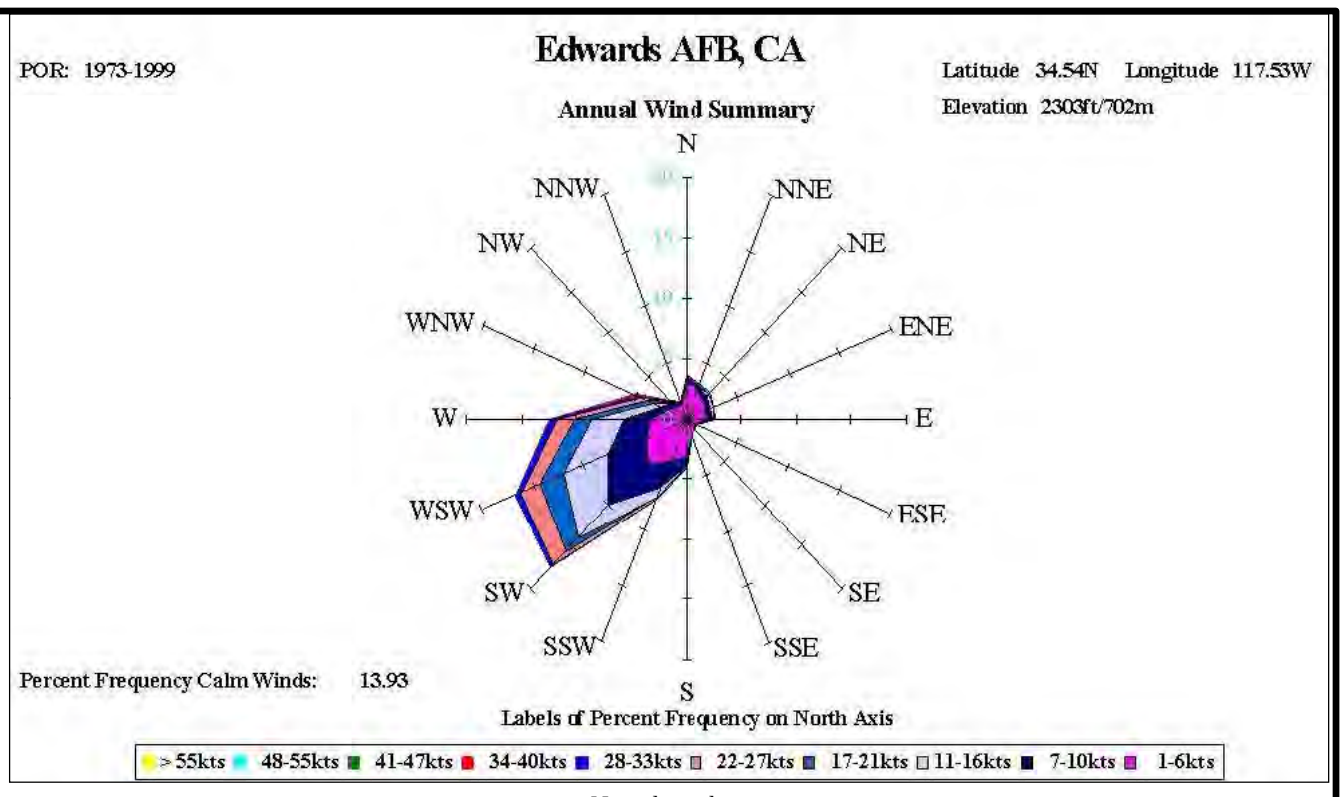

Note: kts = knots

BUILDING OCCUPANCY

BUILDING 4806 - 2 TO 6
BUILDING 4807 - 4 TO 6

BUILDING AREA

BUILDING 4806 - 10,030 SQUARE FEET
BUILDING 4807 - 11,011 SQUARE FEET

EXPLANATION

② ROOM NUMBER
SS01 SUB-SLAB VAPOR POINT SAMPLING LOCATION
IA01 INDOOR AIR SAMPLING LOCATION
OA01 OUTDOOR AIR SAMPLING LOCATION

NOTES:
1. SINGLE-STORY BUILDINGS ON CONCRETE SLAB.
2. OUTDOOR AIR SAMPLING LOCATIONS WERE PLACED AT A DISTANCE FROM THE BUILDING EQUAL TO TWICE THE HEIGHT OF THE BUILDING.

Buildings 4806 and 4807 Sampling Locations

Date 04-2014	VI Investigation Report	Figure
Project No. 60277061	Operable Unit 6 Edwards AFB	8

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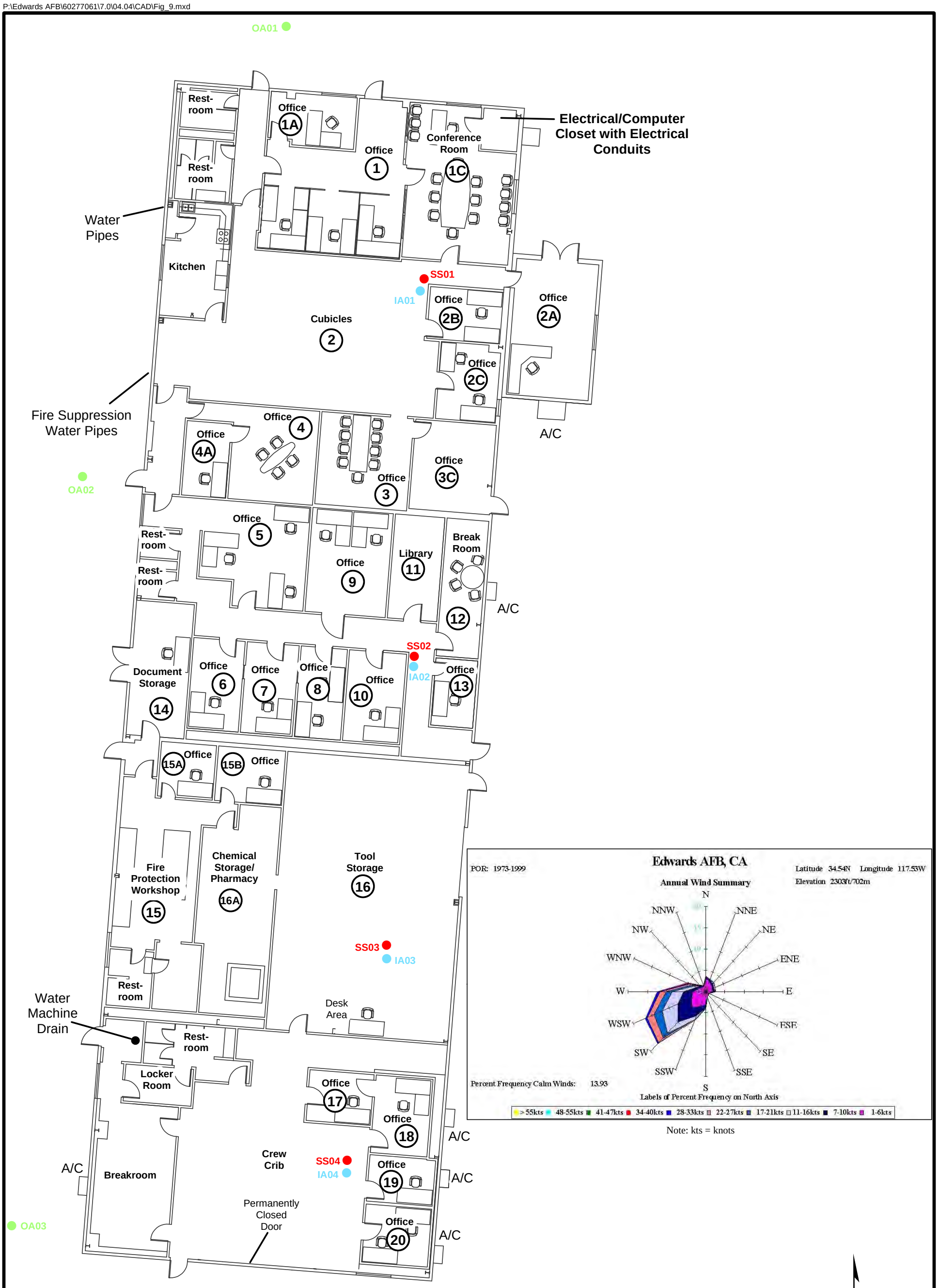


BUILDING OCCUPANCY/AREA

75 PEOPLE/12,644 SQUARE FEET

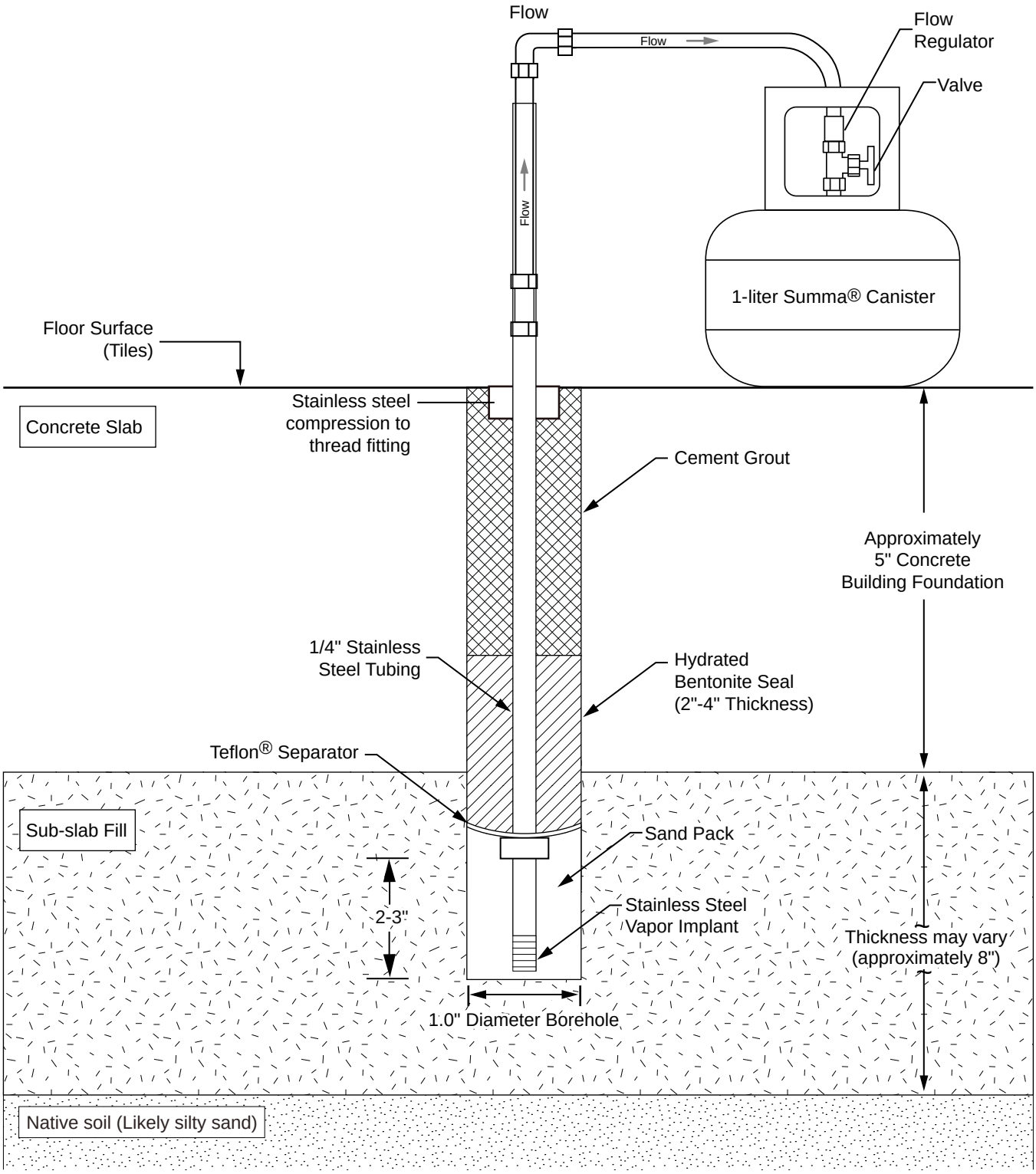
EXPLANATION

NOTES:
1. SINGLE-STORY BUILDING ON CONCRETE SLAB
2. FLOOR DRAINS ARE PRESENT IN RESTROOMS.
3. SUB-SLAB VAPOR POINT SAMPLING LOCATIONS WILL BE PLACED 8 TO 10 FEET FROM WALLS (IF POSSIBLE).
4. OUTDOOR AIR SAMPLING LOCATIONS WILL BE PLACED AT A DISTANCE FROM THE BUILDING EQUAL TO TWICE THE HEIGHT OF THE BUILDING.

② ROOM NUMBER
SS01 SUB-SLAB VAPOR POINT SAMPLING LOCATION
IA01 INDOOR AIR SAMPLING LOCATION
OA01 OUTDOOR AIR SAMPLING LOCATION

Building 4810 Sampling Locations

Date 04-2014	VI Investigation Report	Figure
Project No. 60277061	Operable Unit 6 Edwards AFB	9



Explanation

"	inch
AFB	Air Force Base

NOT TO SCALE

Note:
Sub-slab vapor sampling point construction diagram designed after *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (California Department of Toxic Substances Control, 2011)*

Sub-Slab Vapor Sampling Point Construction Diagram and Sampling Set-Up

Date 04-2014	VI Investigation Report	Figure
Project No. 60277061	**Operable Unit 6 Edwards AFB**	**10**

Picture of Sampling Shroud Set-Up

Date 04-2014	VI Investigation Report	Figure
Project No. 60277061	Operable Unit 6 Edwards AFB	11

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Date: Thursday, April 24, 2014

APPENDIX A

INITIAL BUILDING SURVEY RESULTS
(ON CD)

ENVIRONMENTAL RESTORATION PROGRAM

INITIAL BUILDING SURVEY RESULTS FOR BUILDINGS 4806, 4807, AND 4810
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DRYDEN FLIGHT RESEARCH CENTER
OPERABLE UNIT 6

EDWARDS AIR FORCE BASE
CALIFORNIA

FINAL

MARCH 2013

Prepared for:

412th TEST WING
ENVIRONMENTAL MANAGEMENT (412 TW/CEV)
EDWARDS AIR FORCE BASE, CA 93524-8060

and

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
DRYDEN FLIGHT RESEARCH CENTER
SAFETY, HEALTH, AND ENVIRONMENTAL OFFICE
EDWARDS AIR FORCE BASE, CA 93523-0273

and

U.S. AIR FORCE CIVIL ENGINEER CENTER/
ENVIRONMENTAL CENTER OF EXCELLENCE – WEST (AFCEC/CZRW)
SAN ANTONIO, TX 78226-2018

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PREFACE

This document presents the *Initial Building Survey Results for Buildings 4806, 4807, and 4810, National Aeronautics and Space Administration, Dryden Flight Research Center, Operable Unit 6, Edwards Air Force Base, California*. Initial building surveys were conducted on 5 and 6 June 2012 at Buildings 4806, 4807, and 4810 to record information on the buildings' occupancy patterns, identify preferential flow pathways and chemical usage that could affect sampling results, and evaluate the heating, ventilating, and air conditioning systems. Building managers were also interviewed and building floor plans were acquired to identify potential inaccessible areas. In order to aid in the selection of sub-slab vapor and indoor air sample locations, pressure differential measurements between the inside and outside air at various locations within the building were recorded along with temperature measurements.

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B1.0 BUILDINGS 4806 AND 4807

- Estimated depth to bedrock – 3 feet bgs
- Estimated depth to groundwater – 12 feet bgs (based on Well N3-MW20 located approximately 12 feet north of Building 4806)
- Estimated concentrations of groundwater contaminants beneath the buildings – Building 4806 partially overlies the benzene groundwater plume. A benzene concentration of 450 μg/L was detected in a groundwater sample collected from Well N3-MW20 in May/June 2012.
- Nearest identified potential point sources: Former solvent drum storage and dispensers and former gasoline underground storage tanks associated with former gas station (see Figure 9 in main text).

Building 4806 (Photo 1) is a 10,030-square foot aircraft ground equipment (AGE) garage and maintenance facility. It is used for the repair and routine maintenance of NASA motor vehicles, including modified recreational vehicles (used as mobile technical facilities) and AGE vehicles. Personnel in Building 4806 also managed the former gas station (mentioned under "identified potential point sources" above) in the past. The building is divided into an automotive shop and an AGE shop, with a battery shop located in the southeastern corner. The battery shop provides battery service for NASA and AGE vehicles.

Building 4807 is 11,011 square feet and attached to Building 4806 (Photo 1). Building 4807 is used for aircraft stock storage and pilot training. Pilot training areas include a locker room, shower, gym (basketball court) and physical training room. The facility manager estimates that the pilot training areas are occupied an average of 2 hours per day.

B1.1 BUILDING 4806

Photo 1. Northern side of Buildings 4806 and 4807. Monitoring well N3-MW20 is in the foreground. Roll up door opens to Room 12.

Photo 2. Northern side of Buildings 4806 and 4807. Monitoring well N3-MW14 is in the foreground in front of the trailer tire. Typical roof-mounted evaporative cooler is on the top of Building 4806.

Photo 3. Building 4806. Sheet metal storage area facing south (Room 12). Note the blocked doorway into Room 8 behind blue storage racks.

Photo 4. Pipes entering Building 4806 in northeast corner of Room 12 (sheet metal storage area). This area is only occupied when loading and unloading material for storage. Personnel do not occupy this area for an entire shift. This area was mentioned to formally be used as a vehicle maintenance shop. No estimate was provided as when it was converted to sheet metal storage area. Sub-slab and indoor air sampling are proposed as this area overlies the benzene plume and utility lines are present that may provide a vapor pathway.

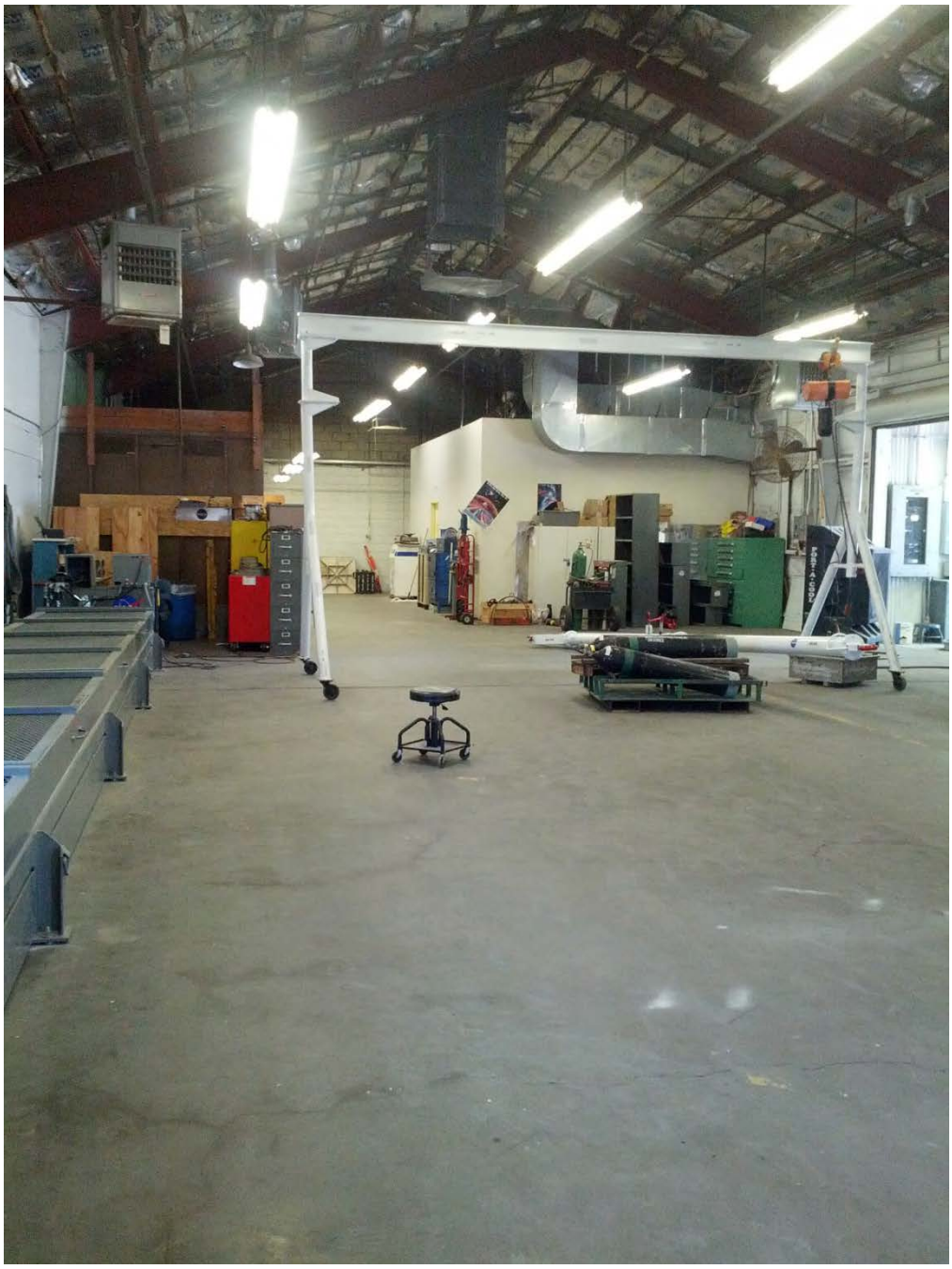

Photo 5. Building 4806. Shop area facing north (Room 5). This area is used to test and repair various types of support equipment.

Photo 6. Building 4806. The exterior walls of the office area (Room 3). This area is normally occupied by one person. Sub-slab and indoor air sampling are proposed in hallway outside of Room 3.

Photo 7. Building 4806. Flammables storage cabinet and a "Port-A-Cool" evaporative cooler in Room 5 (photo facing east). The mobile evaporative coolers are used for "comfort cooling" in main shop areas on extremely hot days.

Photo 8. Building 4806. Door to tool storage room (Room 11) in warehouse area (Room 8). This tool storage room is actually a room in Building 4807, is unoccupied and is inaccessible from Building 4807. Sub-slab and indoor air sampling are proposed in Room 11 due to negative pressure differential reading.

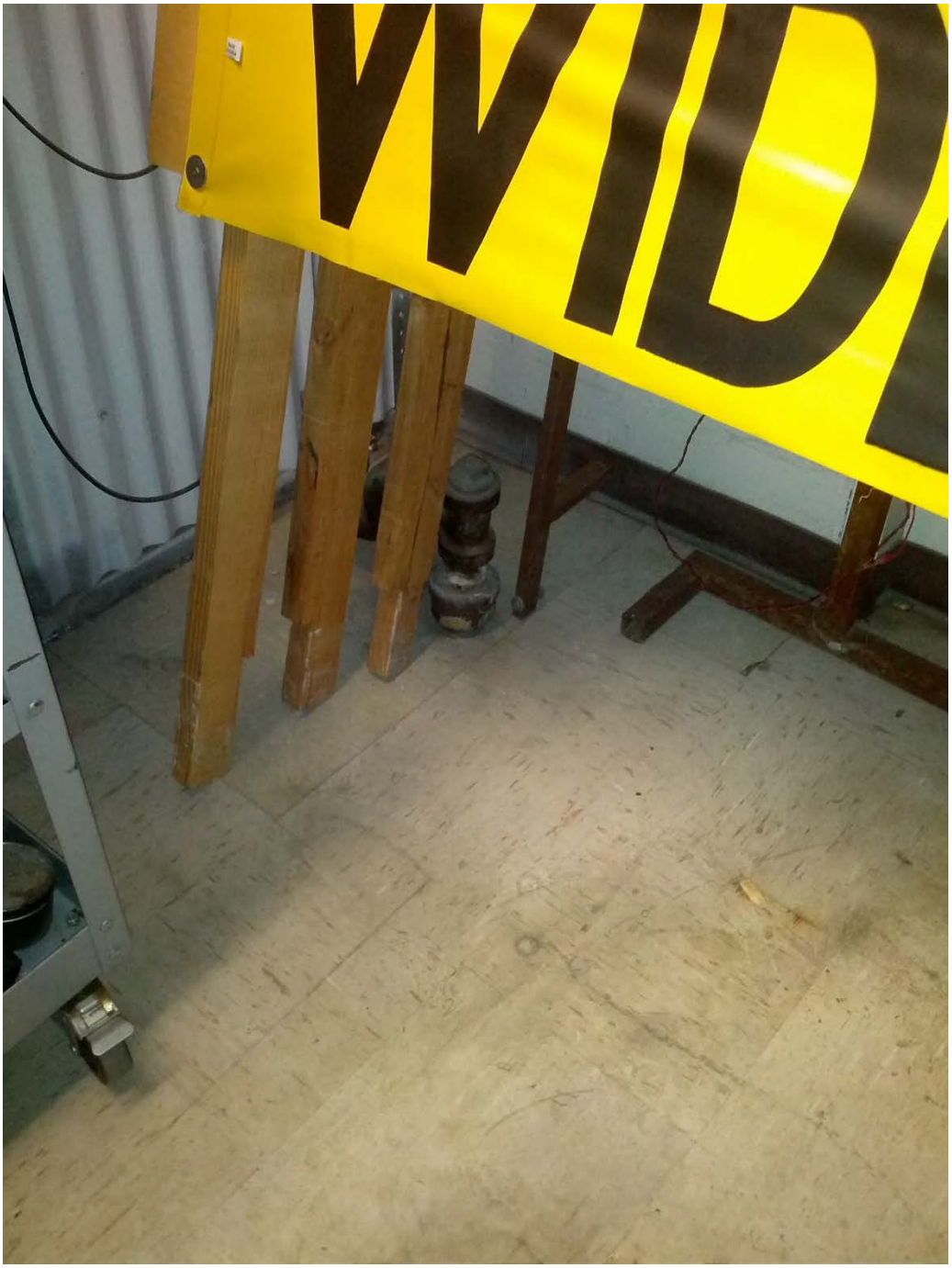

Photo 9. Building 4806. Pipe coming out of the floor in tool storage room (Room 11). Photo is taken facing south. This room is actually in Building 4807. Note possibility of tile containing asbestos. Sub-slab and indoor air sampling are proposed in Room 11 due to negative pressure differential reading.

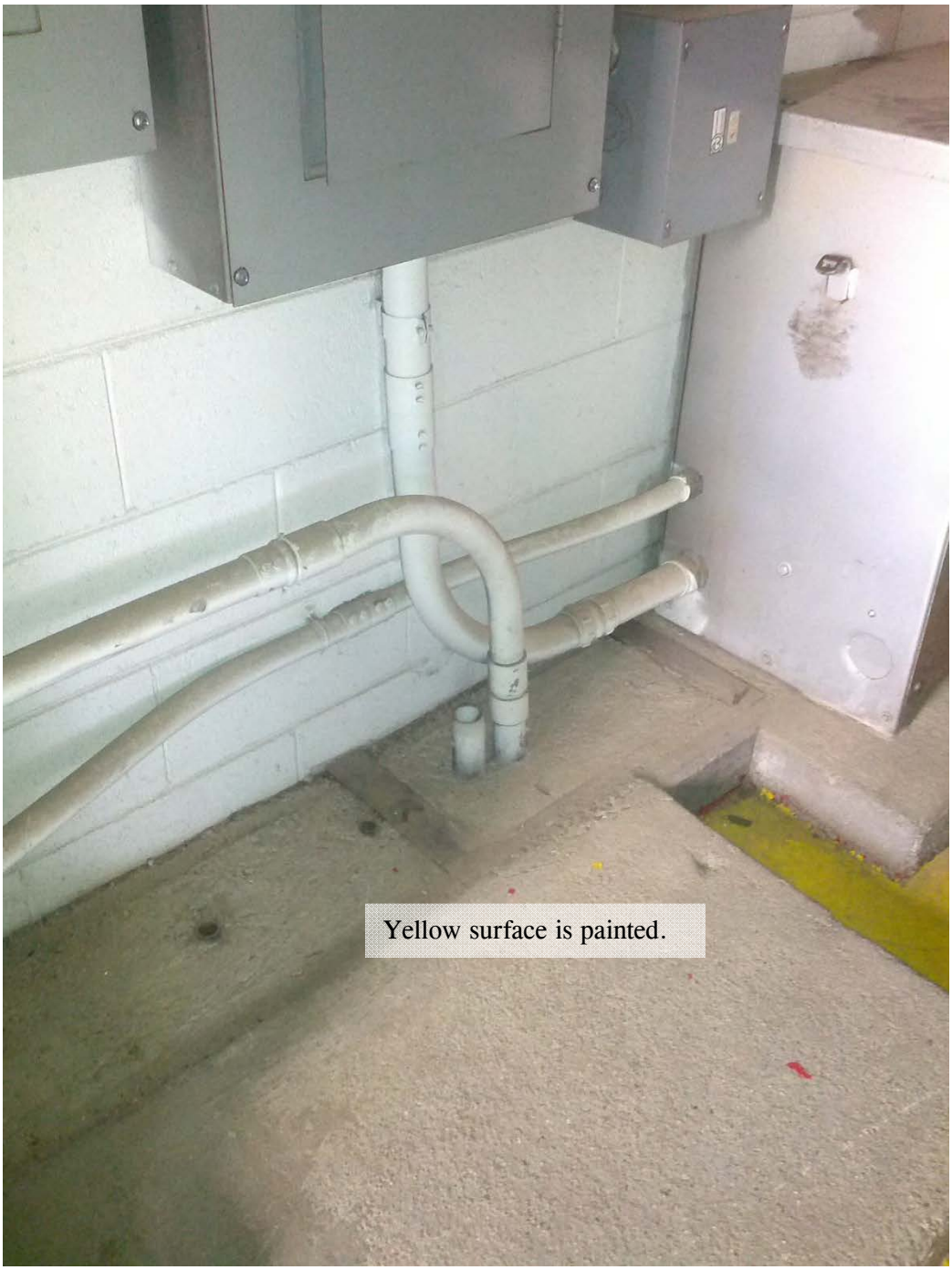

Photo 10. Building 4806. Conduits exiting floor in warehouse area (Room 8). Photo was taken facing south. Sub-slab and indoor air sampling are proposed.

Photo 11. Building 4806. Office space (Room 10) in warehouse area (Room 8). This office is occupied about 3 days a week. Note possibility of tile containing asbestos. Sub-slab and indoor air sampling are proposed within this office space.

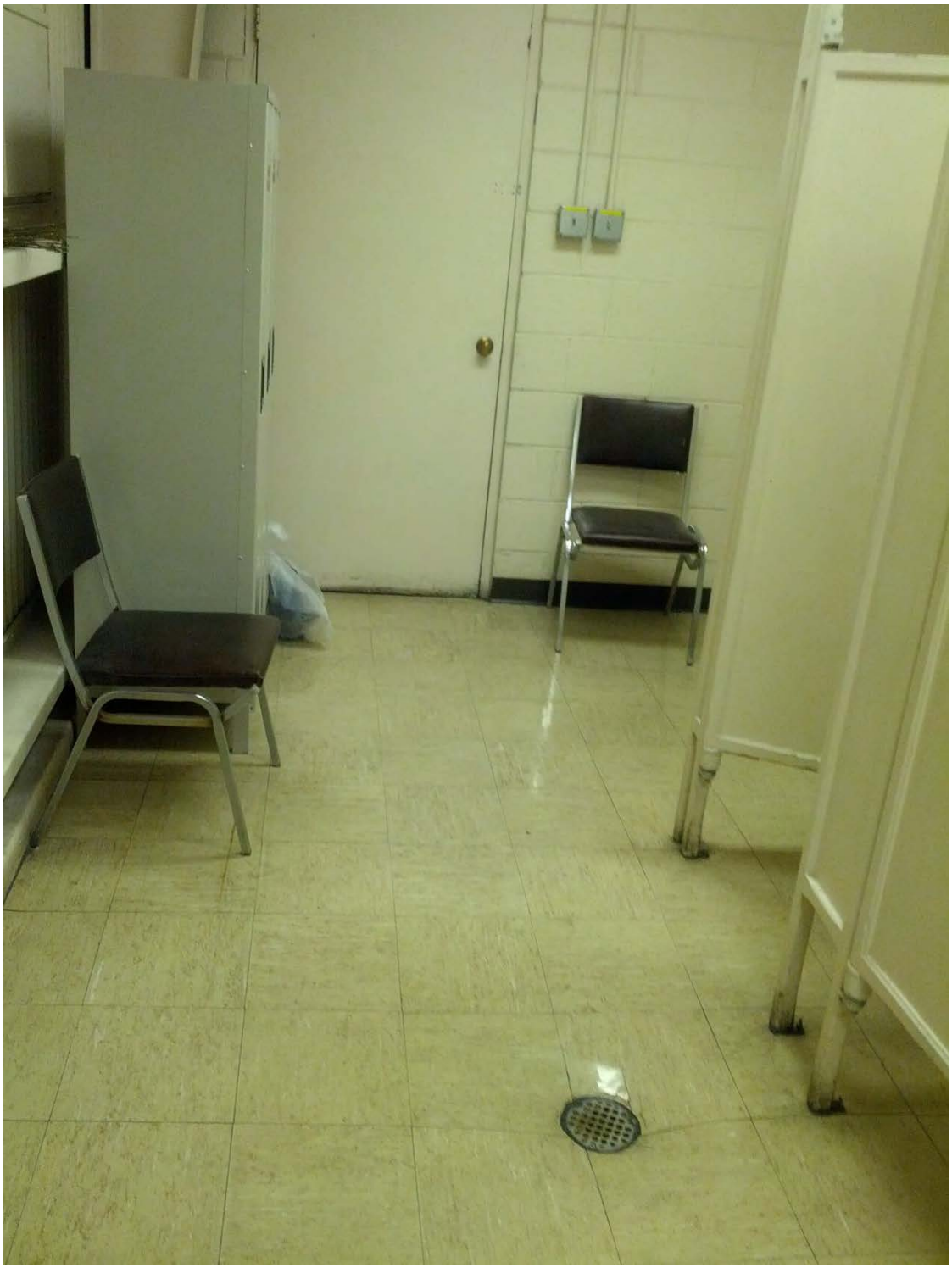

Photo 12. Building 4806. Floor drain in restroom (facing north). Note possibility of tile containing asbestos.

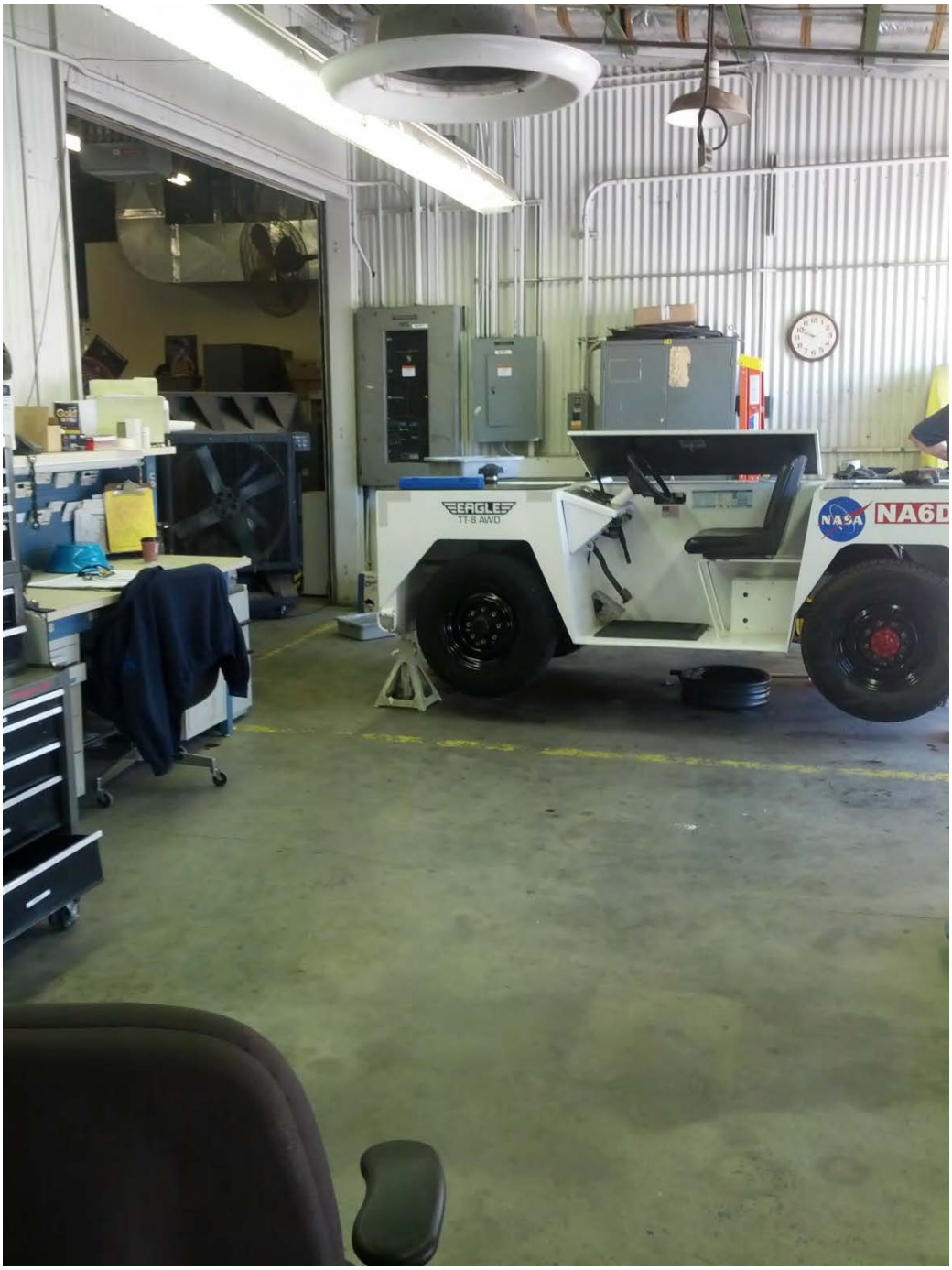

Photo 13. Building 4806. Shop area (Room 9). This area is used for maintenance of industrial trucks and is generally occupied by 1 person (photo taken facing north). Sub-slab and indoor air sampling are proposed due to occupancy and presence of utility lines that may provide a vapor pathway.

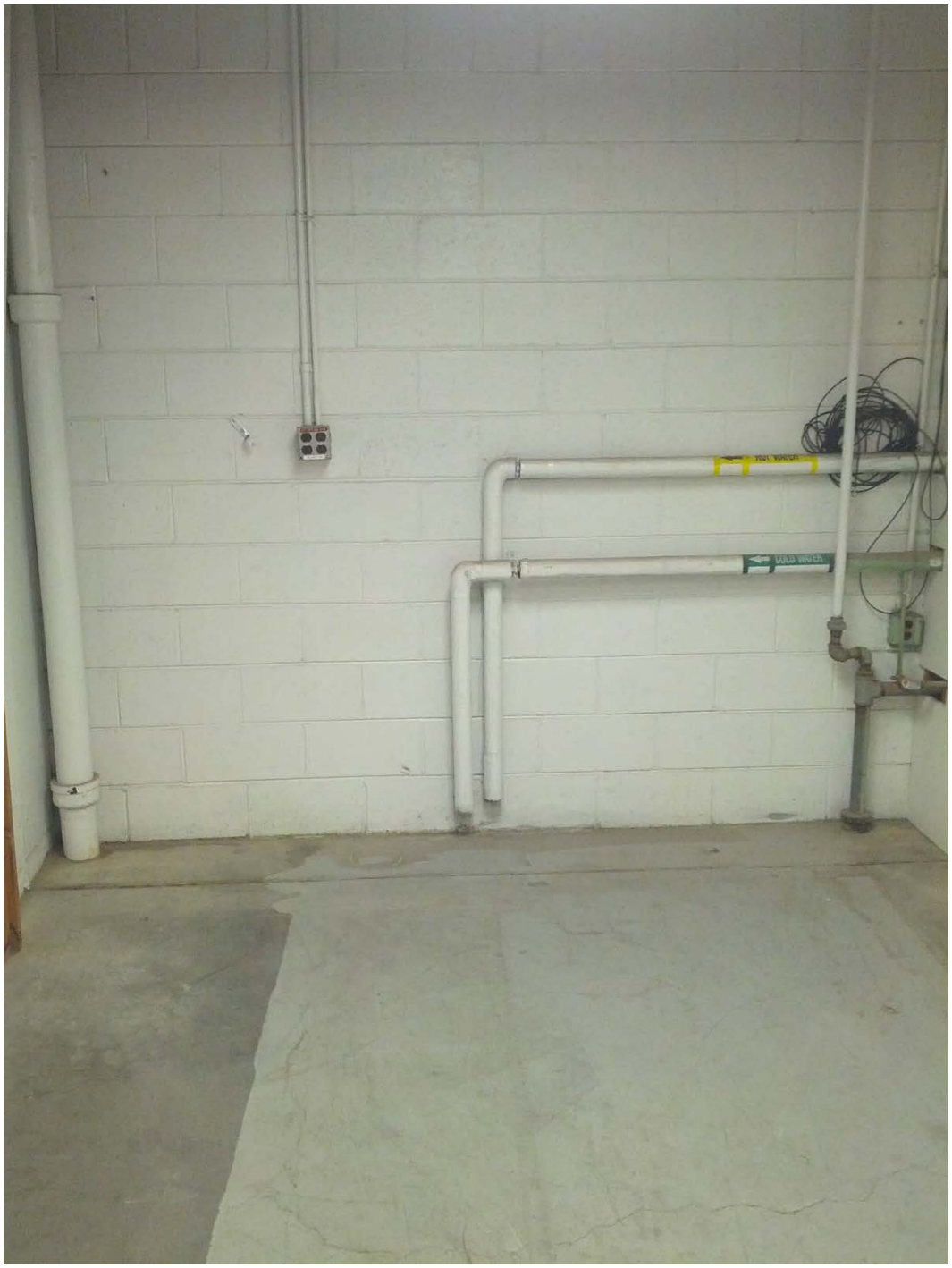

Photo 14. Building 4806. Pipes coming from floor in the auto battery charging area (Room 1). Note that this room is only partially walled off from main shop area (Room 5). Photo was taken facing north.

B1.2 BUILDING 4807

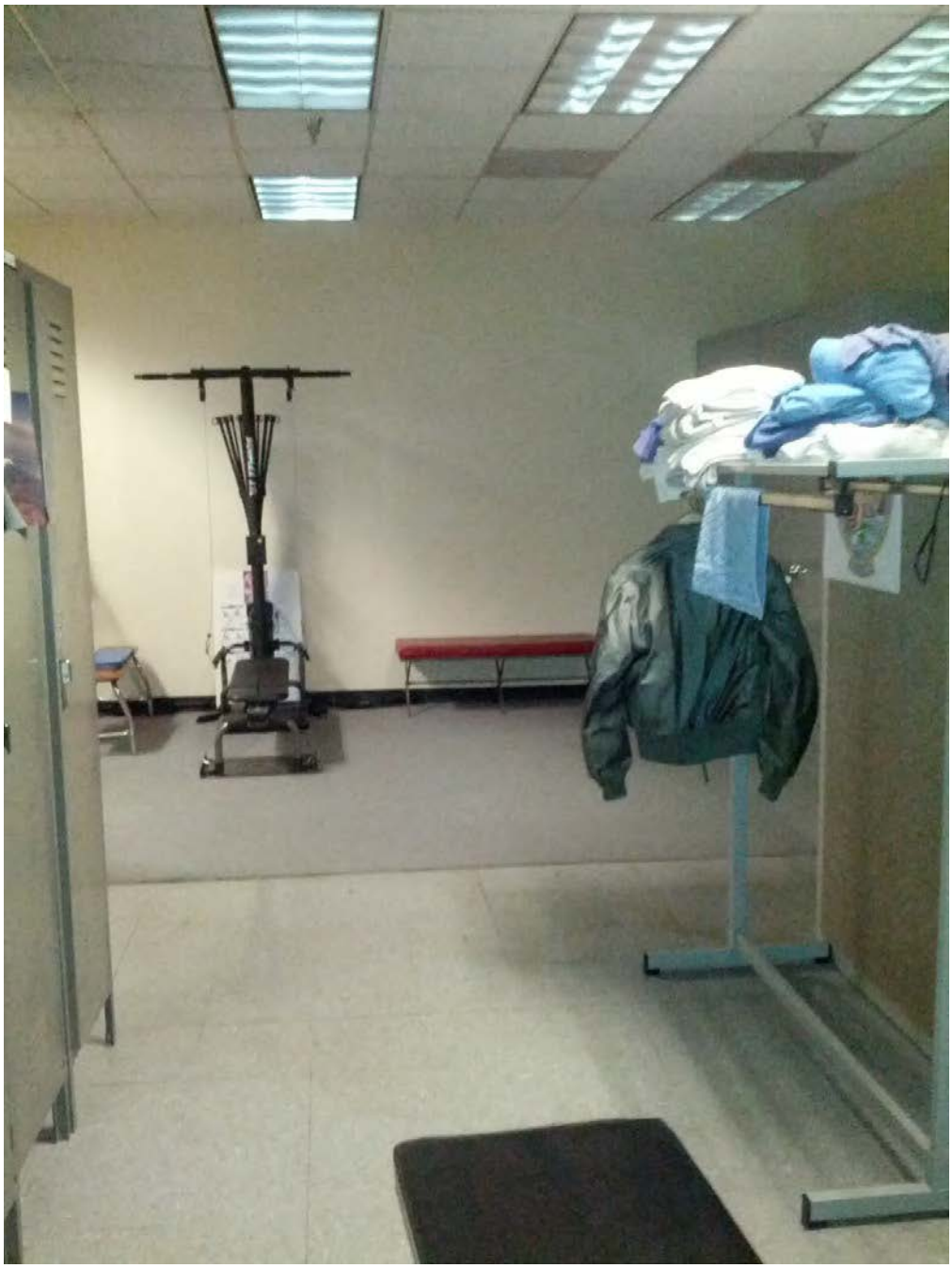

Photo 15. Building 4807. Pilot locker room area (Room 1). Note possibility of tile containing asbestos. Sub-slab and indoor air sampling are proposed due to occupancy and presence of utility lines that may provide a vapor pathway.

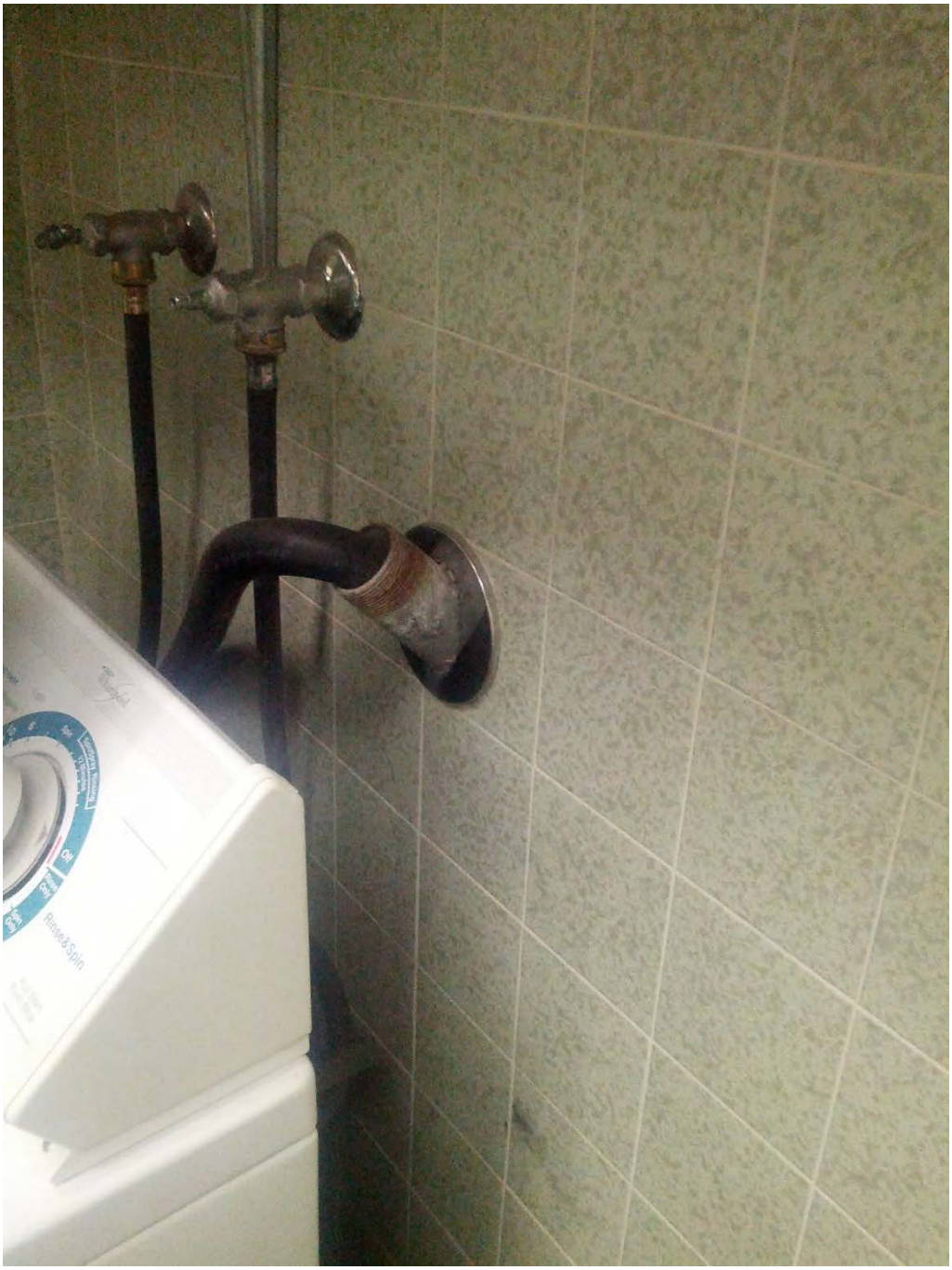

Photo 16. Building 4807. Washing machine drain in shower room (Room 2). Sub-slab and indoor air sampling are proposed in adjacent locker room (Room 1) due to occupancy and presence of utility lines that may provide a vapor pathway.

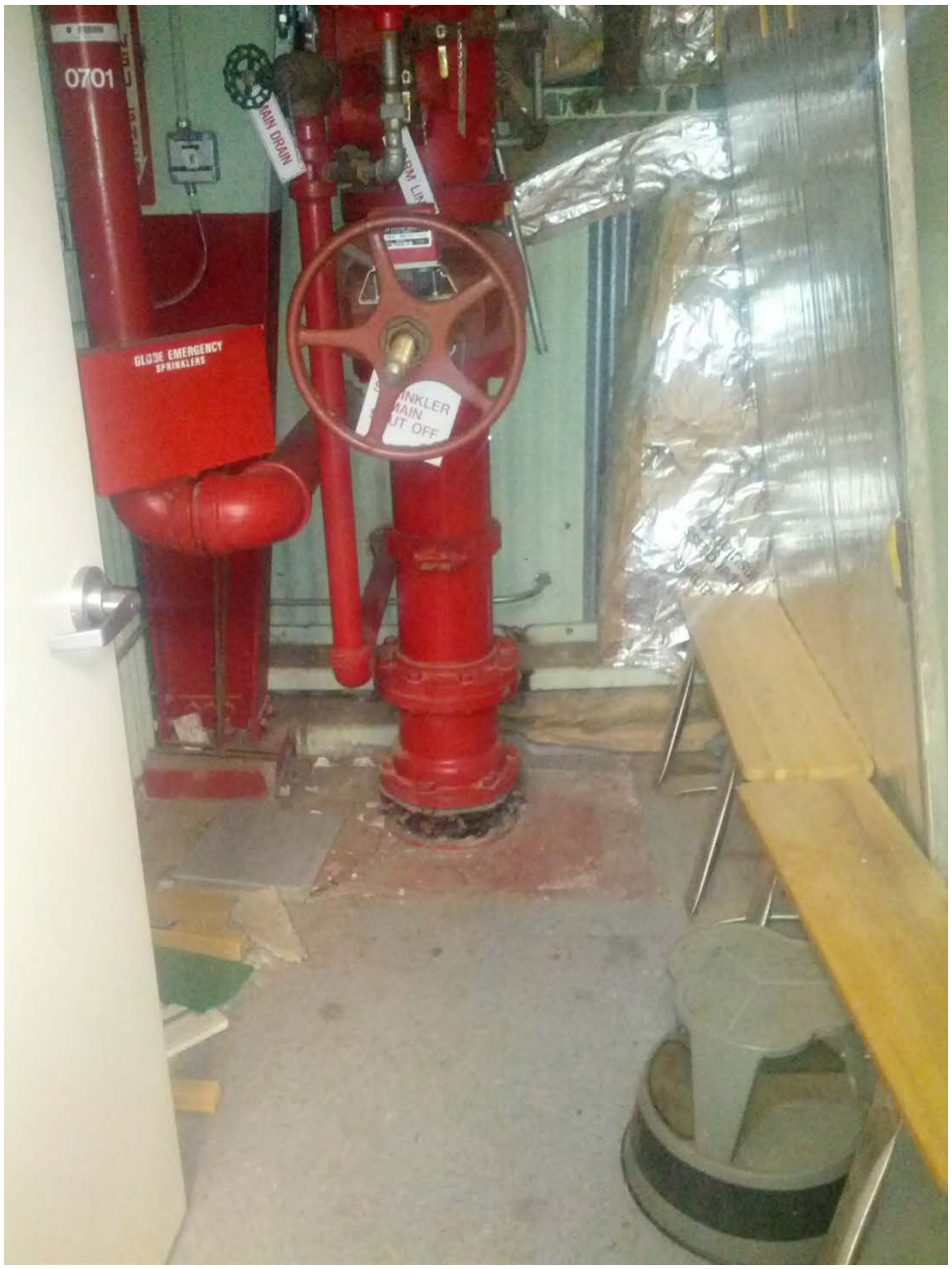

Photo 17. Building 4807. Fire suppression water pipes coming out of ground in closet of training room (Room 6). Sub-slab and indoor air sampling are proposed in Room 6 due to occupancy and presence of utility lines that may provide a vapor pathway.

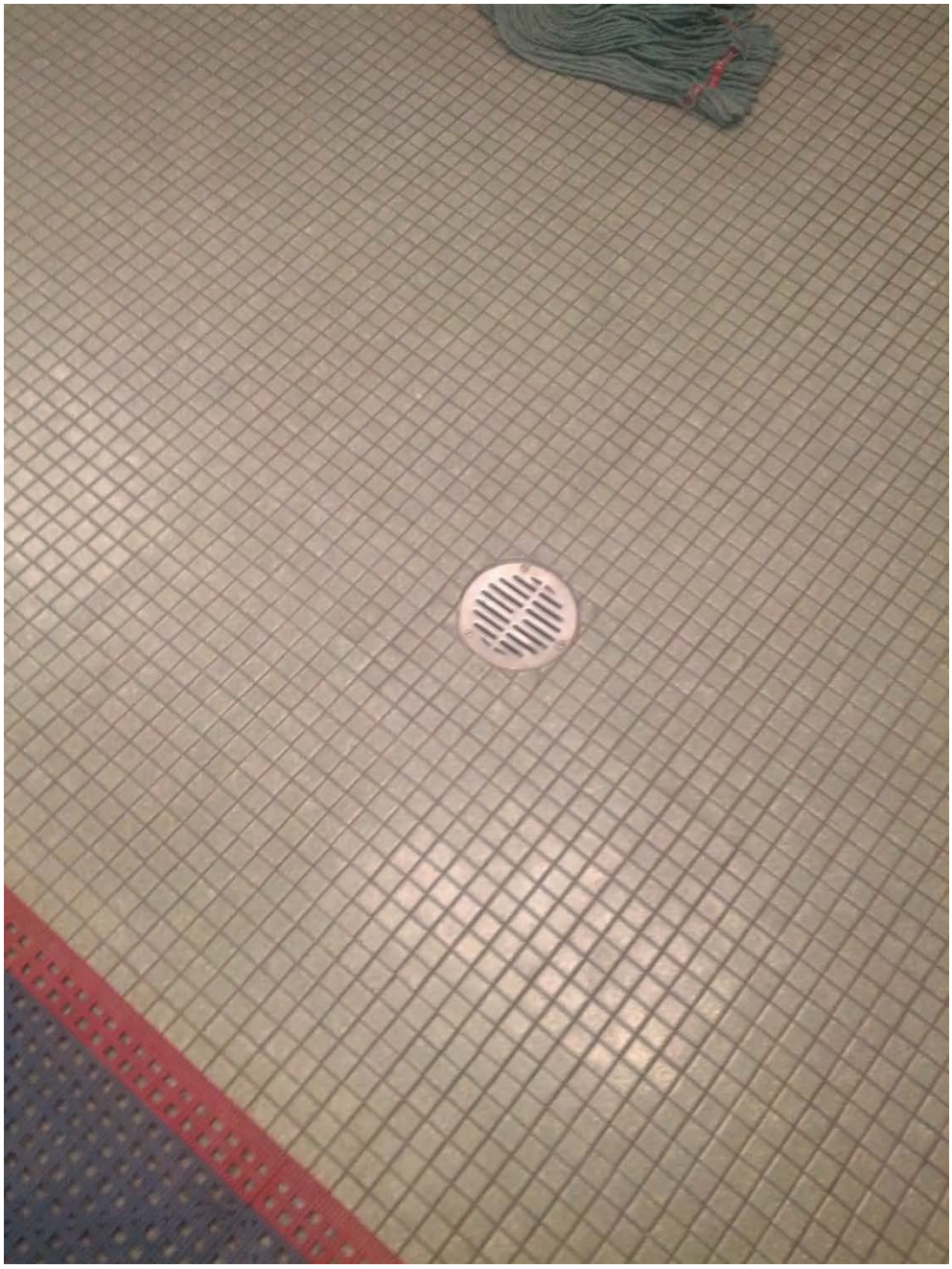

Photo 18. Building 4807. Typical floor drain found in bathroom (Room 4) and shower room (Room 2). Sub-slab and indoor air sampling are proposed in adjacent locker room (Room 1) due to occupancy and presence of utility lines that may provide a vapor pathway.

Photo 19. Building 4807. Door in Room 6 leading into Building 4808. There is an approximate 5 to 6 inch gap underneath door. Building 4808 is used for storage.

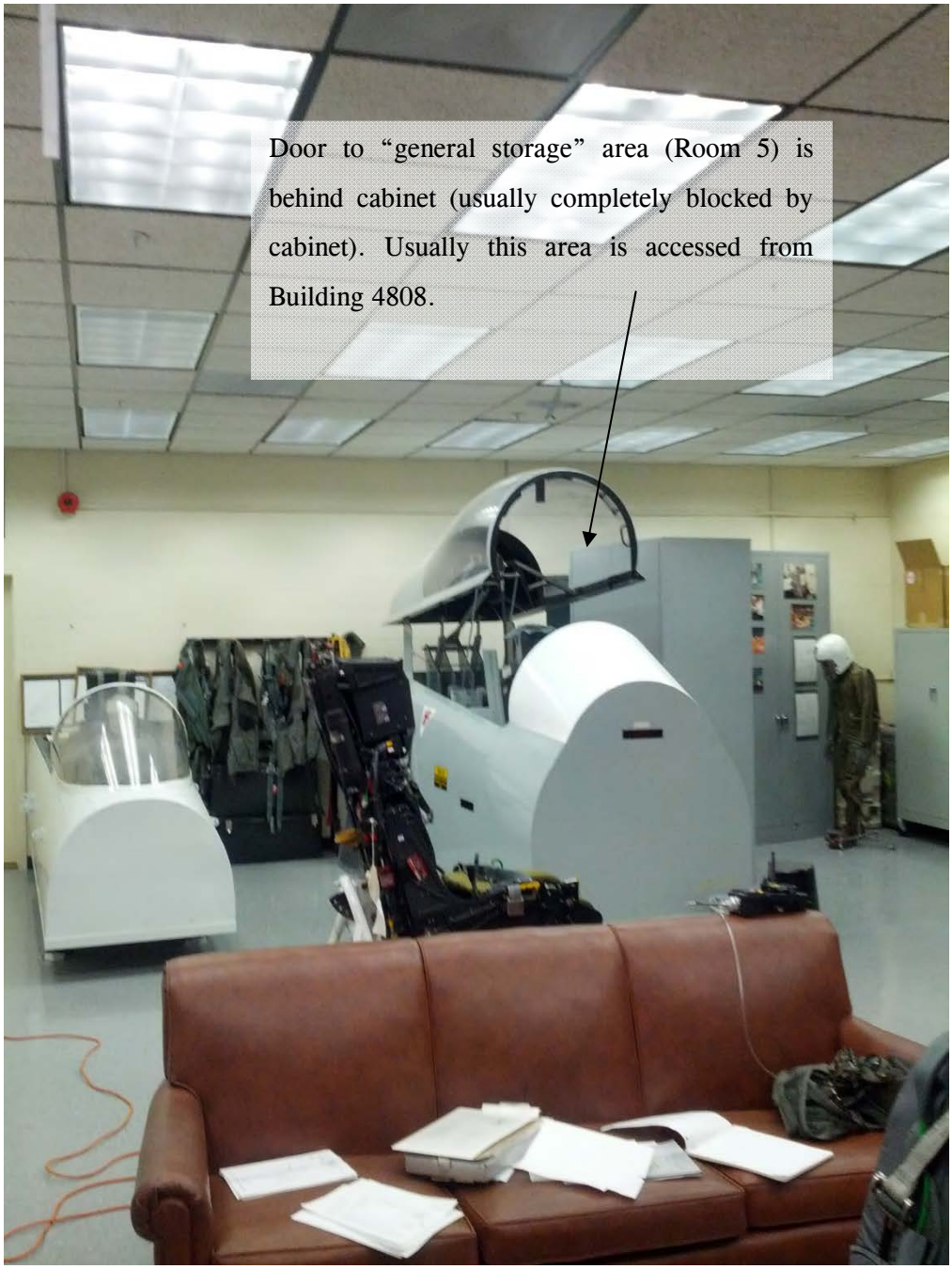

Photo 20. Building 4807. Photo of pilot training room (Room 6). This room is occupied by approximately 2 to 4 people during training sessions.

Photo 21. Building 4807. Gym area (Room 7) (photo taken facing south).

Photo 22. Building 4807. Aircraft parts storage warehouse (Room 8) in southern portion of Building 4807. Note the large doorway that connects to Building 4808. Photo is taken facing to the west. Sub-slab and indoor air sampling are proposed in Room 8 as this area accounts for 50% of the building square footage and is open to Building 4808 (also used for storage).

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B2.0 BUILDING 4810

- Estimated depth to bedrock – 8 feet bgs
- Estimated depth to groundwater – 5 feet bgs (based on Well N7-MW10 located approximately 90 feet east of the southeast corner of Building 4810)
- Estimated concentrations of groundwater contaminants beneath the building – Building 4810 is located upgradient and approximately 60 feet laterally from the TCE plume. Well N7-MW07 is located approximately 70 feet laterally from Building 4810 and near a former potential source area (former drum storage area). A TCE concentration of 29 μg/L was detected in a groundwater sample collected from Well N7-MW07 in March 2002. Well N7-MW08 is located approximately 85 feet east of Building 4810 and approximately 150 feet from the former drum storage area. A TCE concentration of 4.9 μg/L was detected in a groundwater sample collected from Well N7-MW08 in May/June 2012.
- Nearest identified potential point sources: Former solvent drum storage areas.

Building 4810 (Photo 23) is a 12,644-square foot administration building for NASA's Facility group. The building includes mostly office space consisting of cubicles, conference room, breakroom, document storage, tool storage, and pharmacy. Approximately 75 people occupy the building 8 hours daily during the work week.

Photo 23. North side of Building 4810 (photo facing south).

Photo 24. West side of Building 4810 (facing southeast).

Photo 25. East side of Building 4810.

Photo 26. Crew crib (photo facing north). Doors to tool storage/stock room (Room 16), office (Room 17), and crew men's room in background. Sub-slab and indoor air sampling are proposed in the crew crib area near Offices/Rooms 17 to 20.

Photo 27. Floor drain for water machine in crew breakroom (facing east).

Photo 28. Tool storage/stock room clerk area (Room 16) just inside door (photo facing east). Sub-slab and indoor air sampling are proposed in Room 16.

Photo 29. “Pharmacy” area (Room 16A) (facing north). Door in background opens to Room 15.

Photo 30. Room 15 facing south (fire protection workshop).

Photo 31. Doors to offices (15A and 15B) in fire protection area (photo facing south).

Photo 32. Room 14 document storage area (facing south).

Photo 33. Hallway in the office area (photo facing west). Doors are to offices (Rooms 5-11). Sub-slab and indoor air sampling are proposed in the hallway across from Room 11 (last room on the left in the photo).

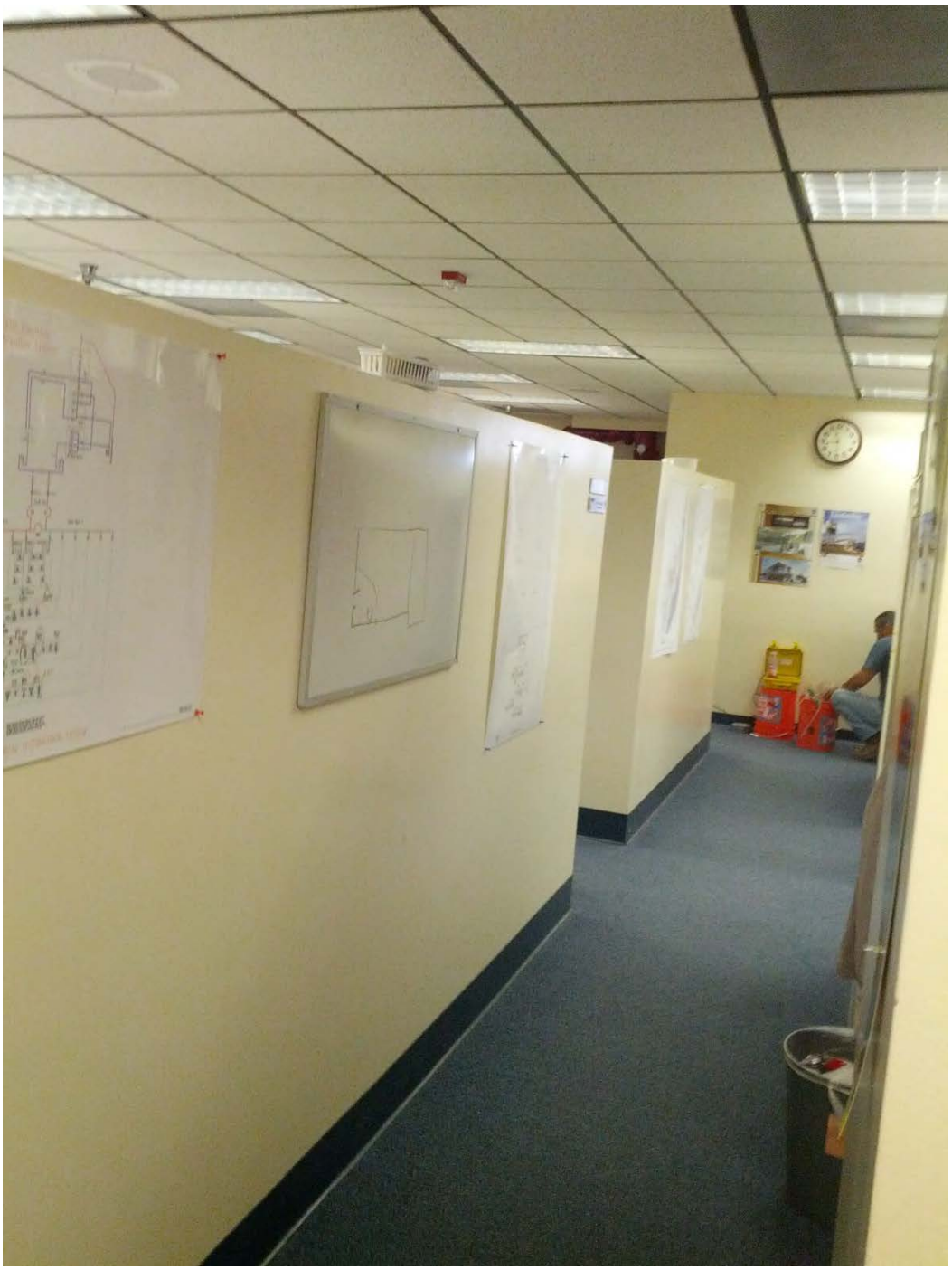

Photo 34. The cubicle area (Room 2). Photo is facing west.

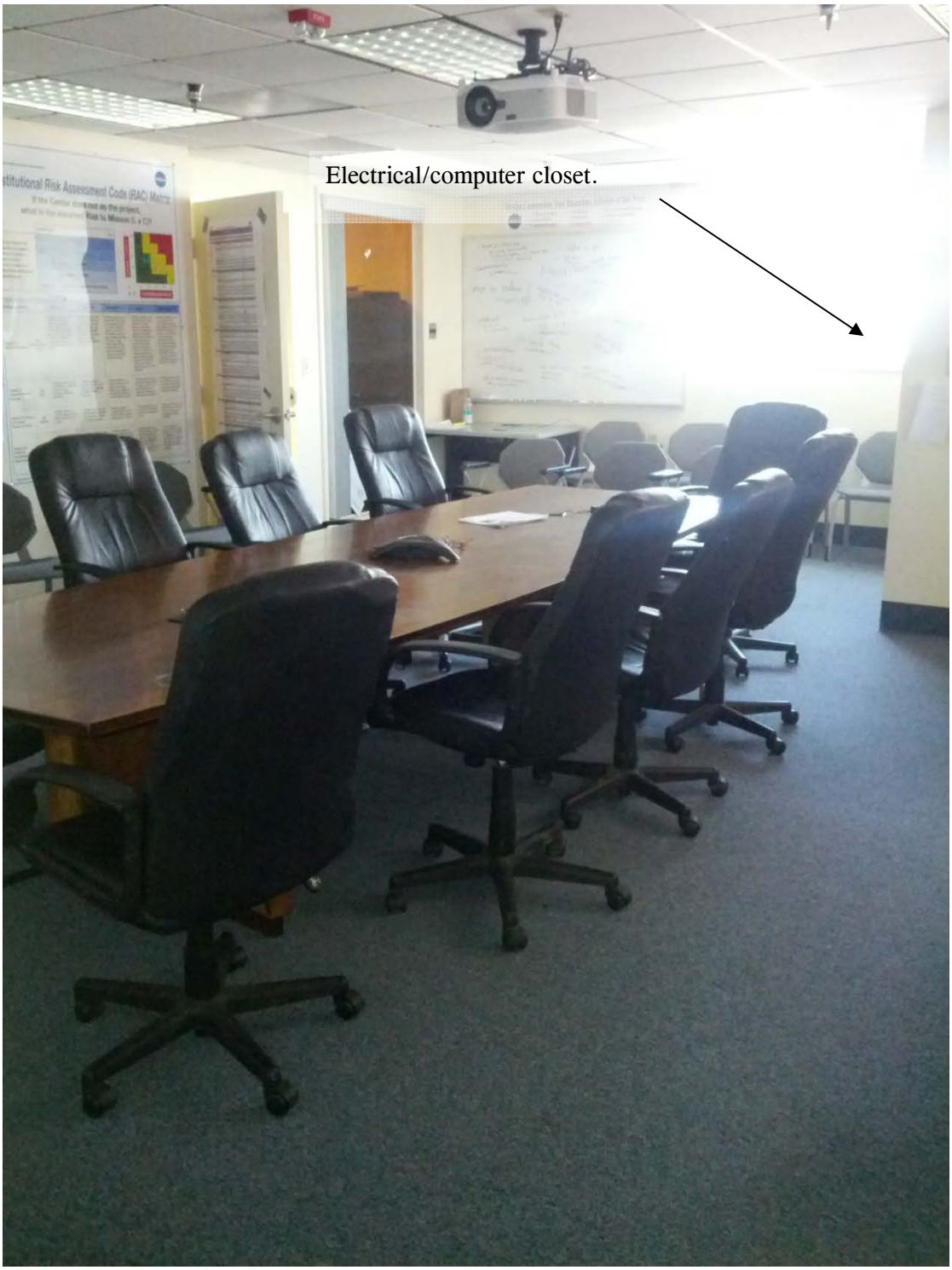

Photo 35. The conference room area (Room 1C) (facing north). Electrical closet pictured in following photo is in right top corner of photo.

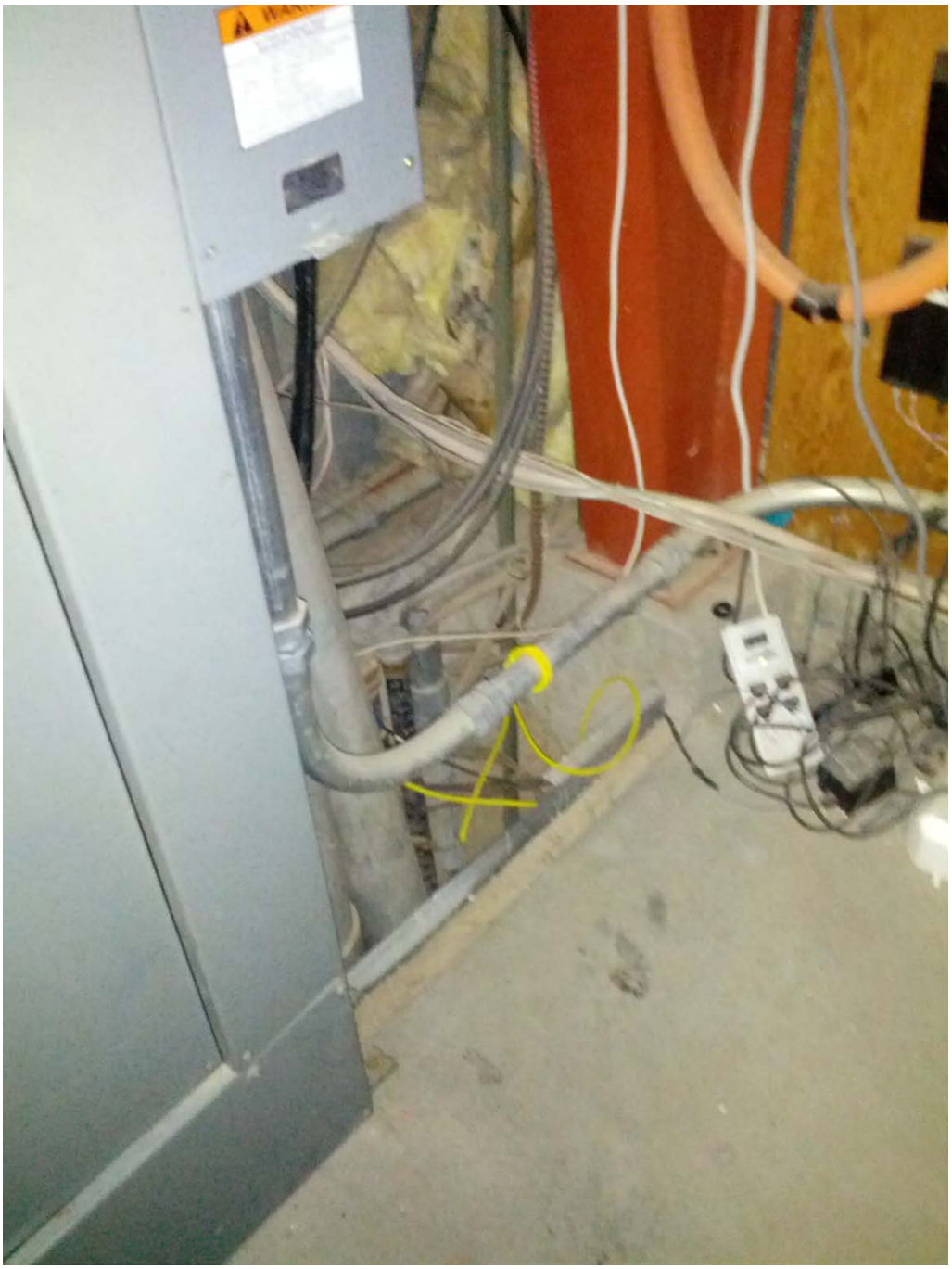

Photo 36. Conduits exiting floor in electrical/computer closet in the northeast corner of conference room (Room 1C).

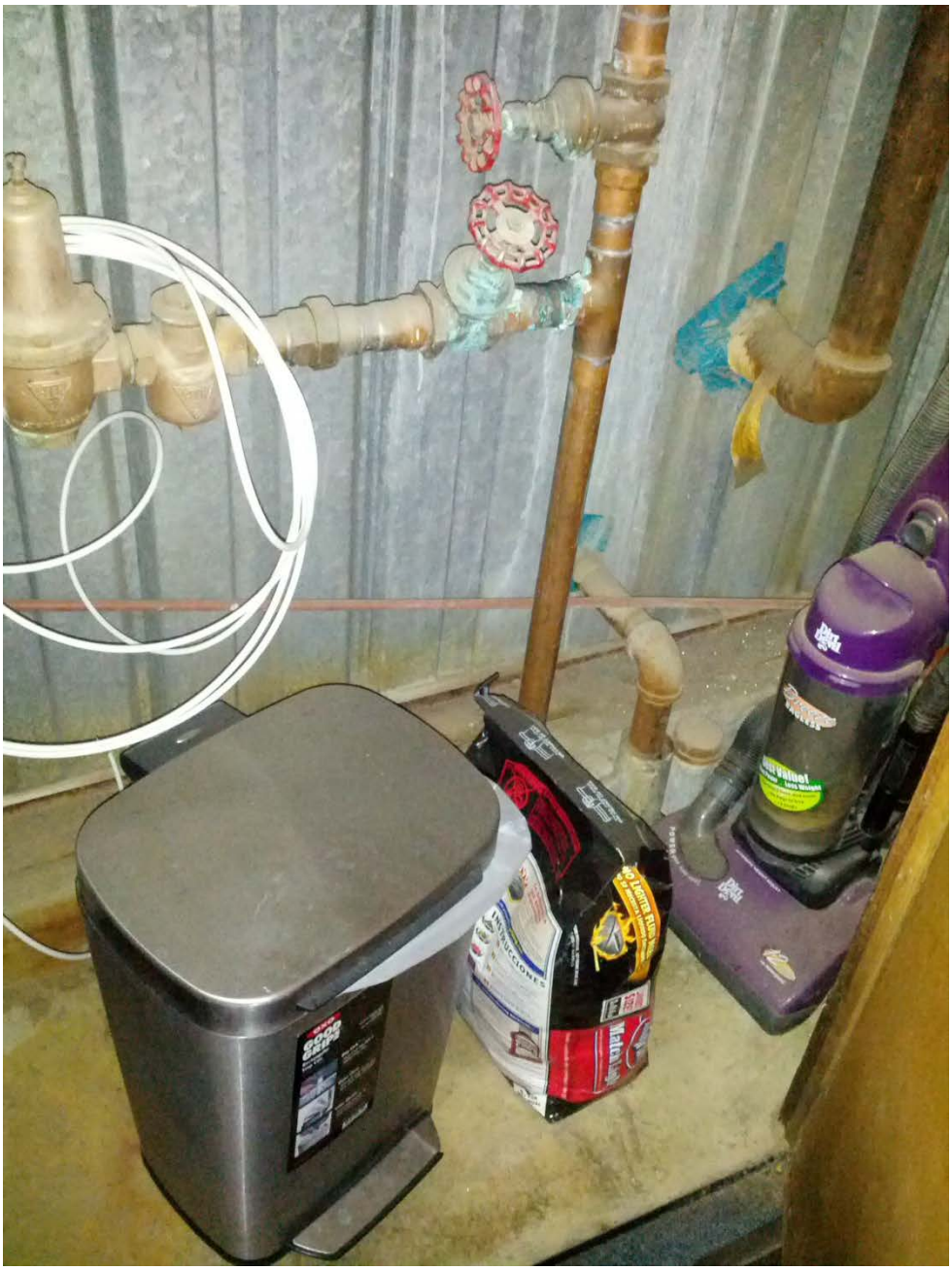

Photo 37. View of water pipes in the kitchen storage closet.

Photo 38. Fire suppression water pipes exiting the floor in Room 2 (cubicle area). Sub-slab and indoor air sampling are proposed in this area.

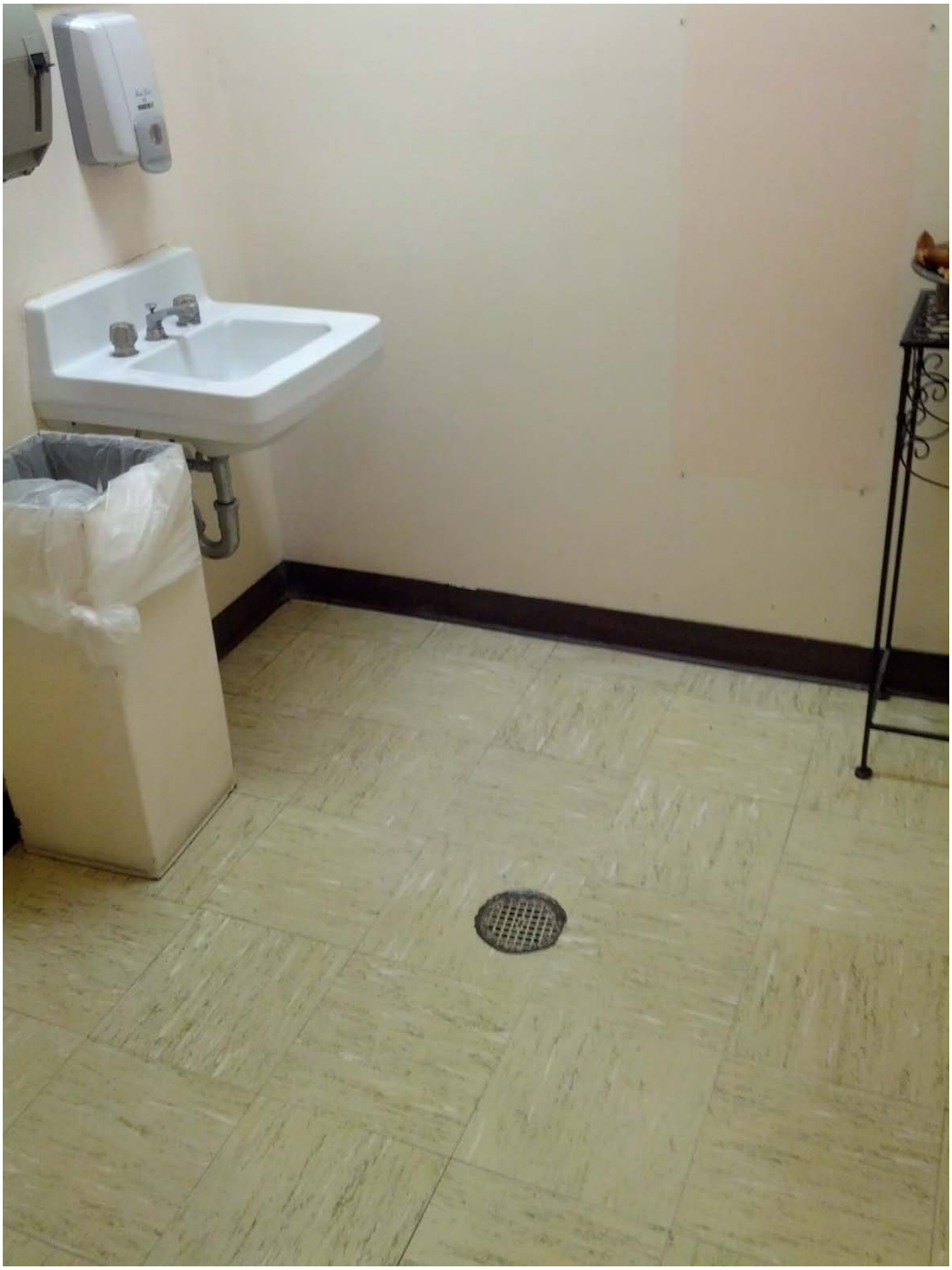

Photo 39. Typical floor drain in restroom areas throughout building.

Building Survey Forms

Building Survey Form

Date 6-5-2012 / 6-6-12

Building ID: 4806 Project No.: 60133976 03.01

Project Name: NASA VIP SURVEY

Preparer's Name: Alonzo Poach Building Location: NASA Dryden EAFB

Facility Manager: Nick Kiriokos (661- 276-3366) Contract Number: FA8903-08-D-8770

A. Building Information:

Estimated number of occupants: 2 (sometimes up to 6)

Normal hours of operation: 0600 to 1600 hours

Building Activities: Office space, battery charging area (aircraft and car) and vehicle maintenance shop

Describe how building space is used: Used as an office space for 1-2 people and shop area for 1-2 people on a regular basis

B. Building Construction:

Foundation type: Slab-on grade yes / no

If no describe:

Foundation thickness (in inches): 4 inches with 6 inches of curbing

Foundation sealed/painted: yes / no

If yes describe where and type: Unknown

Engineered fill below foundation: yes / no

If no describe:

Basement in building: yes / no

If yes does it contain a sump?: yes / no

Framing: Cinder block walls**:** yes / no

If no describe: Interior wall divide only

Building Age: Approximately 50 years **Number of stories:** 1

Is building insulated? Roof only. yes / no

Number of elevators in building: 0

Condition of elevator pits (sealed, open, other): NA

Ceiling height: Center beam ~ 25 feet

Building Survey Form

Date 6-5-2012 / 6-6-12

C. Building Ventilation:

Describe type of heating system: 3 Ceiling mounted natural gas-fired heaters

Describe seasonal variation in HVAC operation: High cooling usage in summer months, high heating usage in winter

Describe operation of HVAC (recycled air /fresh air/combination): Evaporative coolers (swamp coolers)

Describe type of air conditioning: Swamp coolers (port-a-cool units for extremely hot days)

List manufacturer of heating /cooling unit: To be determined, units are located on the roof and were inaccessible during initial building survey

HVAC unit size: To be determined

HVAC estimated maximum flow: To be determined

Normal hours of HVAC operation: To be determined

Temperature settings: Comfort cooling with roof mounted evaporative coolers and port-a-cool units

a. Daytime:

b. Night:

c. Weekends:

Windows or doors frequently left open:

If yes describe why and location: Generally no, with the exception of the shop roll up door, which is usually left open when working on vehicles

Describe other ventilation fans (bathroom, kitchen, open windows, mechanical fans) size, and frequently of use:

Ventilation fans in restroom (runs daily during business hours). Roof ventilators.

D. Potential Indoor Sources

1. Does the building have a kitchen? Yes / No

If yes describe:

2. Are vehicles parked in the building? Yes / No

If yes describe: Industrial trucks (aircraft tugs, forklifts, aircraft ground equipment etc.)

3. Is there a workshop in the building? Yes / No

If yes describe: 90% workshop/ 10% office space

4. Is there an inventory of products used in the building? Yes / No

MSDS available? Yes / No

Building Survey Form

Date 6-5-2012 / 6-6-12

Which of these items are present in the building? (Check all that apply)

NASA Dryden maintains chemical inventories for different areas or zones within the NASA Dryden complex. Buildings 4806 and 4807 are part of the "4809A1 zone". Many of the chemicals inventoried by NASA Dryden contain VOCs. At any given time any of the chemicals included in the zone inventory could be in use at Buildings 4806 and 4807. Prior to any indoor air sampling events, a robust sampling event building survey will be conducted to identify VOC sources present.

Potential VOC Source	✓	Location of Source*	Removed at least 1 week (Yes/No/NA; indicate when prior to sampling
Paints	X	Possibly present in flammable storage cabinet (Room 5)	Not applicable for initial building survey
Gas-powered equipment	X	Shop Area (Room 9)	Not applicable for initial building survey
Gasoline storage cans	X	Possibly present in flammable storage cabinet (Room 5)	Not applicable for initial building survey
Cleaning solvents (thinner)	X	Possibly present in flammable storage cabinet (Room 5)	Not applicable for initial building survey
Air fresheners	X	Bathrooms	Not applicable for initial building survey
Oven cleaners			
Carpet/upholstery cleaners			
Hairspray			
Nail polish/polish remover			
Bathroom cleaner	X	Bathroom	Not applicable for initial building survey
Appliance cleaner			
Furniture/Floor polish			
Mothballs			
Fuel tank			
Woodstove			
Fireplace			
Perfume/Colognes			
Hobby supplies (e.g., solvents, paints, lacquers, glues, photographic darkroom chemicals)			
Scented trees, wreaths, potpourri, etc.			
Polish/Wax			
Insecticide/Pesticide			
Kerosene			
Other[1] (brake cleaner, carburetor cleaner, adhesives, grease)	X	Many of the chemicals inventoried by NASA Dryden contain VOCs.	Prior to any indoor air sampling events, a robust sampling event building survey will be conducted to identify VOC sources present.

Notes:

*See Figure B1 for room locations.

Building Survey Form

Date 6-5-2012 / 6-6-12

[1]Two solvent tanks located in shop areas, a battery shop floor drain, and a satellite accumulation point were identified in Building 4806 during an expanded investigation at OU6 as documented in the *Base-wide Expanded Source Investigation/Resource Conservation and Recovery Act Facility Assessment* (ESI/RFA) (The Earth Technology Corporation, 1993). The solvent tanks reportedly managed solvent (PD-680) potentially containing POL. The solvent tanks were replaced with tanks currently containing water-based cleaners (Chemfree SmartWasher®). The satellite accumulation point reportedly managed waste hydraulic fluids, lubricating oil, grease, antifreeze coolant, crushed oil cans and filters, and solvents. The satellite accumulation point appears to have been located in the east corner of Room 5. The ESI/RFA reported no history or evidence of release for the solvent tanks and accumulation point and PD-680 is no longer used (replaced with Chemfree SmartWasher®). NASA Dryden has confirmed the existence of the accumulation point which currently manages "dirty rags". The battery shop floor drain was reportedly connected to NASA's sanitary sewer. Anecdotal reports indicated possible release of battery acid and potassium hydroxide and corrosion near the floor drain was noted. A March 2012 work order indicated that the floor drain had been repaired.

E. Building Inspection for VIP pathways:

1. Are there any existing piping or conduits entering building through foundation? Yes / No See photos and Figure B1

If yes describe and locate on sketch (Section H). _____

2. Are there any holes drilled in the foundation? Yes / No _____

If yes describe and locate on sketch (Section H). _____

3. Any flow observed from identified pathways: Yes / No _____

If yes describe how it was evaluated (air flow tubes). _____

F. Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: On

Window open during measurements? Yes / No

Instrument used to measure temperature: CENTECH IR Thermometer

Instrument used to measure pressure: OMNI Guard Differential Pressure Recorder

Building Survey Form

Date 6-5-2012 / 6-6-12

Pressure, Temperature, and PID Readings

(Note location where measurements were taken on sketch)

Outside temperature: 70 °F (avoid direct sunlight)

Outside pressure: Differential pressure measured Pa (avoid windy location)

Prior to indoor air sampling

Time : 0845 (6/6/12)

G. Building Screening Results

Photo-ionization detector (PID) instrument used: RAE ppbRAE 3000 (10.6eV)

Room Description or ID (label sketch or map)[1]	Temperature (Fahrenheit)	Pressure (Pa)	PID Reading *(specify units)*[2,3]	Comments (i.e. fan running, odors, etc.)
#1 Battery charging area	69	0.0	~~10.23 ppm~~	
#2 Battery workshop	69	0.0	~~9770 ppb~~	
#3 Office	71	0.0	~~12.69 ppm~~	
#4 Battery storage	68	-0.5	~~12.48 ppm~~	
#5 Shop	67	-1.5	~~471 ppb~~	
#6 Battery charging area	67	0	~~4021 ppb~~	
#7 Restroom	66	-1.5	~~2077 ppb~~	Exhaust fan running
#8 Shop	68	0.0	~~4400 ppb~~	
#9 Shop	72	0	~~9000 ppb~~	
#10 Office	69	0.0	~~5816 ppb~~	
#11 Tool storage	67	-0.5	~~10.76 ppm~~	
#12 Sheet metal storage	69	+2.5	~~322 ppb~~	

Notes:

[1]See Figure B1 for room locations.

[2]The purpose of the initial building survey was to identify building occupancy patterns, preferential flow pathways and chemical usage for the purposes of selecting sub-slab vapor sampling locations. Although, PID readings can be used as one line of evidence for selecting sub-slab sampling locations, the PID readings measured during the Building 4806 initial building survey are not a valid line of evidence for locating sub-slab sampling locations due to the presence of multiple VOC sources. VOC sources included (a) a gas-powered vehicle (parked and in maintenance in the building), (b) a fume hood, and (c) a flammable storage cabinet. Therefore PID measurements were not considered in proposed sub-slab sample location placement.

[3]Although considered a feature, the RAE ppbRAE 3000 variable unit display possibly introduced error in recording PID reading units. Depending on the atmosphere encountered, units of ppb or ppm are displayed. Readings below 10,000 ppb are displayed in ppb units, while readings above 10,000 ppb are displayed in ppm units. Given the uncertainty in the PID measurements recorded during the initial building survey, NASA Dryden performed a supplemental survey (See Attachment 1).

Sub-slab wells (if available):

Sub-slab well ID _____ _____Pa

Sub-slab well ID _____ _____Pa

Sub-slab well ID _____ _____ Pa

Sub-slab well ID _____ _____ Pa

Building Survey Form

Date 6-5-2012 / 6-6-12

H. Sketch of Building:

(Include rooms and dimensions, locations of doorways, where pressure measurements where collected, ventilation fans, windows, air ducts, and locations of any potential pathways for vapor intrusion into the building from the subsurface, i.e., piping, conduits, sumps, elevator shafts, etc.)

See attached Figure B1.

ATTACHMENT 1. PHOTOIONIZATION DETECTOR READINGS
BUILDING 4806

Performing Organization:	NASA Dryden SH&E
Instrument:	MiniRAE 2000 PID (10.6eV)[c,d]
Measurement Date[b]:	1 August 2012
Room Number[a]	PID Reading (ppm)
1	2.5 (maximum)[e]
2	3.7 (maximum)[e]
3	2.6 (maximum)[e]
4	0.0
5	0.2
6	0.2
7	0.4
8	0.7
9	NA
10	NA
11	0.8
12	NA

Notes:

[a] Refer to Figure B1 for room locations.

[b] Exact measurement locations and conditions (i.e., HVAC settings, time of day) were not duplicated between the initial building survey (5 and 6 June 2012) and the supplemental survey (1 August 2012).

[c] Low Range Detection Limit is 0.1 ppm.

[d] NASA Calibration# 1648643. Calibration Date: 09-19-2011. Calibration Due Date: 09-19-2012.

[e] Maximum result observed during reading. Results not identified as maximum are averages or stabilized readings.

eV = electron volts
NA = not accessible, no measurement taken, room not accessible
NASA = National Aeronautics and Space Administration
PID = photoionization detector
ppm = parts per million
SH&E = Safety, Health, and Environmental Office

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Building Survey Form

Date 6-6-2012

Building ID: **4807** (Sean, Onsite contact)

Project No.: 60133976 03.01

Project Name: NASA VIP SURVEY

Preparer's Name: Alonzo Poach

Building Location: NASA Dryden EAFB

Facility Manager: Ray Kenny (661-276-3669)

Contract Number: FA8903-08-D-8770

A. Building Information:

Estimated number of occupants: 4-6 people

Normal hours of operation: 0630 to 1600 hours

Building Activities: North end of building is used as a training and locker area for NASA pilots. South end of building is an aircraft part storage warehouse

Describe how building space is used: Training room for pilots (basketball court, showers, laundry, locker room, and general training area (ejection seat, parachute, etc.)

B. Building Construction:

Foundation type: Slab-on grade (yes) / no

If no describe:

Foundation thickness (in inches): 4 inches with 6 inches of curbing

Foundation sealed/painted: yes / no

If yes describe where and type: Unknown

Engineered fill below foundation: (yes) / no

If no describe:

Basement in building: yes / (no)

If yes does it contain a sump?: yes / no

Framing: Cinder block walls**:** (yes) / no

If no describe: Interior wall divide only

Building Age: Approximately 50 years **Number of stories:** 1

Is building insulated? (yes) / no

Number of elevators in building: 0

Condition of elevator pits (sealed, open, other):

Ceiling height: 9 feet in general areas and approximately 20-25 feet in basketball court

Building Survey Form

Date 6-6-2012

C. Building Ventilation:

Describe type of heating system: Heat Pump (supplying Locker Room [Room 1]), 2250 CFM air flow

Describe seasonal variation in HVAC operation: High heating use in winter and high cooling use in summer

Describe operation of HVAC (recycled air /fresh air/combination):

Describe type of air conditioning: Roof-mounted air conditioning unit shared by Buildings 4807 and 4808

List manufacturer of heating /cooling unit: TRANE Model No. SHP 504c

HVAC unit size: To be determined

HVAC estimated maximum flow: 60 CY condenser fan

Normal hours of HVAC operation: To be determined

Temperature settings:

a. Daytime: To be determined. Controlled by NASA's Facilities Group

b. Night:

c. Weekends:

Windows or doors frequently left open:

If yes describe why and location: NO

Describe other ventilation fans (bathroom, kitchen, open windows, mechanical fans) size, and frequently of use:

Ventilation fans in restrooms and shower areas. (frequency varies based on use). Roof ventilators.

D. Potential Indoor Sources

1. Does the building have a kitchen? Yes / No

If yes describe:

2. Are vehicles parked in the building? Yes / No

If yes describe:

3. Is there a workshop in the building? Yes / No

If yes describe: South end of building.

4. Is there an inventory of products used in the building? Yes / No

MSDS available? Yes / No

Building Survey Form

Date 6-6-2012

Which of these items are present in the building? (Check all that apply)

NASA Dryden maintains chemical inventories for different areas or zones within the NASA Dryden complex. Buildings 4806 and 4807 are part of the "4809A1 zone". Many of the chemicals inventoried by NASA Dryden contain VOCs. At any given time any of the chemicals included in the zone inventory could be in use at Buildings 4806 and 4807. Prior to any indoor air sampling events, a robust sampling event building survey will be conducted to identify VOC sources present.

Potential VOC Source	✓	Location of Source*	Removed at least 1 week (Yes/No/NA; indicate when prior to sampling
Paints			
Gas-powered equipment			
Gasoline storage cans			
Cleaning solvents (thinner)			
Air fresheners	X	Bathrooms.	Not applicable for initial building survey
Oven cleaners			
Carpet/upholstery cleaners			
Hairspray			
Nail polish/polish remover			
Bathroom cleaner			
Appliance cleaner			
Furniture/Floor polish	X	Likely applied to basketball court (Room 7)	Not applicable for initial building survey
Mothballs			
Fuel tank			
Woodstove			
Fireplace			
Perfume/Colognes			
Hobby supplies (e.g., solvents, paints, lacquers, glues, photographic darkroom chemicals)	X	Lacquers likely applied to basketball court (Room 7)	Not applicable for initial building survey
Scented trees, wreaths, potpourri, etc.			
Polish/Wax	X	Likely applied to basketball court (Room 7)	Not applicable for initial building survey
Insecticide/Pesticide			
Kerosene			
Other (brake cleaner, carburetor cleaner, adhesives, grease)	X	Many of the chemicals inventoried by NASA Dryden contain VOCs.	Prior to any indoor air sampling events, a robust sampling event building survey will be conducted to identify VOC sources present.

Note:

*See Figure B1 for room locations.

Building Survey Form

Date 6-6-2012

E. Building Inspection for VIP pathways:

1. Are there any existing piping or conduits entering building through foundation? Yes / No See photos and Figure B1

If yes describe and locate on sketch (Section H). _____

2. Are there any holes drilled in the foundation? Yes / No _____

If yes describe and locate on sketch (Section H). _____

3. Any flow observed from identified pathways: Yes / No _____

If yes describe how it was evaluated (air flow tubes). _____

F. Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: On

Window open during measurements? Yes / No

Instrument used to measure temperature: CENTECH IR Thermometer

Instrument used to measure pressure: OMNI Guard Differential Pressure Recorder

Pressure, Temperature, and PID Readings

(Note location where measurements were taken on sketch)

Outside temperature: 68 °F (avoid direct sunlight)

Outside pressure: Differential pressure measured Pa (avoid windy location)

Prior to indoor air sampling

Time : 0730

G. Building Screening Results

Photo-ionization detector (PID) instrument used: RAE ppbRAE 3000 (10.6eV)

Room Description or ID (label sketch or map)[1]	Temperature (Fahrenheit)	Pressure (Pa)	PID Reading *(specify units)*[2,]	Comments (i.e. fan running, odors, etc.)
Locker room (#1)	63	-1.0	~~60 ppb~~	
Shower area (#2)	55	-1.0	~~70 ppb~~	
Sauna (#3)	65	-1.0	~~5 ppb~~	
Bathroom (#4)	65	-1.5	~~47 ppb~~	
General storage (#5)	71	-1.5	~~Not recorded~~	
Physical Training room (#6)	66	-1.5	~~13 ppb~~	
Basketball court (#7)	68	-1.0	~~428 ppb~~	
Aircraft parts storage (#8)	71	+0.5	~~849 ppb~~	

Notes:

Building Survey Form

Date 6-6-2012

[1]See Figure B1 for room locations.

[2]The purpose of the initial building survey was to identify building occupancy patterns, preferential flow pathways and chemical usage for the purposes of selecting sub-slab vapor sampling locations. Although PID readings can be used as one line of evidence for selecting sub-slab sampling locations, the PID readings measured during the Building 4807 initial building survey are not a valid line of evidence for locating sub-slab sampling locations due to the presence of multiple VOC sources per NASA Dryden-maintained chemical inventories. Therefore PID measurements were not considered in proposed sub-slab sample location placement.

Sub-slab wells (if available):

Sub-slab well ID _____ _____Pa

Sub-slab well ID _____ _____Pa

Sub-slab well ID _____ _____ Pa

Sub-slab well ID _____ _____ Pa

Additional notes regarding flooring:

“Vinyl Asbestos Tile Floor” indicated for Rooms 1 and 6 on as builts.

Building Survey Form

Date 6-6-2012

H. Sketch of Building:

(Include rooms and dimensions, locations of doorways, where pressure measurements where collected, ventilation fans, windows, air ducts, and locations of any potential pathways for vapor intrusion into the building from the subsurface, i.e., piping, conduits, sumps, elevator shafts, etc.)

See attached Figure B1.

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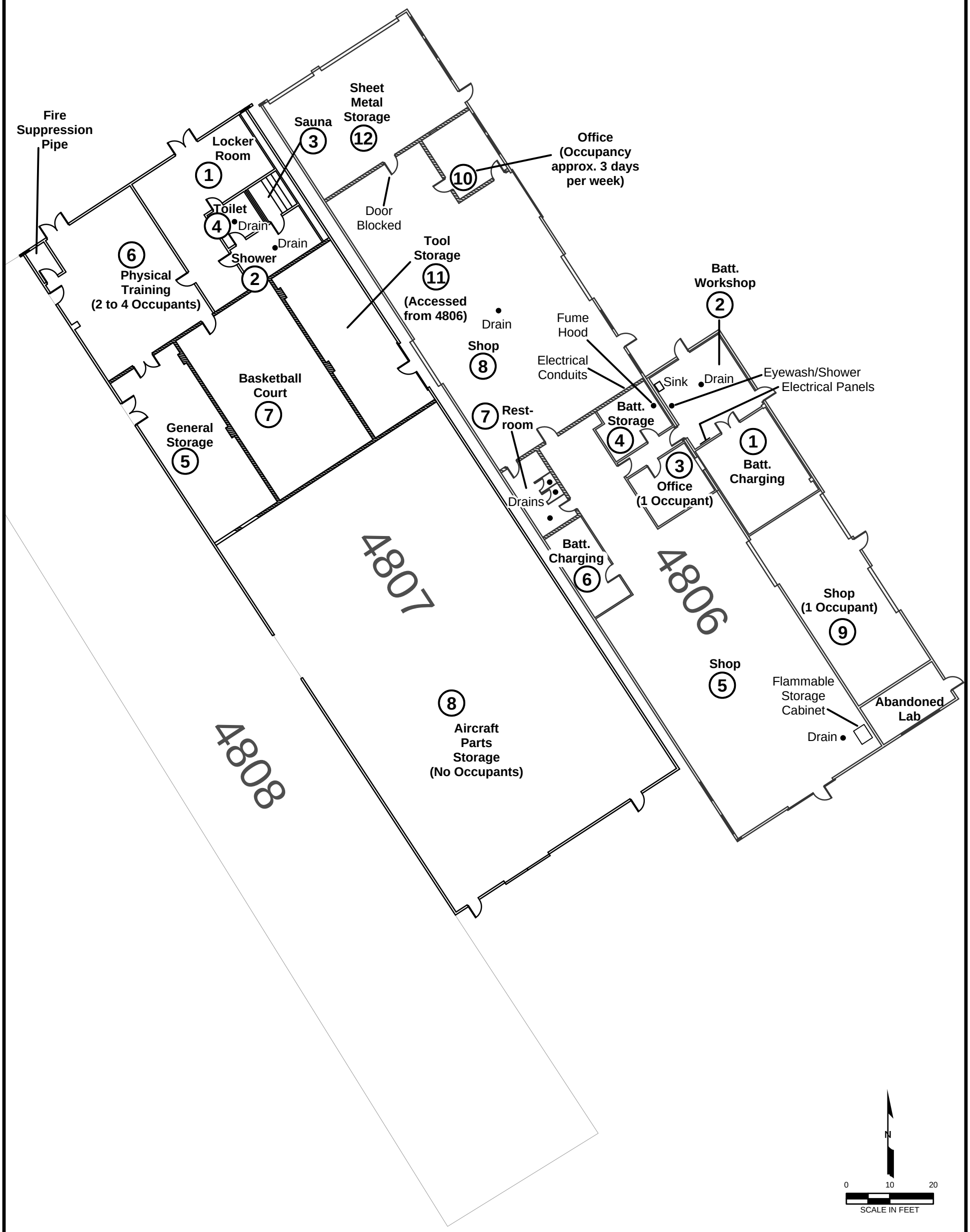


FINAL

EXPLANATION

BUILDING OCCUPANCY
BUILDING 4806 - 2 TO 6
BUILDING 4807 - 4 TO 6

BUILDING AREA
BUILDING 4806 - 10,030 SQUARE FEET
BUILDING 4807 - 11,011 SQUARE FEET

② ROOM NUMBER

NOTE:
SINGLE-STORY BUILDINGS ON CONCRETE SLAB.

Buildings 4806 and 4807

Date 03-2013	Operable Unit 6 Vapor Intrusion Sampling Plan & Risk Assessment Work Plan Edwards AFB	Figure
Project No. 60133976		B1

Building Survey Form

Date 6-5-2012

Building ID: 4810

Project Name: NASA VIP SURVEY

Project No.: 60133976 03.01

Preparer's Name: Alonzo Poach

Building Location: NASA Dryden EAFB

Facility Manager: Dan Eason (661-276-2078)

Contract Number: : FA8903-08-D-8770

A. Building Information:

Estimated number of occupants: 75

Normal hours of operation: 0600 to 1700 hours

Building Activities: General office space (~60%), workshop (~30%), and warehouse (~10%)

Describe how building space is used: General office space and workshop/ warehouse for HVAC, electrical, mechanical, plumbing, and fire system mechanics

B. Building Construction:

Foundation type: Slab-on grade (yes) / no

If no describe:

Foundation thickness (in inches): 4 inches with 6 inches of curbing

Foundation sealed/painted: yes / no

If yes describe where and type: Unknown

Engineered fill below foundation: (yes) / no

If no describe:

Basement in building: yes / (no)

If yes does it contain a sump?: yes / no

Framing: Cinder block walls**:** yes / (no)

If no describe: Steel frame

Building Age: Warehouse section (~50 years) office section (~30 years) **Number of stories:** 1

Is building insulated? (yes) / no

Number of elevators in building: 0

Condition of elevator pits (sealed, open, other):

Ceiling height: 9 feet in office areas and approximately 20 feet in shop and warehouse areas

Building Survey Form

Date 6-5-2012

C. Building Ventilation:

Describe type of heating system: Packaged heating/ air conditioning and evaporative coolers (swamp coolers)

Describe seasonal variation in HVAC operation: See temperature settings

Describe operation of HVAC (recycled air /fresh air/combination): Combination

Describe type of air conditioning: Mechanical cooling

List manufacturer of heating /cooling unit: 1968 as-built specifies FARR Model 10,000E-19-2 (evap. cooler)

HVAC unit size: To be determined

HVAC estimated maximum flow: To be determined

Normal hours of HVAC operation: 0600 to 1700 hours

Temperature settings:

a. Daytime: Cooling 78 degrees / Heating 68 degrees

b. Night: Cooling 85 degrees / Heating 45 degrees

c. Weekends: Cooling 85 degrees / Heating 45 degrees

Windows or doors frequently left open:

If yes describe why and location: No

Describe other ventilation fans (bathroom, kitchen, open windows, mechanical fans) size, and frequently of use:

Ventilation fans in restrooms (daily use during normal business hours. Roof ventilators.

D. Potential Indoor Sources

1. Does the building have a kitchen? (Yes) / No

If yes describe:

2. Are vehicles parked in the building? Yes / (No)

If yes describe:

3. Is there a workshop in the building? (Yes) / No

If yes describe: South end of building

4. Is there an inventory of products used in the building? (Yes) / No

MSDS available? (Yes) / No

Building Survey Form

Date 6-5-2012

Which of these items are present in the building? (Check all that apply)

NASA Dryden maintains a pharmacy within Building 4810. Many of the chemicals inventoried by NASA Dryden contain VOCs. Prior to any indoor air sampling events, a robust sampling event building survey will be conducted to identify VOC sources present.

Potential VOC Source	✓	Location of Source*	Removed at least 1 week (Yes/No/NA; indicate when prior to sampling
Paints	X	Pharmacy (Room 16A)	Not applicable for initial building survey
Gas-powered equipment			
Gasoline storage cans			
Cleaning solvents (thinner)	X	Pharmacy (Room 16A)	Not applicable for initial building survey
Air fresheners	X	Bathrooms, Pharmacy	Not applicable for initial building survey
Oven cleaners			
Carpet/upholstery cleaners			
Hairspray			
Nail polish/polish remover (Acetone)	X	Pharmacy (Room 16A)	Not applicable for initial building survey
Bathroom cleaner	X	Pharmacy (Room 16A)	Not applicable for initial building survey
Appliance cleaner			
Furniture/Floor polish	X	Pharmacy (Room 16A)	Not applicable for initial building survey
Mothballs			
Fuel tank			
Woodstove			
Fireplace			
Perfume/Colognes			
Hobby supplies (e.g., solvents, paints, lacquers, glues, photographic darkroom chemicals)			
Scented trees, wreaths, potpourri, etc.			
Polish/Wax	X	Pharmacy (Room 16A)	Not applicable for initial building survey
Insecticide/Pesticide	X	Pharmacy (Room 16A)	Not applicable for initial building survey
Kerosene			
Other (lubricants, fuel additives, grease, adhesives, degreasers, sealants, dry erase markers)	X	Many of the chemicals inventoried by NASA Dryden contain VOCs	Prior to any indoor air sampling events, a robust sampling event building survey will be conducted to identify VOC sources present.

*See Figure B2 for room locations.

E. Building Inspection for VIP pathways:

1. Are there any existing piping or conduits entering building through foundation? (Yes) / No Fire suppression and water pipes (see photos and Figure B2)

If yes describe and locate on sketch (Section H).

2. Are there any holes drilled in the foundation? Yes / (No)

If yes describe and locate on sketch (Section H).

Building Survey Form

Date 6-5-2012

3. Any flow observed from identified pathways: Yes / No

If yes describe how it was evaluated (air flow tubes).

F. Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: On

Window open during measurements? Yes / No

Instrument used to measure temperature: CENTECH IR Thermometer

Instrument used to measure pressure: OMNI Guard Differential Pressure Recorder

Pressure, Temperature, and PID Readings

(Note location where measurements were taken on sketch)

Outside temperature: 58 °F (avoid direct sunlight)

Outside pressure: Differential pressure measured Pa (avoid windy location)

Prior to indoor air sampling

Time : 1000

G. Building Screening Results

Photo-ionization detector (PID) instrument used: RAE ppbRAE 3000 (10.6eV)

Room Description or ID (label sketch or map)[1]	Temperature (Fahrenheit)	Pressure (Pa)	PID Reading *(specify units)*[2,]	Comments (i.e. fan running, odors, etc.)
Crew crib	65	-1	~~0.0 ppb~~	
Breakroom	70	-4.0	~~1.0 ppb~~	
Locker room	64	+4.5	~~0.0 ppb~~	
Crew crib restroom	65	+5.5	~~0.0 ppb~~	Exhaust fan running
# 19	64	-3.5	~~0.0 ppb~~	
# 20	65	+1.0	~~0.0 ppb~~	
# 15 A	68	+6.0	~~0.0 ppb~~	
# 15 B	70	-1.5	~~0.0 ppb~~	
# 14	64	-7.5	~~3.0 ppb~~	
# 5	70	-1.0	~~32 ppb~~	
# 6	70	-2.0	~~18 ppb~~	
# 7	71	-5.5	~~18 ppb~~	
# 8	71	+3.5	~~0.0 ppb~~	Copier room
# 9	71	-5.0	~~21 ppb~~	
# 10	71	-2.5	~~25 ppb~~	
# 11	70	-2.5	~~18 ppb~~	Hallway library
# 12	70	+1.5	~~15 ppb~~	Break room
# 13	71	+ 1.5	~~18 ppb~~	
# 18	67	+6.5	~~0.0 ppb~~	

Building Survey Form

Date _6-5-2012

Room Description or ID (label sketch or map)[1]	Temperature (Fahrenheit)	Pressure (Pa)	PID Reading *(specify units)*[2,]	Comments (i.e. fan running, odors, etc.)
# 17	64	0.0	~~0.0 ppb~~	
# 16	66	+3.5	~~7.0 ppb~~	
# 16A	67	+4.0	~~5.0 ppb~~	
# 15	69	+7.0	~~0.0 ppb~~	
# 15 Restroom	70	-3.0	~~0.0 ppb~~	
Kitchen **	77	-1.0	~~42 ppb~~	
#2 **	74	+0.5	~~19 ppb~~	Cubicles
# 2B **	76	+0.5	~~31 ppb~~	
# 2C **	77	+1.0	~~31 ppb~~	
# 3 and 3C **	75	+1.5	~~29 ppb~~	
Conference room **	78	-1.0	~~35 ppb~~	
# 2A **	77	-0.5	~~9.0 ppb~~	
# 1 **	74	0.0	~~50 ppb~~	
Hallway near NW Restrooms **	72	0.0	~~61 ppb~~	
NW men's restroom **	76	0.0	~~116 ppb~~	Exhaust fan running.
NW women's restroom **	70	-2.5	~~87 ppb~~	Exhaust fan running.
# 1A **	74	+0.5	~~11 ppb~~	

Notes:

** Measured on 6-6-12 due to time constraints. Ambient outside temperature was 70° Fahrenheit.

[1]See Figure B2 for room locations.

[2]The purpose of the initial building survey was to identify building occupancy patterns, preferential flow pathways and chemical usage for the purposes of selecting sub-slab vapor sampling locations. Although PID readings can be used as one line of evidence for selecting sub-slab sampling locations, the PID readings measured during the Building 4810 initial building survey are not a valid line of evidence for locating sub-slab sampling locations due to the presence of multiple VOC sources per NASA Dryden- maintained chemical inventories. Therefore PID measurements were not considered in proposed sub-slab sample location placement.

Sub-slab wells (if available):

Sub-slab well ID _____ _____Pa

Sub-slab well ID _____ _____Pa

Sub-slab well ID _____ _____ Pa

Sub-slab well ID _____ _____ Pa

Additional notes regarding flooring:

"Vinyl Asbestos Tile Floor" indicated on as builts.

Building Survey Form

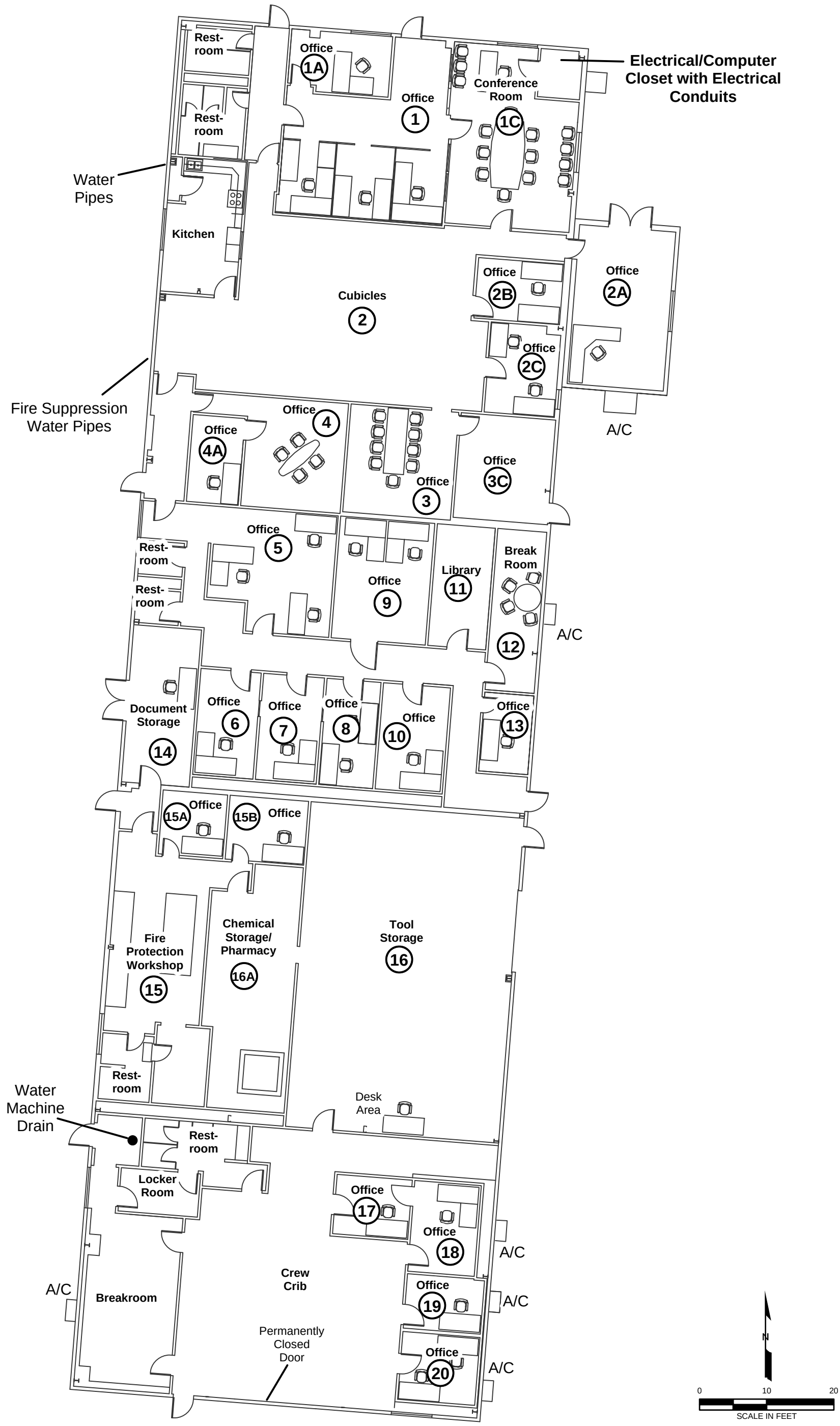
Date 6-5-2012

H. Sketch of Building:

(Include rooms and dimensions, locations of doorways, where pressure measurements where collected, ventilation fans, windows, air ducts, and locations of any potential pathways for vapor intrusion into the building from the subsurface, i.e., piping, conduits, sumps, elevator shafts, etc.)

See attached Figure B2.

P:\EAFB\60265922\7.0\03.90\CADD\Fig_B2.mxd



FINAL

EXPLANATION

BUILDING OCCUPANCY/AREA
75 PEOPLE/12,644 SQUARE FEET

② ROOM NUMBER

NOTE:
SINGLE-STORY BUILDING ON CONCRETE SLAB

Building 4810

Date 03-2013	Operable Unit 6 Vapor Intrusion Sampling Plan & Risk Assessment Work Plan Edwards AFB	Figure
Project No. 60133976		B2

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APPENDIX B

SAMPLING BUILDING SURVEY RESULTS
(COMBINED ON CD WITH APPENDICES A AND C FOR RESOURCE CONSERVATION)

Building Survey Form

Date 03/04/13

Building ID: 4806

Project Name: NASA VIP STUDY

Project No.: 60265922

Preparer's Name: VONNIE RODARTE

Building Location: NASA DRYDEN EAFB

Facility Manager: NICK KIRIOKOS

Contract Number: FA8903-08-D-8770

A. Building Informaton:

Estimated number of occupants: APPROXIMATELY UP TO 6 PEOPLE

Normal hours of operation: 7 AM - 3:30 PM

Building Activities: OFFICE SPACE, BATTERY CHARGING AREA AND VEHICLE MAITENANCE SHOP

Describe how building space is used:

B. Building Construction:

Foundation type: Slab-on grade yes / no

If no describe:

Foundation thickness (in inches): 4"

Foundation sealed/painted: yes / no

If yes describe where and type:

Engineered fill below foundation: yes / no

If no describe:

Basement in building: yes / no

If yes does it contain a sump?: yes / no

Framing: Cinder block walls: yes / no

If no describe:

Building Age: ≈50 YRS **Number of stories:** 1

Is building insulated? yes / no

Number of elevators in building: N/A

Condition of elevator pits (sealed, open, other): N/A

Ceiling height: ≈ 25 FT

Building Survey Form

Date _____

C. Building Ventilation:

Describe type of heating system: 3 CEILING MOUNTED HEATERS

Describe seasonal variation in HVAC operation: HIGH COOLING & HEATING IN SUMMER & WINTER MONTHS, RESPECTIVELY

Describe operation of HVAC (recycled air /fresh air/combination): _____

Describe type of air conditioning: NOT ABLE TO ACCESS UNITS FOR PHOTOS TO BE TAKEN OF SPECS ON THE UNITS

List manufacturer of heating /cooling unit: _____

HVAC unit size: _____

HVAC estimated maximum flow: _____

Normal hours of HVAC operation: FAN CONTINUOUSLY

Temperature settings: TYPICALLY

a. Daytime: 68°F – 72°F

b. Night: _____

c. Weekends: _____

Windows or doors frequently left open:

If yes describe why and location: ROLL UP DOORS OPEN DUE TO VEHICLE MAINTENANCE

Describe other ventilation fans (bathroom, kitchen, open windows, mechanical fans) size, and frequently of use:

CEILING-MOUNTED

D. Potential Indoor Sources

1. Does the building have a kitchen? Yes / No

If yes describe: _____

2. Are vehicles parked in the building? Yes / No

If yes describe: _____

3. Is there a workshop in the building? Yes / No

If yes describe: _____

4. Is there an inventory of products used in the building? Yes / No

MSDS available? SEE ATTACHED ~~MSDS~~ CHEMICAL LIST Yes / No

Building Survey Form

Which of these items are present in the building? (Check all that apply)

Potential VOC Source	✓	Location of Source	Removed at least 1 week prior to sampling (Yes/No/NA; indicate when removed if less than 1 week)
Paints	✓	RM (5)	No
Gas-powered equipment	✓	RM (9)	NO
Gasoline storage cans	✓	RM (5)	NO
Cleaning solvents (thinner)	✓	RM (5)	NO
Air fresheners	✓	BATHRM	NO
Oven cleaners			
Carpet/upholstery cleaners			
Hairspray			
Nail polish/polish remover			
Bathroom cleaner	✓	BATHRM	NO
Appliance cleaner			
Furniture/Floor polish			
Mothballs			
Fuel tank			
Woodstove			
Fireplace			
Perfume/Colognes			
Hobby supplies (e.g., solvents, paints, lacquers, glues, photographic darkroom chemicals)			
Scented trees, wreaths, potpourri, etc.			
Polish/Wax			
Insecticide/Pesticide			
Kerosene			
Other	✓	SEE ATTACHED CHEMICAL LIST	

E. Building Inspection for VIP pathways:

1. Are there any existing piping or conduits entering building through foundation? (Yes) / No SEE

If yes describe and locate on sketch (Section H). PHOTOS TAKEN DURING BLDG SURVEY CONDUCTED ON 6/5-6/2012

2. Are there any holes drilled in the foundation? Yes / (No)

If yes describe and locate on sketch (Section H).

3. Any flow observed from identified pathways: Yes / (No)

If yes describe how it was evaluated (air flow tubes).

Building Survey Form

F. Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: ON

Window open during measurements? Yes / No EXCEPT SHOP ROLL UP DOOR OPEN DURING SAMPLING EVENT

Instrument used to measure temperature: TSI 8386 VELOCICALC

Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)

Outside pressure: _____ Pa (avoid windy location)

Prior to indoor air sampling

Time: _____

Room one

_____ Pa _____ °F

Room two

_____ Pa _____ °F

Room three

_____ Pa _____ °F

Room four

_____ Pa _____ °F

Room five

_____ Pa _____ °F

Room six

_____ Pa _____ °F

At Conclusion of indoor air sampling

Time: _____

Room one

_____ Pa _____ °F

Room two

_____ Pa _____ °F

Room three

_____ Pa _____ °F

Room four

_____ Pa _____ °F

Room five

_____ Pa _____ °F

Room six

_____ Pa _____ °F

Sub-slab wells (if available):

Sub-slab well ID _____

_____ Pa

Sub-slab well ID _____

_____ Pa

Sub-slab well ID _____

_____ Pa

Sub-slab well ID _____

_____ Pa

SEE FIELD LOGS

G. Building Screening Results

Photo-ionization detector instrument used _____

Time measured: _____

Room one

_____ (ppm)

Room two

_____ (ppm)

Room three

_____ (ppm)

Room four

_____ (ppm)

Room five

_____ (ppm)

Room six

_____ (ppm)

Building Survey Form

H. Sketch of Building:
(Include rooms and dimensions, locations of doorways, where pressure measurements where collected, ventilation fans, windows, air ducts, and locations of any potential pathways for vapor intrusion into the building from the subsurface, i.e., piping, conduits, sumps, elevator shafts, etc.)

(2) BATTERY WORKSHOP
- DRAIN COVERED W/REMOVEABLE ALUM COVER

CONTACT FOR ACCESS TO SHEET METAL STORAGE (12)
ED SWAIN
276-3904

Current Issues

Issue Point : KAI Employee : 4806AGE, SUPPORT SHOP

Issue Point	Employee Cd	Employee	Zone	Date Out	Serial Number	Item Name
KAI	11524	4806AGE, SUPPORT SHOP	4806A1	07-NOV-2012	522204.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-NOV-2012	521291.1024	CLEANER, BRAKE PARTS
			4806A1	22-FEB-2013	524671.1024	DISTILLED WHITE VINEGAR
			4806A1	22-FEB-2013	524672.1024	DISTILLED WHITE VINEGAR
			4806A1	20-FEB-2013	520915.1024	BAC ISOPROPYL ALCOHOL, NON AEROSOL
			4806A1	29-NOV-2012	523048.1024	ISOPROPYL ALCOHOL
			4806A1	29-NOV-2012	523047.1024	ISOPROPYL ALCOHOL
			4806A1	11-OCT-2012	520963.1024	CLEANER, BRAKE PARTS
			4806A1	11-OCT-2012	520977.1024	BATTERY TERMINAL CLEANER 765-1072
			4806A1	28-NOV-2012	508849.1024	ENAMEL, ENGINE, AEROSOL
			4806A1	11-FEB-2013	524365.1024	DRY GRAPHITE FILM PART # 765-1413
			4806A1	29-NOV-2012	512601.1024	LUBRICANT
			4806A1	27-NOV-2012	522686.1024	VESSEL SOLUTION-PYRIDINE FREE
			4806A1	20-JUN-2012	519895.1024	VESSEL SOLUTION-PYRIDINE FREE
			4806A1	29-MAY-2012	517619.1024	ENAMEL PAINT, GLOSS WHITE
			4806A1	19-MAR-2012	513775.1024	BRAKE FLUID DOT 3
			4806A1	28-JAN-2012	511371.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511434.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511361.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511358.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511357.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511356.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511355.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511354.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511353.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511352.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511351.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	14-JAN-2012	515148.1024	DIESEL MOTOR OIL
			4806A1	26-JAN-2012	511350.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	26-JAN-2012	511349.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	26-JAN-2012	511347.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	26-JAN-2012	511346.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	26-JAN-2012	511345.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	26-JAN-2012	511344.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	26-JAN-2012	511343.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	26-JAN-2012	511342.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	26-JAN-2012	511341.1024	HYDRAULIC FLUID, FIRE RESISTANT

Current Issues

KAI	11524	4806AGE, SUPPORT SHOP	4806A1	28-JAN-2012	511393.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511392.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511390.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511389.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511360.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511359.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511427.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511422.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511421.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511420.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511419.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511418.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511417.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511416.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511415.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511414.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511413.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511412.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511411.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511391.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511364.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511363.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511362.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511436.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	21-NOV-2011	493373	ENAMEL, OLIVE DRAB 24064
			4806A1	14-NOV-2011	512600.1024	LUBRICANT
			4806A1	21-OCT-2011	466569	BATTERY TERMINAL PROTECTOR
			4806A1	14-DEC-2011	464624	DIESEL MOTOR OIL
			4806A1	08-SEP-2011	477845	WINDSHIELD WASHER FLUID
			4806A1	03-OCT-2011	493382	ENAMEL, OLIVE DRAB 24064
			4806A1	11-AUG-2011	492055	ISOPROPYL ALCOHOL
			4806A1	19-AUG-2011	510929.1024	HYDRAULIC FLUID, PETROLEUM BASE
			4806A1	19-AUG-2011	510928.1024	HYDRAULIC FLUID, PETROLEUM BASE
			4806A1	19-AUG-2011	510926.1024	HYDRAULIC FLUID, PETROLEUM BASE
			4806A1	01-FEB-2011	506815.1024	HYDRAULIC FLUID
			4806A1	01-FEB-2011	506814.1024	HYDRAULIC FLUID
			4806A1	02-FEB-2011	506826.1024	LUBRICANT

Building Survey Form

Date 03/04/13

Building ID: 4807

Project Name: 0116 NASA VIP STUDY

Project No.: 60256922

Preparer's Name: V RODARTE

Building Location: NASA DRYDEN EAFB

CONTACT ~~Facility Manager~~: CURTIS WATTS 661-276-3274

Contract Number: FA8903-09-D-8770

A. Building Informaton:

Estimated number of occupants: 3-6 PEOPLE @ 01

Normal hours of operation: 6:30 AM - 4:00 PM

Building Activities:

NORTHERN SECTION - TRAINING RM & LOCKER RM
SOUTHERN SECTION - STORAGE WAREHOUSE

Describe how building space is used: TRAINING RM FOR PILOTS, RM W/ BASKETBALL COURT
LOCKER RM WITH SHOWERS & RESTRMS.

B. Building Construction:

Foundation type: Slab-on grade yes / no

If no describe:

Foundation thickness (in inches): 6"

Foundation sealed/painted: yes / no

If yes describe where and type: UNKNOWN

Engineered fill below foundation: yes / no

If no describe:

Basement in building: yes / no

If yes does it contain a sump?: yes / no

Framing: Cinder block walls: yes / no

If no describe: WALL DIVIDES NORTHERN & SOUTHERN SECTIONS

Building Age: ≈ 50 YRS **Number of stories:** 1

Is building insulated? yes / no

Number of elevators in building: N/A

Condition of elevator pits (sealed, open, other): N/A

Ceiling height: 9 FT EXCEPT RM WITH BASKETBALL COURT IS APPROXIMATELY 25'

Building Survey Form

Date 3/4/13

C. Building Ventilation:

Describe type of heating system: HEAT PUMP IN LOCKER RM
2250 CFM AIR FLOW

Describe seasonal variation in HVAC operation: HIGH COOLING & HEATING
IN SUMMER & WINTER MONTHS, RESPECTIVELY

Describe operation of HVAC (recycled air /fresh air/combination):

Describe type of air conditioning: NOT ABLE TO ACCESS UNIT ON ROOF
SO PICTURES COULD BE TAKEN OF SPECS ON UNIT

List manufacturer of heating /cooling unit: TRANE MODEL NO. SHP 504C

HVAC unit size:

HVAC estimated maximum flow: 60 CY CONDENSER FAN

Normal hours of HVAC operation: RAN CONTINUOUSLY

Temperature settings: TYPICALLY

a. Daytime: 68°F - 72°F

b. Night:

c. Weekends:

Windows or doors frequently left open: NO

If yes describe why and location:

Describe other ventilation fans (bathroom, kitchen, open windows, mechanical fans) size, and frequently of use:
CEILING-MOUNTED

D. Potential Indoor Sources

1. Does the building have a kitchen? Yes / No

If yes describe:

2. Are vehicles parked in the building? Yes / No

If yes describe:

3. Is there a workshop in the building? Yes / No

If yes describe:

4. Is there an inventory of products used in the building? Yes / No

MSDS available? SEE ATTACHED CHEMICAL LIST Yes / No

Building Survey Form

Which of these items are present in the building? (Check all that apply)

Potential VOC Source	✓	Location of Source	Removed at least 1 week prior to sampling (Yes/No/NA; indicate when removed if less than 1 week)
Paints			
Gas-powered equipment			
Gasoline storage cans			
Cleaning solvents (thinner)			
Air fresheners	X	RESTRM	NO
Oven cleaners			
Carpet/upholstery cleaners			
Hairspray			
Nail polish/polish remover			
Bathroom cleaner			
Appliance cleaner	X	RM (7)	NO
Furniture/Floor polish			
Mothballs			
Fuel tank			
Woodstove			
Fireplace			
Perfume/Colognes			
Hobby supplies (e.g., solvents, paints, lacquers, glues, photographic darkroom chemicals)	X	RM (7)	NO
Scented trees, wreaths, potpourri, etc.			
Polish/Wax	X	RM (7)	NO
Insecticide/Pesticide			
Kerosene			
Other	X	SEE ATTACHED CHEMICAL LIST	

E. Building Inspection for VIP pathways:

1. Are there any existing piping or conduits entering building through foundation? (Yes) / No SEE PHOTOS

If yes describe and locate on sketch (Section H). TAKEN DURING BLD SURVEY CONDUCTED ON 6/6/2012

2. Are there any holes drilled in the foundation? Yes / (No)

If yes describe and locate on sketch (Section H).

3. Any flow observed from identified pathways: Yes / (No)

If yes describe how it was evaluated (air flow tubes).

Building Survey Form

F. Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: ON

Window open during measurements? Yes / No

Instrument used to measure temperature: TSI 8386 VELOCICALC

Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)

Outside pressure: _____ Pa (avoid windy location)

Prior to indoor air sampling

Time: _____

Room one

_____ Pa _____ °F

Room two

_____ Pa _____ °F

Room three

_____ Pa _____ °F

Room four

_____ Pa _____ °F

Room five

_____ Pa _____ °F

Room six

_____ Pa _____ °F

At Conclusion of indoor air sampling

Time: _____

Room one

_____ Pa _____ °F

Room two

_____ Pa _____ °F

Room three

_____ Pa _____ °F

Room four

_____ Pa _____ °F

Room five

_____ Pa _____ °F

Room six

_____ Pa _____ °F

Sub-slab wells (if available):

Sub-slab well ID _____

_____ Pa

Sub-slab well ID _____

_____ Pa

Sub-slab well ID _____

_____ Pa

Sub-slab well ID _____

_____ Pa

SEE FIELD LOGS

G. Building Screening Results

Photo-ionization detector instrument used _____

Time measured: _____

Room one

_____ (ppm)

Room two

_____ (ppm)

Room three

_____ (ppm)

Room four

_____ (ppm)

Room five

_____ (ppm)

Room six

_____ (ppm)

Building Survey Form

H. Sketch of Building:
(Include rooms and dimensions, locations of doorways, where pressure measurements where collected, ventilation fans, windows, air ducts, and locations of any potential pathways for vapor intrusion into the building from the subsurface, i.e., piping, conduits, sumps, elevator shafts, etc.)

POC FOR ACCESS TO ~~NORTHERN~~ NORTHERN SECTION (8) OF BLDG 4807 (NASA LIFE SUPPORT)

SEAN
661-276-3161

Anything on this list
Max 48 hour Checkout
time for as needed use
w/ Exception of lubricating
Oil for sewing machine

07-MAR-2013 09:48:58

Zone Authorized Use List by NSN

Isopropyl Alcohol
used on regular basis

Zone: 4808A1

Zone	NSN	Trade Name	Item Name	AUL Expiration
4808A1	5970011579469	KE-3498-WHITE SILICONE	KE-3498-WHITE SILICONE	
	6505006558366	ISOPROPYL RUBBING ALCOHOL 70%	ISOPROPYL RUBBING ALCOHOL, USP	
	6505NASA2240804	ISOPROPYL ALCOHOL 99%	SOLVENT	
	6505NASA2410811	ISOPROPYL ALCOHOL 70%	SOLVENT	
	6810NASA2130306	ISOPROPYL ALCOHOL 70%	ISOPROPYL ALCOHOL	
	6810NASA2850209	ISOPROPYL ALCOHOL 99%	ISOPROPYL ALCOHOL ANHYDROUS	
	6840NASA3131101	WESCODYNE PLUS	WESCODYNE PLUS, SANITIZER, DISINFECTANT	
	6850001775094	V-724; POLY DIMETHYL SILOXANE	SILICONE COMPOUND	
	6850013771809	SOLVENT A-A-59601A TYPE III	CLEANING COMPOUND, SOLVENT A-A 59601D TYPE III	
	6850013832117	CLEANING COMPOUND SOLVENT	CLEANING COMPOUND, SOLVENT	
	6850NASA2110401	SAFETY-KLEEN MIL-PRF-680, TYPE II	CLEANING SOLVENT	
	7920008239817	PAD, METAL POLISH IMPREGNATED	POLISH	
	7930NASA411103	NOVUS PLASTIC POLISH #1	NOVUS PLASTIC POLISH #1	
	7930NASA411104	NOVUS PLASTIC POLISH #2	NOVUS PLASTIC POLISH #2	
	8010NASA1710208	HARDHT LSPR 6PK GLOSS WHITE	PAINT	
	8010NASA2130612	V2179 GLOSS BLACK	ENAMEL AEROSOL TOPCOAT	
	8010NASA2140607	V2164 BRIGHT RED ENAMEL TOPCOAT	PAINT (AEROSOL)	
	8010NASA2560612	KRYLON INDUSTRIAL TOUGH COAT ACRYLIC ENAMEL, SEMI-FLAT BLACK	PAINT, SEMI-FLAT BLACK	
	8030000812336	SEALING COMPOUND	SEALING COMPOUND	
	8030001635792	VIBRA-TITE INDUSTRIAL GRADE	COATING COMPOUND, PLASTISOL	
	8030007535004	WS-8020 RC B-1/2 PART A	WS-8020 RC B-1/2 PART A , SEALANT	
	8030007535007	PR-1440 B-1/2, ACCELERATOR	SEALING COMPOUND, PART 2 OF 2	
	8030012905134	SILANE SOLUTION PR-1826 ADHESION PROMOTER	SILANE SOLUTION PART 3 OF 3	
	8030013885604	SAF-T-LOK PRIMER T	SEALING COMP, T-GRADE, FORM	
	8030013885606	LOCTITE 7649 PRIMER N	LOCTITE 7649 PRIMER N, ACCELERATOR	
	8030014600246	ALODINE 1132 TOUCH-N-PREP COATING	ALODINE 1132 TOUCH-N-PREP COATING	
	8030NASA1690207	F-900 TORQUE SEAL (GREEN)	SEALING COMPOUND, GREEN	
	8030NASA2460206	GRADE AV SEALANT	ANAEROBIC ADHESIVE/SEALANT	
	8030NASA681101	LOCTITE 277 THREADLOCKER HIGH STRENGTH	LOCTITE 277 THREADLOCKER HIGH STRENGTH, ANAEROBIC SEALANT	
	8040001178510	INSTABOND 1645 CLEAR NEUTRAL CURE SILICONE	INSTABOND 1645 CLEAR NEUTRAL CURE SILICONE	
	8040001450432	SCOTCH-WELD EPOXY ADHESIVE 2216, GRAY (PART B)	SCOTCH-WELD EPOXY ADHESIVE 2216, GRAY (PART B)	
	8040NASA1210206	3145 RTV MIL-A-46146 ADHESIVE SEALANT-CLEAR	ADHESIVE	
	8040NASA2210609	L1142M	SOLVENT BASED ADHESIVE	
	8040NASA2561101	PC4426	CEMENT, BONDING	
	8040NASA2561102	HH-66 VINYL CEMENT	CEMENT	
	8040NASA2561103	ACC1030	ACCELERATOR	
	8040NASA2561104	FA1013	ADHESIVE	
	8040NASA2740206	3M(TM) FOAM FAST 74 SPRAY ADHESIVE AND	ADHESIVE	

as needed

Zone Authorized Use List by NSN

Zone: 4808A1

Zone	NSN	Trade Name	Item Name	AUL Expiration
4808A1	8040NASA2740206	3M(TM) 74 CYLINDER		
	9150004580075	VV-L-800C LUBRICATING OIL GENERAL PUROSE	PRO LUBE	
	9150013601905	PERMA-SILK S AEROSOL (PPSSAE)	BONDED SOLID FILM LUBRICANT	
	9150013804235	MOLKOTE 321 DRY FILM LUBRICANT (AEROSOL)	MOLKOTE 321 DRY FILM LUBRICANT (AEROSOL)	
	9150014439003	MS-122XD PTFE RELEASE AGENT/DRY LUBRICANT	TFE RELEASE / DRY LUBRICANT	
	9150NASA0270307	DOW CORNING (R) 55 O-RING LUBRICANT	GREASE, SILICONE	
	9150NASA2280510	ROYCO 308CA	LUBRICANT	
	9150NASA2330206	ROYCO 43	LUBRICATING GREASE	
	9150NASA2330207	PRO LUBE	LUBRICANT	

Current Issues

KAI	11524	4806AGE, SUPPORT SHOP	4806A1	23-JAN-2012	506734.1024	STARTING FLUID
			4806A1	13-JAN-2012	503745.1024	GARDFLEET SAE 15W-40,
			4806A1	19-DEC-2011	466186	WATER STANDARD
			4806A1	19-DEC-2011	515149.1024	TEXACO STARPLEX
			4806A1	19-DEC-2011	515147.1024	LUBRICANT
			4806A1	19-DEC-2011	515097.1024	GENERATOR SOLUTION 10 X5 ML
			4806A1	26-JAN-2012	511348.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	26-JAN-2012	511326.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	25-JAN-2012	515497.1024	MOTOR OIL 10W30
			4806A1	28-JAN-2012	511433.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511432.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511431.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511430.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511429.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511428.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511435.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511426.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511425.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511424.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511423.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511410.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511409.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511408.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511407.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511406.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511405.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511404.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511403.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511402.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511401.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511400.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511399.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511398.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511397.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511396.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511395.1024	HYDRAULIC FLUID, FIRE RESISTANT
			4806A1	28-JAN-2012	511394.1024	HYDRAULIC FLUID, FIRE RESISTANT

Building Survey Form

Date 3/5/13

Building ID: 4810

Project Name: 0U6 NASA VIP STUDY

Project No.:

Preparer's Name: V RODARTE

Building Location: NASA DRYDEN EAFB

Facility Manager: DAN EASON 661-276-2078

Contract Number: FA8903-08-D-8770

A. Building Informaton:

Estimated number of occupants: ≈75

Normal hours of operation: 6:00 AM - 5:00 PM

Building Activities: OFFICE (≈60%)
WORKSHOP (30%)
WAREHOUSE (10%)

Describe how building space is used: OFFICE, WORKSHOP/WAREHOUSE
CHEMICAL PHARMACY IN WAREHOUSE SECTION

B. Building Construction:

Foundation type: Slab-on grade (yes) / no

If no describe:

Foundation thickness (in inches): 4"

Foundation sealed/painted: yes / no

If yes describe where and type: UNKNOWN

Engineered fill below foundation: (yes) / no

If no describe:

Basement in building: yes / (no)

If yes does it contain a sump?: yes / no

Framing: Cinder block walls: yes / (no)

If no describe:

Building Age: OFFICE ≈ 30 YRS, WAREHOUSE ≈ 50 YRS **Number of stories:** 1

Is building insulated? (yes) / no

Number of elevators in building: N/A

Condition of elevator pits (sealed, open, other): N/A

Ceiling height: OFFICE ≈9'
WORKSHOP/WAREHOUSE ≈ 20'

Building Survey Form

Date 3/5/13

C. Building Ventilation:

Describe type of heating system: SWAP COOLERS AND HEATING/AC (PACKAGED)

Describe seasonal variation in HVAC operation:

Describe operation of HVAC (recycled air /fresh air/combination): COMBINATION

Describe type of air conditioning: MECHANICAL COOLING

List manufacturer of heating /cooling unit: PER AS BUILT - FARR MODEL ID,000E-19-2 (EVAP COOLER)

HVAC unit size: UNKNOWN

HVAC estimated maximum flow: UNKNOWN

Normal hours of HVAC operation:

Temperature settings:

a. Daytime: COOL - 78°F / HEAT-68°F

b. Night: " 85°F / " 45°F

c. Weekends: " 85°F / " 45°F

Windows or doors frequently left open:

If yes describe why and location: NO

Describe other ventilation fans (bathroom, kitchen, open windows, mechanical fans) size, and frequently of use: CEILING-MOUNTED

D. Potential Indoor Sources

1. Does the building have a kitchen? Yes / No

If yes describe:

2. Are vehicles parked in the building? Yes / No

If yes describe:

3. Is there a workshop in the building? Yes / No

If yes describe: SOUTH END OF BLDG

4. Is there an inventory of products used in the building? Yes / No

MSDS available? SEE ATTACHED CHEMICAL LIST Yes / No

Building Survey Form

Which of these items are present in the building? (Check all that apply)

Potential VOC Source	✓	Location of Source	Removed at least 1 week prior to sampling (Yes/No/NA; indicate when removed if less than 1 week)
Paints	✓	RM 16A	NO
Gas-powered equipment			
Gasoline storage cans			
Cleaning solvents (thinner)	✓	RM 16A	NO
Air fresheners	✓	RESTRM	NO
Oven cleaners			
Carpet/upholstery cleaners			
Hairspray			
~~Nail polish/polish remover~~ ACETONE	✓	RM 16A	NO
Bathroom cleaner	✓	RM 16A	NO
Appliance cleaner			
Furniture/Floor polish	✓	RM 16A	NO
Mothballs			
Fuel tank			
Woodstove			
Fireplace			
Perfume/Colognes			
Hobby supplies (e.g., solvents, paints, lacquers, glues, photographic darkroom chemicals)			
Scented trees, wreaths, potpourri, etc.			
Polish/Wax	✓	RM 16A	NO
Insecticide/Pesticide	✓	RM 16A	NO
Kerosene			
Other	✓	SEE CHEMICAL LIST	

E. Building Inspection for VIP pathways:

1. Are there any existing piping or conduits entering building through foundation? (Yes) No FIRE SUPPRESSION

If yes describe and locate on sketch (Section H). AND WATER PIPES

SEE PHOTOS FROM BLDG SURVEY ON 6/5/2012

2. Are there any holes drilled in the foundation? Yes / (No)

If yes describe and locate on sketch (Section H).

3. Any flow observed from identified pathways: Yes / (No)

If yes describe how it was evaluated (air flow tubes).

Building Survey Form

F. Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: ON

Window open during measurements? Yes / No

Instrument used to measure temperature: TSI 8386 VELOCICALC

Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)

Outside pressure: _____ Pa (avoid windy location)

Prior to indoor air sampling

Time: _____

Room one

_____ Pa _____ °F

Room two

_____ Pa _____ °F

Room three

_____ Pa _____ °F

Room four

_____ Pa _____ °F

Room five

_____ Pa _____ °F

Room six

_____ Pa _____ °F

At Conclusion of indoor air sampling

Time: _____

Room one

_____ Pa _____ °F

Room two

_____ Pa _____ °F

Room three

_____ Pa _____ °F

Room four

_____ Pa _____ °F

Room five

_____ Pa _____ °F

Room six

_____ Pa _____ °F

Sub-slab wells (if available):

Sub-slab well ID _____

_____ Pa

Sub-slab well ID _____

_____ Pa

Sub-slab well ID _____

_____ Pa

Sub-slab well ID _____

_____ Pa

SEE FIELD LOGS

G. Building Screening Results

Photo-ionization detector instrument used _____

Time measured: _____

Room one

_____ (ppm)

Room two

_____ (ppm)

Room three

_____ (ppm)

Room four

_____ (ppm)

Room five

_____ (ppm)

Room six

_____ (ppm)

Building Survey Form

H. Sketch of Building:
(Include rooms and dimensions, locations of doorways, where pressure measurements where collected, ventilation fans, windows, air ducts, and locations of any potential pathways for vapor intrusion into the building from the subsurface, i.e., piping, conduits, sumps, elevator shafts, etc.)

Bldg. 4810

MSDS CHEMICAL INVENTORY

UPDATED: 03/06/13

	Material Name	Manufacturer's/Vendor Name
1	101 ULTRA COPPER MAXIMUM TEMPERATURE GASKET MAKER	PERMATEX, INC.
2	101BR SENSOR SAFE ULTRA COPPER SILICONE HIGH TEMP RTV	PERMATEX, INC.
3	3-IN-ONE PROFESSIONAL GARAGE DOOR LUBE	WD-40
4	3M ™ SUPER 77™ MULTIPURPOSE ADHESIVE (AEROSOL)	3M
5	827 RED OIL	MERIAM INSTRUMENT
6	ACETYLENE, DISSOLVED	PRAXAIR, INC.
7	ACTI-KLEAN	VIRGINIA KMP
8	ALEX PAINTERS ACRYLIC LATEX CAULK - ALL COLORS	DAP
9	ALL PURPOSE MARKING PAINT (ALL COLORS)	AERVOE INDUSTRIES, INC.
10	ALLSTAR CHEMTROL SUPER STRIP HD STRIPPER ✓ Hazmat Company	UNISOURCE WORLDWIDE, INC.
11	ALVANIA GREASE RL 2	SOPUS PRODUCTS
12	ANTIFREEZE 50/50 PREMIX	COMPLEX CHEMICALS
13	ATLAS PERMA-GUARD UNIVERSAL ANTI FREEZE	COMPLEX CHEMICALS
14	BAYER ADVANCES 2-IN-1 SYSTEMIC ROSE & FLOWER CARE GRA	BAYER ENVIRONMENTAL SCIENCE
15	BIG BLU LEAK DETECTOR SOLUTION	REFRIGERATION TECHNOLOGIES A522-E1
16	BLACK GOLD	J/B INDUSTRIES A475-40
17	BLACK W/B ZONE MARKING PAINT ✓ Connex	COLORADO PAINT
18	BLEACH CLOROX	CLOROX COMPANY
19	BLUE W/B ZONE MARKING PAINT ✓ Connex	COLORADO PAINT
20	C-4 REFRIGERATION OIL - 4304 ✓ Flam Connex	NU-CALGON WHOLESALER, INC.
21	CASTROL DEXRON III / MERCON ✓ Connex Flam	BP LUBRICANTS USA INC.
22	CHAIN LIFE (AEROSOL)	PROTECT ALL, INC.
23	~~CHEMTREAT BL1302~~ ✓	CHEMTREAT, INC.
24	CHEMTREAT C2189T Bld 4827	CHEMTREAT, INC.
25	CHEMTREAT CL1446 ✓	CHEMTREAT, INC.
26	CHEMTREAT CL1454 ✓	CHEMTREAT, INC.
27	CHEMTREAT CL2150 ✓	CHEMTREAT, INC.
28	CHEMTREAT CL2871 Hazmat ✓	CHEMTREAT, INC.
29	CHEMTREAT CL2900 Connex ✓	CHEMTREAT, INC.
30	CHEMTREAT CL49	CHEMTREAT, INC.
31	CHEMTREAT CL5695 ✓	CHEMTREAT, INC.
32	CHEMTREAT CL6033 ✓	CHEMTREAT, INC.
33	CHEMTREAT CT23 ✓	CHEMTREAT, INC.
34	CHEMTREAT FO120 ✓	CHEMTREAT, INC.
35	CHEVRON DELO® 400 ✓ Flam Connex	CHEVRON PRODUCTS COMPANY
36	CHEVRON RPM ® UNIVERSAL GEAR LUBRICANT	CHEVRON PRODUCTS COMPANY
37	CONTACT CLEANER (AEROSOL)	CRC INDUSTRIES, INC.
38	COOL TOOL II	MONROE FLUID TECHNOLOGY
39	COOLER COATING	DIAL MANUFACTURING, INC.
40	COOLER COATING	DIAL MFG. A454
41	COPPER PHOSPHORUS (6% SILVER) BRAZING ROD	LENOX
42	CRACK SHOT SPACKLING PASTE	DAP
43	CRYSTAL **SIMPLE GREEN** INDUSTRIAL CLEANER & DEGREASER	SUNSHINE MAKERS
44	DENATURED ALCOHOL	SUNNYSIDE

MSDS CHEMICAL INVENTORY

UPDATED: 03/06/13

45	DIESEL POWER	ADDITIVES, INC.
46	DOW CORNING ® 732 MULTI-PURPOSE SEALANT CLEAR	DOW CORNING CORPORATION
47	DRANO MAX GEL CLOG REMOVER	S.C. JOHNSON
48	DRYDEX SPACKLING (RTU)	DAP
49	DUCTSEAL 321 (MASTIC DUCT SEALANT)	HARDCAST A691-00
50	ELMER'S GLUE-ALL	ELMER'S PRODUCTS, INC.
51	ETK ACID TEST KIT	PARKER A480
52	FAST N FINAL PREMIUM	DAP
53	GAS LEAK DETECTOR	VIRGINIA KMP
54	GAS LEAK DETECTOR (NRP)	CORNSTAR INTERNATIONAL INC.
55	GREASE TRAP TREATMENT, GT	ROEBIC LABORATORIES
56	GREENCHOICE COVE BASE ADHESIVE, 3401	FRANKLIN INTERNATIONAL
57	GRRIP	HERCULES CHEMICAL COMPANY INC.
58	GRUVLOK, EXTREME TEMP, LUBRICANT	ANVIL INTERNATIONAL
59	HAMILTON RED DOT ALL PURPOSE JOINT COMPOUND	HAMILTON DRYWALL PRODUCTS
60	HE287 SOLARFLEX ELASTOMERIC COATING	HENRY COMPANY
61	HE289 WHITE ROOFING SEALANT	HENRY COMPANY
62	HE906 - FLASHMASTER PLUS ✓ Flam Connex	HENRY COMPANY
63	HOMAX WATERBASED ORANGEPEEL & SPLATTER SPRAY TEXTU	HOMAX PRODUCTS, INC.
64	HOT MELT GLUE & ADHESIVE	FPC CORPORATION
65	IMS-II SANITIZER (4211) ICE MACHINE SANTIZER	NU-CALGON WHOLESALER
66	IMS-II SANITIZER (4211) ICE MACHINE SANTIZER	NU-CALGON A389-92
67	INSTANT STARTING FLUID	RADIATOR SPECIALTY
68	INSTITUTIONAL FORMULA DRANO	JOHNSON DIVERSEY
69	JB WELD - EPOXY STEEL RESIN	U.S. CHEMICAL & PLASTICS
70	JB WELD EPOXY STEEL HARDENER	U.S. CHEMICAL & PLASTICS
71	KILZ 2® LATEX	MASTERCHEM INDUSTRIES LLC
72	KITCHEN AND BATH ACRYLIC CAULK - WHITE & COLORS	RED DEVIL, INC.
73	LIQUID WRENCH PENETRATING OIL, L112	RADIATOR SPECIALTY
74	LIQUID WRENCH SUPER PENETRANT	RADIATOR SPECIALTY
75	LPS ® 1	LPS LABORATORIES
76	LPS ® 2 (AEROSOL)	LPS LABORATORIES
77	LPS ® 3 (AEROSOL)	LPS LABORATORIES
78	LPS ® HEAVY-DUTY SILICONE	LPS LABORATORIES
79	LPS ® PRESOLVE	LPS LABORATORIES
80	LUBRIPLATE 1200-2	LUBRIPLATE® LUBRICANTS CO.
81	LUBRIPLATE EMB	LUBRIPLATE® LUBRICANTS CO.
82	MALTBY RUST INHIBITOR PENETRANT	FOUR STAR CHEMICAL
83	MAP PRO PREMIUM HAND TORCH FUEL	WORTHINGTON CYLINDER
84	MOBILUX EP 2 ✓ Flam Connex	EXXON MOBIL
85	MOBILUX EP 2 ✓ Flam Connex	EXXON MOBIL
86	NIKAL	JET-LUBE
87	NOKORODE REGULAR PASTE FLUX	THE RECTORSEAL CORPORATION
88	ONE-COMPONENT POLYURETHANEE FOAM SEALANT/ADH	FOMO PRODUCTS
89	OXYGEN, COMPRESSED	PRAXAIR, INC.
90	PERMABOND LH 050	PERMABOND LLC
91	PORTABLE SELF-CONTAINED EYEWASH STATION PRESERVATIVE	GERMIPHENE CANADA

MSDS CHEMICAL INVENTORY

UPDATED: 03/06/13

92	PRO DOPE®	HERCULES CHEMICAL COMPANY INC.
93	PROPYLENE GLYCOL USP	AMBER CHEMICAL, INC.
94	PROTREAT (CONDENSATE PAN TREATMENT) TABLETS	DIVERSITECH A490-80
95	PVC CEMENT	MARSH LABORATORIES
96	R-134A	NATIONAL REFRIGERANTS, INC.
97	R-22	NATIONAL REFRIGERANTS, INC.
98	R-404A	NATIONAL REFRIGERANTS, INC.
99	R-407C	NATIONAL REFRIGERANTS, INC.
100	R-410A	NATIONAL REFRIGERANTS, INC.
101	REAL TUFF	HERCULES CHEMICAL COMPANY INC.
102	RED ACRYLIC W/B CURB MARKING	PERVO PAINT COMPANY
103	RED W/B ZONE MARKING PAINT	COLORADO PAINT
104	REFRIGERATION OIL "C" / YORK OIL "C"	DELTA PETROLEUM CO INC.
105	ROSIN CORE LEAD FREE SOLDER	LENOX
106	RTV 102 ACETOXY SEALANT (WHITE)	MOMENTIVE PERFORMANCE MATERIAL
107	RYDLYME, RID-LIME ✓ Hazmat conney	APEX ENGINEERING PRODUCTS CORP.
108	SAFFER THAN SALT® PREMIUM ENHANCED ORANGE DE-ICER	THE KISSNER GROUP
109	SIMPLE GREEN	SUNSHIN
110	SNAKE OIL	GENERAL PIPE CLEANER
111	SPRING MINT PLUS LIQUID EXZYMES	WAXIE SANITARY SUPPLY
112	STA PUT®	HERCULES CHEMICAL COMPANY INC.
113	STRUST SSPR 24PK GLOSS BLACK	RUST-OLEUM CORPORATION
114	STRUST SSPR 6PK FLAT BLACK	RUST-OLEUM CORPORATION
115	STRUST SSPR 6PK FLAT LT GRAY AUTO PRIMER	RUST-OLEUM CORPORATION
116	STRUST SSPR 6PK GLOSS SMOKE GRAY	RUST-OLEUM CORPORATION
117	STRUST SSPR 6PK GLOSS SUNBURST YELLOW	RUST-OLEUM CORPORATION
118	STRUST SSPR 6PK GLOSS SUNRISE RED	RUST-OLEUM CORPORATION
119	STRUST SSPR 6PK GLOSS WHITE	RUST-OLEUM CORPORATION
120	SUNISO 3GS REFRIGERATION OIL	VIRGINIA KMP
121	SUNISO 4GS REFRIGERATION OIL ✓ Flam connex	VIRGINIA KMP
122	SUREGRIP 128 PREMIUM HD CLEAR STRIPPABLE WALL ADH	ZINSSER
123	TANAKA PERFECT MIX	OLYMPIC OIL
124	TAP MAGIC EP-XTRA FORMULA	THE STECO CORPORATION
125	TAPMATIC ® DUAL ACTION #2 CUTTING FLUID	LPS LABORATORIES
126	TAPMATIC 1 GOLD (AEROSOL)	LPS LABORATORIES
127	TAPMATIC EDGE LIQUID	LPS LABORATORIES
128	TIN/ANTIMONY SOLDER ALLOY (FABRICATION/FORMS)	LENOX
129	TITEBOND SELF-LEVELING CONCRETE JOINT SEALER	FRANKLIN INTERNATIONAL
130	TKO REFRIGERATION OIL TEST KIT	VIRGINIA KMP
131	TRI-FLOW ™ SUPERIOR LUBRICANT WITH PTFE	THE SHERWIN-WILLIAMS COMPANY
132	TRINITY N245P PREDILUTED HEAVY DUTY ANTIFREEZE (50%)	DEMENNO KERDOON
133	VERSAGRIP 181, CCWI 181	CARLISLE COATINGS & WATERPROOFING
134	VIPER COIL DEGREASER	REFRIGERATION TECHNOLOGIES
135	VIRGINIA ICE MACHINE CLEANER	PARKER A480
136	VIRGINIA ICE MACHINE CLEANER	PARKER HANNIFIN
137	VIRGINIA TKO REFIRGERATION OIL TEST KIT	PARKER A480
138	WD-40 AERO5OL	WD-40

Flam conney

MSDS CHEMICAL INVENTORY

UPDATED: 03/06/13

139	WELD-ON 2771-2773 LOW VOC CEMENT FOR ABS PLASTIC PIPE	IPS CORPORATION
140	WELD-ON 721 LOW VOC CEMENT FOR PLASTIC	IPS CORPORATION
141	WELD-ON P-68 LOW VOC PRIMER	IPS CORPORATION
142	WELD-ON® 505™ KEY TITE LOW VOC PIPE JOINT COMPOUND	IPS CORPORATION
143	WHITE W/B ZONE MARKING PAINT ✓ Flam connex	IPS CORPORATION
144	YELLOW LF W/B ZONE MARKING PAINT ✓ Flam connex	COLORADO PAINT
145	YORK C OIL ✓ Flam connex	YORK INTERNATIONAL CORPORATION
146	YORK L OIL/ESTER ✓ Flam connex	YORK INTERNATIONAL CORPORATION
147	YORK OIL C ✓ Flam connex	YORK INTERNATIONAL CORPORATION
148	YORK S OIL Bldg 4804	JOHNSON CONTROLS
149	ZOOM SPOUT OILER	PHILLIPS 66 COMPANY
150	ZOOM SPOUT OILER	LA - CO INDUSTRIES
	Blue paint as well	

AUGUST 2013 BUILDING SURVEYS

A review of building conditions in August 2013 prior to the sampling event indicated that no changes occurred since the March 2013 building surveys. Details recorded on the March 2013 building survey forms for 4806, 4807, and 4810 apply to August 2013 conditions and additional forms were not necessary and are not provided in this document.

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APPENDIX C

FIELD FORMS
(COMBINED ON CD WITH APPENDICES A AND B FOR RESOURCE CONSERVATION)

Sub Slab Vapor Well Field Data Sheet

PID Used: PPB RAE3
He Detector: H2P
PA Meter: OMNIGUARD II

Building: 4806

Page _____ of _____

DIFF PRESSURE IA/OA

	Location	Sample ID	Cannister	Controller	Date	Shut In Test (H2O/Hg/min)	Differential Pressure (Pa)	Purge VOC Time	PID Measurement (ppB)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
-0.5	N3-480655Ø1	VSØ7	A7612	160	3/6/13	100	Initial: —	300	Initial: —	Start: 1458	800 H2P	NOTES	Initial: —
6 PPB PID	Notes: CANNISTER PRESSURE "HG					Initial Vacuum: -30				Mid: —			
						Final Vacuum: -5	Post: +1.0		Post: 34	Stop: 1504	—	—	Post: 72.4
-3.5	N3-480655Ø2	VSØ2	A7657	132	3/6/13	100	Initial: —	300	Initial: —	Start: 1520	H2P	NOTES	Initial: —
24 PPB PID	Notes: "					Initial Vacuum: -28				Mid: —			
						Final Vacuum: -5	Post: -2.5		Post: 439	Stop: 1526	—	—	Post: 69.7
-3.5	N3-480655Ø3	VSØ2	A7659	165	3/6/13	100	Initial: —	300	Initial: —	Start: 1645	H2P	NOTES	Initial: —
43 PPB	Notes: "					Initial Vacuum: -26				Mid: —			
						Final Vacuum: -5	Post: -1.0		Post: 66	Stop: 1650	—	—	Post: 59.8
-3.5	N3-480655Ø3	VSØ2	A5311	146	3/6/13	100	Initial: —	300	Initial: 66	Start: 1655	H2P	NOTES	Initial: —
43 PPB	Notes: "					Initial Vacuum: -24				Mid: —			
						Final Vacuum: -5	Post: -1.0		Post: 66	Stop: 1701	—	—	Post: 59.8

Sampler Name(s): V RODARTE / A POACH
Date: 3/6/2013
Project Number:
Project Name: OU6 NASA VIP
Analytical Methods: TO-15

Comments:

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F-1077
Rev: 10-10-12

Sub Slab Vapor Well Field Data Sheet

PID Used: PPB RAE
He Detector: H&P
PA Meter: OMNIGOARD IV

Building: 4807/4806

Page _____ of _____

DIFF PRESSURE FA/OA

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
N3-4807SS01	VS01	6149	136	3/6/13	VOL 100	Initial: UP -5.5	VOL 300 cc	Initial: —	Start: 1357	SEE H&P NOTES		Initial: —
Notes: CANNISTER PRESSURE 11 HG					Initial Vacuum: -26				Mid: —	—	—	
					Final Vacuum: -5	Post: -5.5		Post: 445	Stop: 1404	—	—	Post: 71.3

-6

112 PPB PID

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp13)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
N3-4806SS04	VS01	5269	145	3/6/13	VOL 100	Initial: —	VOL 300 cc	Initial: —	Start: 1759	H&P NOTES		Initial: —
Notes: "					Initial Vacuum: -26				Mid: —	—	—	
					Final Vacuum: -5	Post: -2.5		Post: 1394	Stop: 1805	—	—	Post: 62.7

-3.5

75 PPB PID

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp13)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
N3-4806SS05	VS01	5930	166	3/6/13	VOL 100	Initial: —	VOL 300 cc	Initial: —	Start: 1822	H&P NOTES		Initial: —
Notes: "					Initial Vacuum: -26				Mid: —	—	—	
					Final Vacuum: 5	Post: UP ~~-3.0~~ -3.0		Post: 13	Stop: 1827	—	—	Post: 61.5

-1.5

54 PID PPB

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Sampler Name(s): U RODARTE / A POACH
Date: 3/6/2013
Project Number:
Project Name: OU6 NASA VIP
Analytical Methods: TO-15

Comments:

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F-1077
Rev: 10-10-12

Building: 48006
Date: 03/04/13
Project No.:
Project Name: NASA VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements:
Windows open during measurements? Yes / No
Instrument used to measurement temperature: TSI 8386 VELOCICALC +
Instrument used to measure pressure: OMNIGUARD

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: 64 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 11:45 AM

Room #2 PID 100 PPB Purpose BATTERY (BATT) WORKSHOP Occupants Ø HVAC
+1.0 Pa 71.4 °F Piping/Conduit: Yes / No Comments:
SINK/DRAIN LOCATED IN CTR. OF ROOM
DRAIN

Room 1 PID 30 PPB Purpose BATT CHARGING Occupants Ø HVAC
-2.0 Pa 71.5 °F Piping/Conduit: Yes / No Comments:

Room 4 PID 36 PPB Purpose Occupants 1 HVAC
+3.5 Pa 71.3 °F Piping/Conduit: Yes / No Comments:
OCCUPANT IN ROOM ON DIFFERENT
OCCASIONS; NOT COMMONLY OCCUPIED.

Room 3 PID 45 PPB Purpose Occupants Ø HVAC
+3.5 Pa 71.5 °F Piping/Conduit: Yes / No Comments:
OCCUPANT NO LONGER ASSIGNED TO
THIS ROOM; ROOM IS NOW VACANT

Room 1 PID 24 PPB Purpose Occupants HVAC
-5.0 Pa 70.2 °F Piping/Conduit: Yes / No Comments:
WORK AREA
WORKER OCCASIONALLY IN AREA.
DOORS TYPICALLY OPEN BUT CLOSED FOR

Additional Comments:

2/5

Building: 4806 (JP)
Date: 03/04/13
Project No.:
Project Name: NASA VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements:
Windows open during measurements? Yes / (No)
Instrument used to measurement temperature:
Instrument used to measure pressure:

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 12:40

Room (5) PID 30 PPB Purpose SHOP Occupants 1-2 HVAC
-2.5 Pa 70.4 °F Piping/Conduit: Yes / No Comments:
WORKERS OCCASIONALLY WORK IN THIS AREA

Room (6) PID 23 PPB Purpose BATT CHARGING Occupants Ø HVAC
-0.5 Pa 70.6 °F Piping/Conduit: Yes / No Comments:
CURRENTLY, ROOM IS COMPLETELY EMPTY.
FUTURE PLANS FOR IS ROOM INCLUDE ~~BRING~~ BATTERY CHARGING ACTIVITIES

Room (7) PID 55 PPB Purpose Occupants Ø HVAC
-1.0 Pa 70.6 °F Piping/Conduit: Yes / No Comments:
BATHROOMS

Room (8) PID 33 PPB Purpose Occupants Ø HVAC
-1.5 Pa 68.1 °F Piping/Conduit: Yes / No Comments:
DRAIN COVERED WITH ALUM COVER
STORAGE AREA

Room (11)/BLDG 4807 BUT ONLY ACCESSIBLE THRO BLDG 4806 PID 214 PPB Purpose Occupants Ø HVAC
-0.5 Pa 66.7 °F Piping/Conduit: Yes / No Comments:
TOOL STORAGE AREA FOR GAS POWERED ITEMS
NEAR SAMPLING LOCATION
GENERATORS FILLED W/GASOLINE

Additional Comments:

3/5

Building: 48006
Date: 03/04/16
Project No.:
Project Name: NASA VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: _____

Windows open during measurements? Yes / No

Instrument used to measurement temperature: _____

Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)

Outside pressure: _____ Pa (avoid windy location)

Time: 1:10 PM

Room 10 PID 23 PPB Purpose OFFICE Occupants 1 HVAC _____
0.0 Pa 69.3 °F Piping/Conduit: Yes / No Comments:
OCCUPIED APPROX. 3 DAYS/WK

Room 12 PID 0 PPB Purpose _____ Occupants Ø HVAC _____
-0.5 Pa 61.4 °F Piping/Conduit: Yes / No Comments:
STORAGE AREA

Room PID 110 PPB Purpose _____ Occupants _____ HVAC _____
0.0 Pa 70.3 °F Piping/Conduit: Yes / No Comments:
ABANDONED LAB

@ 1500

Room PID _____ Purpose _____ Occupants _____ HVAC _____
_____ Pa _____ °F Piping/Conduit: Yes / No Comments:

Room PID _____ Purpose _____ Occupants _____ HVAC _____
_____ Pa _____ °F Piping/Conduit: Yes / No Comments:

Additional Comments:

Sub Slab Vapor Well Field Data Sheet

PID Used: PPBRAE
He Detector: H2 P
PA Meter: OMNIGUARD IV

Building: 4807

Page _____ of _____

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

DIFF PRESSURE IA/OA

-6.5

PID 58 PPB

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp B)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
N3-4807SS04	VS01	1718	120	3/6/13	H2O 100	Initial: —	VOL 300cc	Initial: —	Start: 1845	H2P NOTES		Initial: —
Notes: GENERATORS AND MISC STORED IN AREA		CANISTER PRESSURE IN HG			Initial Vacuum: -26				Mid: —			
					Final Vacuum: -5	Post: -2.0		Post: 41	Stop: 1855	—		Post: (VR) 62.0

Sampler Name(s): U. RODARTE / A. POACH
Date: 3/6/2013
Project Number:
Project Name: OU6 NASA VIP
Analytical Methods: TO-15

Comments:

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F-1077
Rev: 10-10-12

Sub Slab Vapor Well Field Data Sheet

PID Used: PPB RAE
He Detector: ~~H~~ P
PA Meter: OMNIGUARD IV

Building: 4807

Page _____ of _____

DIFF PRESSURE IA/OA

Location	Sample ID	Cannister	Controller	Date	Shut In Test (~~Hg~~ H_2O/min)	Differential Pressure (Pa)	Purge ~~Time~~ VOL_2	PID Measurement (pp~~B~~)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
-7.5	N3-480755Ø2	VSØ1	3132	142	100	Initial: —	300cc	Initial: —	Start: 0906	~~H~~ P NOTES		Initial: —
Notes:					Initial Vacuum: -26				Mid: —			
					Final Vacuum: -5	Post: -4.0		Post: 485	Stop: 0912	—	—	Post: 63.0

PID 1.0 ~~10~~ PPB VIP

CANNISTER PRESSURE "HG

Location	Sample ID	Cannister	Controller	Date	Shut In Test (~~Hg~~ H_2O/min)	Differential Pressure (Pa)	Purge ~~Time~~ VOL_2	PID Measurement (pp~~B~~)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
-4.0	N3-480755Ø3	VSØ1	A8092	170	100	Initial: —	300	Initial: —	Start: 0934	~~H~~ P NOTES		Initial: —
Notes:					Initial Vacuum: -29				Mid: —			
					Final Vacuum: -5	Post: -4.5		Post: 160 ~~165~~	Stop: 0939	—	—	Post: 64.0

PID 98 PPB

CANNISTER PRESSURE "HG

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Sampler Name(s): V RODARTE / A POACH
Date: 3/7/2013
Project Number:
Project Name: OU6 NASA VIP
Analytical Methods: TO-15

Comments:

4/5

Building: 4807
Date: 03/04/13
Project No.:
Project Name: NASA VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: _____
Windows open during measurements? Yes / No
Instrument used to measurement temperature: _____
Instrument used to measure pressure: _____

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 1:55 PM

Room 6 — PID 50 PPB — Purpose _____ — Occupants _____ — HVAC _____
0.0 Pa — 77.1 °F — Piping/Conduit: Yes / No — Comments: APPROXIMATELY UP TO 4 OCCUPANTS IN TRAINING ROOM / USED INTERMITTENTLY

Room 1 — PID 45 PPB — Purpose LOCKER ROOM — Occupants _____ — HVAC _____
-0.5 Pa — 70.1 °F — Piping/Conduit: Yes / No — Comments:

Room 2 — PID 20 PPB — Purpose SHOWERS — Occupants _____ — HVAC _____
0.0 Pa — 69.8 °F — Piping/Conduit: Yes / No — Comments:

Room 3 — PID 40 PPB — Purpose SAUNA — Occupants _____ — HVAC _____
0.0 Pa — 68.4 °F — Piping/Conduit: Yes / No — Comments:

Room 4 — PID 13 PPB — Purpose BATHROOM — Occupants _____ — HVAC _____
0.0 Pa — 68.2 °F — Piping/Conduit: Yes / No — Comments: NO EXHAUST FAN

Additional Comments:

5/5

Building: 4807
Date: 03/04/13
Project No.:
Project Name: NASA VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements:
Windows open during measurements? Yes / No
Instrument used to measurement temperature:
Instrument used to measure pressure:

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 2:20 PM

Room 7 — PID 25 PPB — Purpose BASKETBALL COURT — Occupants Ø — HVAC ND
0.0 Pa — 71.7 °F — Piping/Conduit: Yes / No — Comments:
NO HVAC RUNNING/ROOF TOP VENTS

Room 5 — PID 31 PPB — Purpose GENERAL STORAGE — Occupants Ø — HVAC
-0.5 Pa — 72.1 °F — Piping/Conduit: Yes / No — Comments:
STORAGE AREA

Room 8 — PID 55 PPB — Purpose PARTS STORAGE — Occupants Ø — HVAC
-2.5 Pa — 71.0 °F — Piping/Conduit: Yes / No — Comments:
STORAGE AREA

Room — PID — Purpose — Occupants — HVAC
Pa — °F — Piping/Conduit: Yes / No — Comments:

Room — PID — Purpose — Occupants — HVAC
Pa — °F — Piping/Conduit: Yes / No — Comments:

Additional Comments:

Indoor and Outdoor Ambient Air Field Data Sheet

Building: 4806/4807

Page 1 of 3

Location	Sample ID	Cannister	Controller ID	Sample Date	Sample Start Time	Sample End Time	PID Measurement (ppb)	Initial Vacuum (" Hg)	Initial Temp	Final Vacuum	Final Temp	Comments
N3-4806OAØ1	VS1	3653	2068	3/5/13	0740	1535	—	-27	~~60~~	-6	—	
	VS2	3745	2068	"	"	"	—	"	—	"	—	
N3-4806OAØ2	VS1	1415	2077	3/5/13	0755	1540	—	-27	—	-4	—	
N3-4806OAØ3	VS1	1438	2039A	3/5/13	0810	1545	—	-27	—	-5	—	
N3-4806IAØ2	VS1	5416	2019	3/5/13	0830	1600	87	-28	—	-6	—	
~~N3-4806IAØ5~~ 7 VIP N3-4807IAØ3	VS1	3140	2017	3/5/13	0840	1555	142	-28	—	-6	—	

Sampler Name(s): V RODARTE / A POACH

Date: 3/5/13

Project Number: 60226922

Project Name: OU6 NASA VIP

Analytical Methods: TO-15 LL

Comments: @ APPROXIMATELY 1:30 PM DOORS WERE ROLLED UP AND STREET SWEEPER PARKED INTO BLDG NEAR LOCATION. DOORS WERE OPEN FOR APPROXIMATELY 15 MINUTES.

N3-4806IAØ2 AND N3-4806SSØ2

Indoor and Outdoor Ambient Air Field Data Sheet

Building: 4806/4807

Location	Sample ID	Cannister	Controller ID	Sample Date	Sample Start Time	Sample End Time	PID Measurement (ppB)	Initial Vacuum	Initial Temp	Final Vacuum	Final Temp	Comments
N3-4806IA03	US1	3153	2018	3/5/13	0843	1601	104	-27	—	-6	—	
N3-4806IA01	US1	~~3138~~ 3151	2008	3/5/13	0855	1605	13	-28	—	-4	—	
	US2	1454	2068	3/5/13	0855	1605	13	-28	—	-4	—	
N3-4806IA04	US1	2036	1426	3/5/13	0902	1610	70	-27	—	-7	—	
N3-4806IA05	US1	1478	2007	3/5/13	0913	1613	70	-28.5	—	-7	—	
N3-4807IA01	US1	1463	2004	3/5/13	0926	1626	107	-27.5	—	-4	—	

Sampler Name(s): URODARTE/A POACH

Date: 3/5/13

Project Number: 60265922

Project Name: OU6 NASA UIP

Analytical Methods: TO-15 LL

Comments:

Indoor and Outdoor Ambient Air Field Data Sheet

Building: 4807

Location	Sample ID	Cannister	Controller ID	Sample Date	Sample Start Time	Sample End Time	PID Measurement (ppB)	Initial Vacuum (1416)	Initial Temp	Final Vacuum	Final Temp	Comments
N3-4807IAQ2	US1	1383	2044	3/5/13	0928	1635	81	-27	—	-7	—	
N3-4807IAQ4	US1	1459	2037	3/5/13	0945	1710	38	-28	—	-7	—	

Sampler Name(s): V RODARTE / A RODARTE

Date: 3/5/13

Project Number: 60265922

Project Name: CLC NASA VIP

Analytical Methods: TO-15LL

Comments:

Sub Slab Vapor Well Field Data Sheet

PID Used: PPB RAE
He Detector: N8, P
PA Meter: OMNIGUARD III

Building: 4810

Page 1 of 2

DIFF PRESSURE IA/OA

	Location	Sample ID	Cannister	Controller	Date	Shut In Test (~~Hg~~ H2O/min)	Differential Pressure (Pa)	Purge ~~Time~~ Vol cc	PID Measurement (ppB)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
+1.0	N3-48105501	VS01	5824	124	3/7/13	100	Initial: —	~~300~~	Initial: —	Start: 1017	SEE H2, P NOTES		Initial: 76.1
PID 90 PPB	Notes: CANNISTER PRESSURE IN HG					Initial Vacuum: -26		~~300~~		Mid: —			
						Final Vacuum: -5	Post: 0.0	—	Post: 320	Stop: 1023	—		Post:
	Location	Sample ID	Cannister	Controller	Date	Shut In Test (~~Hg~~ H2O/min)	Differential Pressure (Pa)	Purge ~~Time~~ Vol cc	PID Measurement (ppB)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
+3.5	N3-48105502	VS01	A7820	123	3/7/13	100	Initial: —	300	Initial: —	Start: 1048	SEE H2, P NOTES		Initial: —
PID 24 PPB	Notes: CANNISTER PRESSURE " HG					Initial Vacuum: -26				Mid: —			
						Final Vacuum: -5	Post: +3.0	—	Post: 581	Stop: 1055			Post: 72.0
	Location	Sample ID	Cannister	Controller	Date	Shut In Test (~~Hg~~ H2O/min)	Differential Pressure (Pa)	Purge ~~Time~~ Vol cc	PID Measurement (ppB)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
-20.0	N3-48105504	VS02	A7668	170	3/7/13	100	Initial: —	300	Initial: —	Start: 1114	SEE H2, P NOTES		Initial:
53 PPB PID	Notes: "					Initial Vacuum: -24				Mid: —			
						Final Vacuum: -5	Post: -16.0	—	Post: 36.0	Stop: 1118	—		Post: 68.4
	Location	Sample ID	Cannister	Controller	Date	Shut In Test (~~Hg~~ H2O/min)	Differential Pressure (Pa)	Purge ~~Time~~ Vol cc	PID Measurement (ppB)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
-20.0	N3-48105504	VS02	5272	160	3/7/13	100	Initial: —	300	Initial: —	Start: 1124	SEE H2, P NOTES		Initial: —
53 PPB PID	Notes: "					Initial Vacuum: -26				Mid: —			
						Final Vacuum: -5	Post: -16.0	—	Post: 36.0	Stop: 1130	—		Post: 68.4

Sampler Name(s): V. RODARTE / A. POACH
Date: ~~3/7/2013~~ 3/7/2013
Project Number:
Project Name: OU6 NASA VIP
Analytical Methods: TO-15

Comments:

F:\Rodarte - Backup Files 01-24-12\Rodarte\FINAL - OU1 PH II VIP SAP\Mini WP\Field Forms\Sub Slab Form 1077 (F-1077)rev1.xlsx

F-1077
Rev: 10-10-12

Sub Slab Vapor Well Field Data Sheet

PID Used: PPBRAE
He Detector: SEE H&P
PA Meter: OMNIGUARD III

Building: 4810

Page 2 of 2

DIFF PRESSURE FA/OA +5.0

0 PPB PID

Location	Sample ID	Cannister	Controller	Date	Shut In Test (H2O Hg/min)	Differential Pressure (Pa)	Purge Vol ~~Time~~	PID Measurement (pp B)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
N3-4B105503	VS01	6139	170	3/7/13	100	Initial: —	300 cc	Initial: —	Start: 1146	H&P NOTES		Initial: —
Notes: CANNISTER PRESSURE " HG					Initial Vacuum: -25				Mid: —			
					Final Vacuum: -5	Post: +5.0	—	Post: 120	Stop: 1151	—	—	Post: 69.3

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp___)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp___)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp___)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Sampler Name(s): J RODARTE / A POACH
Date: 3/7/2013
Project Number:
Project Name: OU6 NASA VIP
Analytical Methods: TO-15

Comments:

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19

Building: 4810 (N)
Date: ~~5/1/2013~~ 3/5/2013
Project No.:
Project Name: NASA VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements:
Windows open during measurements? Yes / No
Instrument used to measurement temperature:
Instrument used to measure pressure:

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 11:30 AM

Room CREW CRIB — PID 70 PPB — Purpose CREW CRIB — Occupants 1 — HVAC
+2.0 Pa — 74.2 °F — Piping/Conduit: Yes / No — Comments: BREAK ROOM

Room 20 — PID 76 PPB — Purpose OFFICE — Occupants 1 — HVAC
+0.5 Pa — 73.6 °F — Piping/Conduit: Yes / No — Comments:

Room 19 — PID 150 PPB — Purpose EMPTY OFFICE — Occupants 0 — HVAC
-1.0 Pa — 73.6 ~~76~~ °F — Piping/Conduit: Yes / No — Comments: VACANT ROOM AND FRESHLY PAINTED.

Room 18 — PID 140 PPB — Purpose OFFICE — Occupants — HVAC
0.0 Pa — 73.4 °F — Piping/Conduit: Yes / No — Comments:

Room 17 — PID 120 PPB — Purpose OFFICE — Occupants — HVAC
-1.0 Pa — 73.3 °F — Piping/Conduit: Yes / No — Comments:

Additional Comments:

2/9

Building: 4810
Date: 3/5/13
Project No.:
Project Name: NASA VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: ON
Windows open during measurements? Yes / No
Instrument used to measurement temperature:
Instrument used to measure pressure:

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 11:35 AM

Room REST ROOM (CREW CRIB) PID 30 PPB Purpose REST ROOM Occupants ~~0~~ HVAC
-0.5 Pa 73.2 °F Piping/Conduit: Yes / No Comments:
EXHAUST FAN ON

Room TOOL STORAGE (16) PID 110 PPB Purpose Occupants HVAC
-0.5 Pa 71.2 °F Piping/Conduit: Yes / No Comments:

Room CHEMICAL STORAGE PHARMACY (16A) PID 84 PPB Purpose PHARMACY Occupants HVAC
+0.5 Pa 71.2 °F Piping/Conduit: Yes / No Comments:
CHEMICAL STORAGE
PHARMACY

Room BREAK ROOM (CREW CRIB) PID 143 PPB Purpose Occupants HVAC
-0.5 Pa 73.6 °F Piping/Conduit: Yes / No Comments:

Room LOCKER ROOM (CREW CRIB) PID 136 PPB Purpose Occupants HVAC
-0.5 Pa 74.2 °F Piping/Conduit: Yes / No Comments:

Additional Comments:

Building: 4810
Date: 3/5/2013
Project No.:
Project Name: NASA VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: ON
Windows open during measurements? Yes / No
Instrument used to measurement temperature:
Instrument used to measure pressure:

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 12:10 PM

Room 15 — PID 64 PPB — Purpose _____ — Occupants _____ — HVAC _____
+1.5 Pa — 74.1 °F — Piping/Conduit: Yes / No — Comments:
FIRE PROTECTION WORKSHOP

Room 15A — PID 62 PPB — Purpose OFFICE — Occupants 1 — HVAC _____
-1.0 Pa — 74.8 °F — Piping/Conduit: Yes / No — Comments:

Room 15B — PID 84 PPB — Purpose OFFICE — Occupants 6 — HVAC _____
+1.0 Pa — 74.4 °F — Piping/Conduit: Yes / No — Comments:

Room RESTROOM — PID 66 PPB — Purpose REST ROOM — Occupants 0 — HVAC _____
+2.0 Pa — 74.2 °F — Piping/Conduit: Yes / No — Comments:
EXHAUST FAN ON / FLOOR DRAIN

Room _____ — PID _____ — Purpose _____ — Occupants _____ — HVAC _____
_____ Pa — _____ °F — Piping/Conduit: Yes / No — Comments:

Additional Comments:

4/9

Building: 4810
Date: 3/5/13
Project No.:
Project Name: NASA VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: ON
Windows open during measurements? Yes / No
Instrument used to measurement temperature:
Instrument used to measure pressure:

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 12:27

Room 13 — -3.5 Pa — 76.7 °F — PID 30 PPB — Purpose OFFICE — Occupants 1 — HVAC
Piping/Conduit: Yes / No — Comments:

Room 12 — -2.5 Pa — 77.0 °F — PID 55 PPB — Purpose — Occupants Ø — HVAC
Piping/Conduit: Yes / No — Comments:
BREAK ROOM

Room 11 — -2.5 Pa — 77.4 °F — PID 41 PPB — Purpose — Occupants — HVAC
Piping/Conduit: Yes / No — Comments:
FILE ROOM / LIBRARY - NO DOOR ATTACHED

Room 10 — -2.5 Pa — 77.7 °F — PID 35 PPB — Purpose OFFICE — Occupants 1 — HVAC
Piping/Conduit: Yes / No — Comments:

Room 8 — -1.5 Pa — 77.9 °F — PID 89 PPB — Purpose — Occupants Ø — HVAC
Piping/Conduit: Yes / No — Comments:
COPY/PRINTER ROOM

Additional Comments:

5/9

Building: 4810
Date: 3/5/13
Project No.:
Project Name: NASA VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: (ON)
Windows open during measurements? Yes / No (No)
Instrument used to measurement temperature:
Instrument used to measure pressure:

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 12:33

Room 9 PID 75 PPB Purpose OFFICE Occupants 2 HVAC
-1.5 Pa 78.0 °F Piping/Conduit: Yes / No Comments:

Room ~~10~~ 7 PID 41 PPB Purpose OFFICE Occupants 1 HVAC
-2.0 Pa 78.0 °F Piping/Conduit: Yes / No Comments:

Room 5 PID 68 PPB Purpose OFFICE Occupants 2 HVAC
-0.5 Pa 77.0 °F Piping/Conduit: Yes / No Comments:

Room 6 PID 41 PPB Purpose OFFICE Occupants 1 HVAC
-2.0 Pa 77.5 °F Piping/Conduit: Yes / No Comments:

Room 14 PID 54 PPB Purpose Occupants ~~0~~ HVAC
~~-0.5~~ 0.0 Pa 75.4 °F Piping/Conduit: Yes / No Comments:
DOCUMENT STORAGE ROOM

Additional Comments:

6/9

Building: 4810
Date: 3/5/13
Project No.:
Project Name: NASA VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: ON
Windows open during measurements? Yes No
Instrument used to measurement temperature:
Instrument used to measure pressure:

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 12:43 PM

Room WOMENS RESTROOM PID 27 PPB Purpose WOMEN RESTROOM Occupants 0 HVAC
-3.0 Pa 74.5 °F Piping/Conduit: Yes / No Comments:
EXHAUST FAN ON (NEXT TO 14)

Room MENS RESTOOM PID 62 PPB Purpose MEN'S RESTROOM Occupants 0 HVAC
-5.0 Pa 77 °F Piping/Conduit: Yes / No Comments:
EXHAUST FAN ON (NEXT TO 14)

Room 3C PID 38 ppb Purpose office Occupants HVAC
-0.5 Pa 77.5 °F Piping/Conduit: Yes / No Comments:

Room 3 PID 37 ppb Purpose Office/cubes Occupants HVAC
-0.5 Pa 77.5 °F Piping/Conduit: Yes / No Comments:

Room 2C PID 36 ppb Purpose office Occupants 1 HVAC
-0.5 Pa 77.6 °F Piping/Conduit: Yes / No Comments:

Additional Comments:

7/9

Building: 4810
Date: 3/5/2013
Project No.:
Project Name: NASA VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: _____

Windows open during measurements? Yes / No

Instrument used to measurement temperature: _____

Instrument used to measure pressure: _____

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)

Outside pressure: _____ Pa (avoid windy location)

Time: 1325

Room 2B
−0.5 Pa 77.7 °F
PID 36 ppb Purpose Office Occupants ____ HVAC ____
Piping/Conduit: Yes / No Comments:

Room 2
+1.0 Pa 79.1 °F
PID 36 ppb Purpose Cubicles Occupants ____ HVAC ____
Piping/Conduit: (Yes) / No Comments:

Room 2A
+1.0 Pa 78.7 °F
PID 14 ppb Purpose Office Occupants ____ HVAC ____
Piping/Conduit: Yes / No Comments:
Window AP 3513 & Doors open just prior to measurement.

Room 1C
+3.0 Pa 77.0 °F
PID 34 ppb Purpose Conference room Occupants ____ HVAC ____
Piping/Conduit: Yes / No Comments:

Room 4A
+0.5 Pa 75.5 °F
PID 30 ppb Purpose Office Occupants 1 HVAC yes
Piping/Conduit: Yes / No Comments:

Additional Comments:

8/9

Building: 4810
Date: 3-5-13
Project No.:
Project Name: NASA VIP

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements:
Windows open during measurements? Yes / No
Instrument used to measurement temperature:
Instrument used to measure pressure:

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 1343

Room 4 — 0.0 Pa — 74.5 °F — PID 24 ppb — Purpose Office — Occupants 2 — HVAC yes
Piping/Conduit: Yes / No — Comments:

Room Kitchen — -0.5 Pa — 74.7 °F — PID 36 ppb — Purpose Kitchen (North side) — Occupants — HVAC yes
Piping/Conduit: Yes / No — Comments: ↳ in closet.

Room 1 — 0.0 Pa — 75.2 °F — PID 36 ppb — Purpose office — Occupants — HVAC yes
Piping/Conduit: Yes / No — Comments:

Room 1A — -0.5 Pa — 75.1 °F — PID 79 ppb — Purpose Office — Occupants 1 — HVAC yes
Piping/Conduit: Yes / No — Comments:

Room Womans restroom (North) — -2.5 Pa — ~~77.7~~ °F 75.1 AP 3-5-13 — PID 30 ppb — Purpose — Occupants — HVAC
Piping/Conduit: Yes / No — Comments: exhaust fan on. Floor drain

Additional Comments:

9/9

Building: 4810
Date: 3-5-13
Project No.:
Project Name: NASA VIP survey

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: _____
Windows open during measurements? Yes / No
Instrument used to measurement temperature: _____
Instrument used to measure pressure: _____

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 1:56 PM

Room PID 40 PPB Purpose _____ Occupants _____ HVAC _____
0.0 Pa 74.6 °F Piping/Conduit: Yes / No Comments: _____
EXHAUST FAN / DRAIN

Room PID _____ Purpose _____ Occupants _____ HVAC _____
_____ Pa _____ °F Piping/Conduit: Yes / No Comments: _____

Room PID _____ Purpose _____ Occupants _____ HVAC _____
_____ Pa _____ °F Piping/Conduit: Yes / No Comments: _____

Room PID _____ Purpose _____ Occupants _____ HVAC _____
_____ Pa _____ °F Piping/Conduit: Yes / No Comments: _____

Room PID _____ Purpose _____ Occupants _____ HVAC _____
_____ Pa _____ °F Piping/Conduit: Yes / No Comments: _____

Additional Comments: _____

Indoor and Outdoor Ambient Air Field Data Sheet

Building: 4810

Page 1 of 2

Location	Sample ID	Cannister	Controller ID	Sample Date	Sample Start Time	Sample End Time	PID Measurement (ppb)	Initial Vacuum	Initial Temp	Final Vacuum	Final Temp	Comments
N3-4810A03	US1	5952	2005	3/6/13	0719	1458	—	-27	—	-3	—	
	US2	1446	2005	3/6/13	0719	1458	—	-27	—	-3	—	
N3-4810A01	US1	1479	2013	3/6/13	0730	1502	—	-29	—	-7	—	
N3-4810A02	US1	1344	2057	3/6/13	0740	1506	—	-28	—	-6	—	
N3-4810IA04	US1	3097	2099	3/6/13	0750	1510	—	-27	—	-7	—	PID= 20 PPB
	US2	1416	2099	3/6/13	0750	1510	—	-27	—	-7	—	
N3-4810IA03	US1	3546	2016	3/6/13	0755	1515	14	-27.5	—	-6.5	—	

Sampler Name(s): V RODARTE / A POACH

Date: 3/6/13

Project Number: 60265922

Project Name: OU6 NASA VIP

Analytical Methods: TO-15 LL

Comments:

Indoor and Outdoor Ambient Air Field Data Sheet

Building: 4810

Location	Sample ID	Cannister	Controller ID	Sample Date	Sample Start Time	Sample End Time	PID Measurement (ppb)	"HG Initial Vacuum	Initial Temp	Final Vacuum	Final Temp	Comments
N3-4810IA02	US1	1462	2041	3/6/13	0800	1520	40	-29	—	-7	—	
N3-4810IA01	US1	3743	2043	3/6/13	0805	1525	100	-27	—	-6	—	

Sampler Name(s): V RODARTE / A POAGH

Date: 3/6/13

Project Number: 60265922

Project Name: OU1 NASA VIP

Analytical Methods: TO-15LL

Comments:

Ambient weather readings ~~during VIP sample collection~~

Project Name: NASA OU6 VIP **Project Number:**

Morning Readings		Afternoon Readings	
Date: 3/4/13	Time: 0920	Time: 1630	
Temperature: 57°F	Humidity: 43%	Temperature: 71°F	Humidity: 49%
Wind speed & direction: CALM WINDS		Wind speed & direction: CALM WINDS	
Barometric pressure: 30.02 IN HG.		Barometric pressure: 27.60 IN HG.	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by: V. RODARTE		Recorded by: V. RODARTE	

Date: 3-5-13	Time: 1100	Time: 1500		
Temperature: 62°F	Humidity: 45%	Temperature: 70°F	Humidity: 29%	
Wind speed & direction: Calm winds.		Wind speed & direction: 14 MPH WSW		
Barometric pressure: 30.04 in		Barometric pressure: 29.95 IN HG		
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:	
Recorded by: A. POACH		Recorded by: V. RODARTE		

Start @ 1100 AM

Date: 3/6/13	Time: 0930	Time: 1847	
Temperature: 53°F	Humidity: 55%	Temperature: 51°F	Humidity: 78%
Wind speed & direction: SW 17 MPH		Wind speed & direction: 17 MPH WSW	
Barometric pressure: 30.05 inch		Barometric pressure: 29.55 INCH	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by: A. POACH		Recorded by: V. RODARTE	

Date: 3-7-13	Time: ~~0930~~ 1030 AP 3-7-13	Time: 1600		
Temperature: 54°F	Humidity: 52%	Temperature: 54°F	Humidity: 45%	
Wind speed & direction: WSW @ 18mph		Wind speed & direction: SW @ 18 MPH		
Barometric pressure: 29.42 in.		Barometric pressure: 29.85 inch		
Clear/Cloudy	Comments: Cloudy/partly cloudy chance of showers	Clear/Cloudy	Comments: Mostly cloudy	
Recorded by: POACH		Recorded by: A. POACH		

Date:	Time:	Time:	
Temperature:	Humidity:	Temperature:	Humidity:
Wind speed & direction:		Wind speed & direction:	
Barometric pressure:		Barometric pressure:	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by:		Recorded by:	

DB

H&P Mobile Geochemistry Inc.

Vapor Sampling with Helium Shroud

Site Address: Edwards AFB
Date: 3/6/13
Company: AECOM
H&P Project #: AECO30613
Arrival Time: 0800
Field Rep(s): Vonnie / Alonzo
H&P Rep(s): Dave P / Amilcar
Departure Time: 1915

			Summa Info					Probe Specs					Sample Information					Shroud Info			Probe (ppm) after sample
	Point ID	Date	Summa #	Start Time	Initial (" Hg)	End / Sample Time	End (" Hg)	Probe Depth (ft)	Tubing Length (ft)	Tubing Dia (in.)	Sand Pack Dia (in.)	Sand Pack Ht (in.)	Purge Vol (mL)	Flow Rate (mL/min)	Pump Run Time	Shut-in Test (✓if pass)	Probe Pressure (" Hg)	Shroud % Before	Shroud % After	Probe ppmv	
1	N3-48075S01-VS01	3/6/13	6149	1357	-26	1404	-5	SS	1'	1/4"	1"	3"	300	150	N/A	✓	0	54.0	50.1	3400	8522
2	N3-48075S02-VS01		3162	/	-26	/	/	SS	1'	1/4"	1"	3"	300	150	N/A	✓	/	53.4	/	/	/
3	N3-48065S01-VS01		7642	1458	-30	1504	-5	SS	1'	1/4"	1"	3"	300	150	N/A	✓	0	53.7	50.6	0	0
4	N3-48065S02-VS01		7657	1520	-28	1526	-5	SS	1'	1/4"	1"	3"	300	150	N/A	✓	0	53.9	51.2	17300	5.1%
5	N3-48065S02-VS02		7800	/	-28	/	/	SS	1'	1/4"	1"	3"	1300	150	N/A	✓	0	/	/	/	/
6	N3-48075S02-VS01		~~7659~~	/	-26	/	/	SS	1'	1/4"	1"	3"	300	150	N/A	✓	0	53.6	/	6.2%	/
7	N3-48065S03-VS01		7659	1645	-26	1650	-5	SS	1'	1/4"	1"	3"	300	150	N/A	✓	0	52.0	50.4	0	1500
8	N3-48065S03-VS02		5311	1655	-24	1701	-5	SS	1'	1/4"	1"	3"	1300	150	N/A	✓	0	53.2	51.1	625	6000
9	N3-48075S03-VS01		~~5269~~	/	-26	/	/	SS	1'	1/4"	1"	3"	300	150	N/A	✓	0	56.5	/	13.2%	/
10	N3-48065S04-VS01		5269	1759	-26	1805	-5	SS	1'	1/4"	1"	3"	300	150	N/A	✓	0	53.0	50.6	0	1300
11	N3-48065S05-VS01		5930	1822	-25	1827	-5	SS	1'	1/4"	1"	3"	300	150	N/A	✓	0	51.6	50.0	225	1900
12	N3-48075S04-VS01		1718	1845	-26	1855	-5	SS	1'	1/4"	1"	3"	300	150	N/A	✓	0	51.4	50.6	475	4975
13																					
14																					
15																					

Purge Volume Amount Selected: 300cc Selected by: client

Shroud Procedure Summary:

Overtime:

Approved by:

Field and Sample Collection Notes:
From sample # N3-48065S04-VS01 I added bentonite seal around SS fitting.

H&P Mobile Geochemistry Inc.

Vapor Sampling with Helium Shroud

Site Address: Edwards AFB
Company: AECOM
Field Rep(s): Vonnie / Alonzo
H&P Project #: AEC030613
H&P Rep(s): Dave P / Amilcar
Date: 3/7/13
Arrival Time: 0700
Departure Time: 1215

			Summa Info					Probe Specs					Sample Information					Shroud Info			Probe (ppm) after sample
	Point ID	Date	Summa #	Start Time	Initial (" Hg)	End / Sample Time	End (" Hg)	Probe Depth (ft)	Tubing Length (ft)	Tubing Dia (in.)	Sand Pack Dia (in.)	Sand Pack Ht (in.)	Purge Vol (mL)	Flow Rate (mL/min)	Pump Run Time	Shut-in Test (✓if pass)	Probe Pressure (" Hg)	Shroud % Before	Shroud % After	Probe ppmv	
1	N3-48075S02-VS01	3/7/13	3132	0906	-26	0912	-5	SS	1'	1/4"	1"	3"	300	150	N/A	✓	0	52.5	50.4	250	25
2	N3-48075S03-VS01		8092	0934	-29	0939	-5	SS	1'	1/4"	1"	3"	300	150	N/A	✓	0	51.2	51.3	10275	14.3%
3	N3-48105S01-VS01		5824	1017	-26	1023	-5	SS	1'	1/4"	1"	3"	300	150	N/A	✓	0	52.2	51.3	1825	450
4	N3-48105S02-VS01		7820	1048	-26	1055	-5	SS	1'	1/4"	1"	3"	300	150	N/A	✓	0	51.1	51.0	875	1000
5	N3-48105S04-VS01		7668	1114	-24	1118	-5	SS	1'	1/4"	1"	3"	300	150	N/A	✓	0	51.0	50.9	500	4000
6	N3-48105S04-VS02		5272	1124	-26	1130	-5	SS	1'	1/4"	1"	3"	1300	150	N/A	✓	0	50.4	51.2	3675	5100
7	N3-48105S03-VS01		6139	1146	-25	1151	-5	SS	1'	1/4"	1"	3"	300	150	N/A	✓	0	52.9	51.0	575	2650
8																					
9																					
10																					
11																					
12																					
13																					
14																					
15																					

Purge Volume Amount Selected: 300cc Selected by: Client

Shroud Procedure Summary:

Overtime:

Approved by:

Field and Sample Collection Notes:
Added bentonite seal around SS fitting on all samples.

E030802-01/38

AECOM

Chain-of-Custody Record

Laboratory:
Air Technology Laboratories
18501 E. Gale Avenue Suite 130
City of Industry, CA 91748
Contact: Joann De La Ossa
(626) 964-4032 phone
(626) 964-5832 fax

Client:
AECOM - SJ/EAFB
100 Contractor Hill Road
Edwards, CA 93523

Shipment Number: 6689
Method of Shipment: Sampler
Air Bill Number:
Cooler Number: NA
Custody Seal No.:

Project Number: 60277061-08.01
Project Name: NASA Dryden OU6 VIP
Project Contact: Kimberly Coleman
(916) 361-6406 phone
(916) 361-6401 fax

Sampler's Signature: Vonnie Rodarte/

Lab Job:
Ship Date: 3/8/2013
Page: 1 of 3

	Sample	Field Sample ID	Sampling Date	Sampling Time	Matrix Type	Type/Size of Container	Preservation Temp	Preservation Chemical	Filtered	No. of Containers	Low Vol VOCs - µg/m3 (TO-15)	Helium (D1946)	TO15 SIM	Remarks	END TIME
01	01	EDWRD-N3-4806-IA01-VS1	3/5/2013	0855	A	Summa	NA	NA		1	X			6L TO-15 Low level	1605
02	02	EDWRD-N3-4806-IA01-VS2	3/5/2013	0855	A	Summa	NA	NA		1	X			6L TO-15 Low level	1605
03	03	EDWRD-N3-4806-IA02-VS1	3/5/2013	0830	A	Summa	NA	NA		1	X			6L TO-15 Low level	1600
04	04	EDWRD-N3-4806-IA03-VS1 0843	3/5/2013	~~0840~~	A	Summa	NA	NA		1	X			6L TO-15 Low level	~~1555~~ 1601
05	05	EDWRD-N3-4806-IA04-VS1	3/5/2013	0902	A	Summa	NA	NA		1	X			6L TO-15 Low level	1610
06	06	EDWRD-N3-4806-IA05-VS1	3/5/2013	0913	A	Summa	NA	NA		1	X			6L TO-15 Low level	1613
07	07	EDWRD-N3-4806-OA01-VS1	3/5/2013	0740	A	Summa	NA	NA		1	X			6L TO-15 Low level	1535
08	08	EDWRD-N3-4806-OA01-VS2	3/5/2013	0740	A	Summa	NA	NA		1	X			6L TO-15 Low level	1535
09	09	EDWRD-N3-4806-OA02-VS1	3/5/2013	0755	A	Summa	NA	NA		1	X			6L TO-15 Low level	1540
10	10	EDWRD-N3-4806-OA03-VS1	3/5/2013	0810	A	Summa	NA	NA		1	X			6L TO-15 Low level	1545
11	11	EDWRD-N3-4806-SS01-VS1	3/6/2013	1458	A	Summa	NA	NA		1	X	X	X	1 L Standard Level	1504
12	12	EDWRD-N3-4806-SS02-VS1	3/6/2013	1520	A	Summa	NA	NA		1	X	X	X	1 L Standard Level	1526
13	13	EDWRD-N3-4806-SS03-VS1	3/6/2013	1645	A	Summa	NA	NA		1	X	X	X	1 L Standard Level	1650
14	14	EDWRD-N3-4806-SS03-VS2	3/6/2013	1655	A	Summa	NA	NA		1	X	X	X	1 L Standard Level	1701
15	15	EDWRD-N3-4806-SS04-VS1	3/6/2013	1759	A	Summa	NA	NA		1	X	X	X	1 L Standard Level	1805

Relinquished By	Date	Received By	Date	Relinquished By	Date	Received By	Date
Signature: Vonnie Rodarte	3/8/13	Signature: Joann De La Ossa	3/8/13	Signature:		Signature:	
Printed: VONNIE RODARTE	Time 1204	Printed: Joann De La Ossa	Time 1204	Printed:	Time	Printed:	Time
Company: AECOM		Company: Air Tech Labs		Company:		Company:	
Reason:				Reason:			

Comments:
Shipment summary: 38 samples, 1 cooler, 3 COC pages. Summa Canisters; ***Also analyze 1 liter SUMMAS for Helium (via ASTM D1946)*** TAT Type: Standard.

LEVEL IV FOR ALL SAMPLES JR

All ID's to ind. "Ø", VSØ1 or VSØ2

Relinquished By	Date	Received By	Date
Signature:		Signature:	
Printed:	Time	Printed:	Time
Company:		Company:	
Reason:			

Distribution: WHITE to Analytical Laboratory Report, YELLOW to Laboratory File, PINK to Courier/Delivery Service or Field Office, GOLDEN to Project Office File

per email from K. Coleman 3/11/13 JD

60280802-01158

AECOM

Chain-of-Custody Record

Laboratory:
Air Technology Laboratories
18501 E. Gale Avenue Suite 130
City of Industry, CA 91748
Contact: Joann De La Ossa
(626) 964-4032 phone
(626) 964-5832 fax

Client:
AECOM - SJ/EAFB
100 Contractor Hill Road
Edwards, CA 93523

Shipment Number: 6689
Method of Shipment: Sampler
Air Bill Number:
Cooler Number: NA
Custody Seal No.:

Project Number: 60277061-08.01
Project Name: NASA Dryden OU6 VIP
Project Contact: Kimberly Coleman
(916) 361-6406 phone
(916) 361-6401 fax

Sampler's Signature: Vonnie Rodarte /a

Lab Job:
Ship Date: 3/8/2013
Page: 2 of 3

Analyses Requested: LOW LEVEL VOCs - µg/m3 (TO15); HELIUM (D1946); TO-15 STANDARD

	Sample	Field Sample ID	Sampling Date	Sampling Time	Matrix Type	Type/Size of Container	Preservation Temp	Preservation Chemical	Filtered	No. of Containers	LOW LEVEL VOCs - µg/m3 (TO15)	HELIUM (D1946)	TO-15 STANDARD	Remarks	END TIME
16	16	EDWRD-N3-4806-SS05-VS1	3/6/2013	1822	A	Summa	NA	NA		1	X	X	X	1 L Standard Level	1827
17	17	EDWRD-N3-4807-IA01-VS1	3/6/2013	0926	A	Summa	NA	NA		1	X			6L TO-15 Low level	1626
18	18	EDWRD-N3-4807-IA02-VS1	3/5/2013	0928	A	Summa	NA	NA		1	X			6L TO-15 Low level	1635
19	19	EDWRD-N3-4807-IA03-VS1 0840	3/5/2013	~~0843~~ VR	A	Summa	NA	NA		1	X			6L TO-15 Low level	1555
20	20	EDWRD-N3-4807-IA04-VS1	3/5/2013	0945	A	Summa	NA	NA		1	X			6L TO-15 Low level	1710
21	21	EDWRD-N3-4807-SS01-VS1	3/6/2013	1357	A	Summa	NA	NA		VR 1	X	X	X	1 L Standard Level	1404
22	22	EDWRD-N3-4807-SS02-VS1	3/7/2013	0906	A	Summa	NA	NA		1	X	X	X	1 L Standard Level	1912
23	23	EDWRD-N3-4807-SS03-VS1	3/7/2013	0934	A	Summa	NA	NA		1	X	X	X	1 L Standard Level	0939
24	24	EDWRD-N3-4807-SS04-VS1	3/6/2013	1845	A	Summa	NA	NA		1	X	X	X	1 L Standard Level	1855
25	25	EDWRD-N3-4810-IA01-VS1	3/6/2013	0805	A	Summa	NA	NA		1	X			6L TO-15 Low level	1525
26	26	EDWRD-N3-4810-IA02-VS1	3/6/2013	0800	A	Summa	NA	NA		1	X			6L TO-15 Low level	1520
27	27	EDWRD-N3-4810-IA03-VS1	3/6/2013	0755	A	Summa	NA	NA		1	X			6L TO-15 Low level	1515
28	28	EDWRD-N3-4810-IA04-VS1	3/6/2013	0750	A	Summa	NA	NA		1	X			6L TO-15 Low level	1510
29	29	EDWRD-N3-4810-IA04-VS2	3/6/2013	0750	A	Summa	NA	NA		1	X			6L TO-15 Low level	1510
30	30	EDWRD-N3-4810-OA01-VS1	3/6/2013	0730	A	Summa	NA	NA		1	X			6L TO-15 Low level	1502

Relinquished By	Date	Received By	Date	Relinquished By	Date	Received By	Date
Signature: Vonnie Rodarte	3/8/13	Signature: Joann De La Ossa	3/8/13	Signature:		Signature:	
Printed: VONNIE RODARTE	Time 1204	Printed: Joann De La Ossa	Time 1204	Printed:	Time	Printed:	Time
Company: AECOM		Company: Air Tech Labs		Company:		Company:	
Reason:				Reason:			

Comments:
Shipment summary: 38 samples, 1 cooler, 3 COC pages. Summa Canisters; ***Also analyze 1 liter SUMMAS for Helium (via ASTM D1946)*** TAT Type: Standard.
LEVEL IV FOR ALL SAMPLES VR
All TO's to incl. "Ø", VSØ1 or VSØ2 per email from K. Cole 3/11/13

Relinquished By	Date	Received By	Date
Signature:		Signature:	
Printed:	Time	Printed:	Time
Company:		Company:	
Reason:			

Distribution: WHITE to Analytical Laboratory Report, YELLOW to Laboratory File, PINK to Courier/Delivery Service or Field Office, GOLDEN to Project Office File

E030802-01138

AECOM

Chain-of-Custody Record

Laboratory:
Air Technology Laboratories
18501 E. Gale Avenue Suite 130
City of Industry, CA 91748
Contact: Joann De La Ossa
(626) 964-4032 phone
(626) 964-5832 fax

Client:
AECOM - SJ/EAFB
100 Contractor Hill Road
Edwards, CA 93523

Shipment Number: 6689
Method of Shipment: Sampler
Air Bill Number:
Cooler Number: NA
Custody Seal No.:

Project Number: 60277061-08.01
Project Name: NASA Dryden OU6 VIP
Project Contact: Kimberly Coleman
(916) 361-6406 phone
(916) 361-6401 fax

Sampler's Signature: Donnie Rodarte /in

Lab Job:
Ship Date: 3/8/2013
Page: 3 of 3

Analyses Requested

	Sample	Field Sample ID	Sampling Date	Sampling Time	Matrix Type	Type/Size of Container	Preservation Temp	Preservation Chemical	Filtered	No. of Containers	~~LOW LEVEL~~ VOCs - µg/m3 (TO15) (VP)	HELIUM D1946	TO-15 STANDARD (VP)	TO-15 STANDARD	Remarks
31	31	EDWRD-N3-4810-OA02-VS1	3/6/2013	0740	A	Summa	NA	NA		1	X				6L TO-15 Low level 1506
32	32	EDWRD-N3-4810-OA03-VS1	3/6/2013	0719	A	Summa	NA	NA		1	X				6L TO-15 Low level 1458
33	33	EDWRD-N3-4810-OA03-VS2	3/6/2013	0719	A	Summa	NA	NA		1	X				6L TO-15 Low level 1458
34	34	EDWRD-N3-4810-SS01-VS1	3/7/2013	1017	A	Summa	NA	NA		1	~~X~~	X	X		1 L Standard Level 1023
35	35	EDWRD-N3-4810-SS02-VS1	3/7/2013	1048	A	Summa	NA	NA		1	~~X~~	X	X		1 L Standard Level 1055
36	36	EDWRD-N3-4810-SS03-VS1	3/7/2013	1146	A	Summa	NA	NA		1	~~X~~	X	X		1 L Standard Level 1151
37	37	EDWRD-N3-4810-SS04-VS1	3/7/2013	1114	A	Summa	NA	NA		1	~~X~~	X	X		1 L Standard Level 1118
38	38	EDWRD-N3-4810-SS04-VS2	3/7/2013	1124	A	Summa	NA	NA		1	~~X~~	X	X		1 L Standard Level 1130
										(VP)					

Relinquished By	Date	Received By	Date	Relinquished By	Date	Received By	Date
Signature: Donnie Rodarte	3/8/13	Signature: Joann DeLa Ossa	3/8/13	Signature:		Signature:	
Printed: DONNIE RODARTE	Time 1204	Printed: Joann De La Ossa	Time 1204	Printed:	Time	Printed:	Time
Company: AECOM		Company: Air Tech Labs		Company:		Company:	
Reason:				Reason:			

Comments:
Shipment summary: 38 samples, 1 cooler, 3 COC pages. Summa Canisters; ***Also analyze 1 liter SUMMAS for Helium (via ASTM D1946)*** TAT Type: Standard.
LEVEL IV FOR ALL SAMPLES (VP) All 10's to incl. "Ø", VS01 or VS02, per email from K. Ide 3/11/13 OD

Relinquished By	Date	Received By	Date
Signature:		Signature:	
Printed:	Time	Printed:	Time
Company:		Company:	
Reason:			

Distribution: WHITE to Analytical Laboratory Report, YELLOW to Laboratory File, PINK to Courier/Delivery Service or Field Office, GOLDEN to Project Office File

Sub Slab Vapor Well Field Data Sheet

PID Used: PPb RAE 3000
He Detector: MGD · 2002 RAPID DETECTION
PA Meter: OMNI GUARD 4

Building: 4806

Page 1 of 2

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
EDWARDS												
N3-4806-SS01	VS2	6153	—	8/22/13	120" H_2O	Initial: —	300 cc	Initial: —	Start: 1124	54.7 %	0 ppm	Initial: 83
Notes: AMB. ROOM PID: 0 ppb					Initial Vacuum: -30"				Mid: —	—	—	
					Final Vacuum: -5"	Post: 0.0		Post: 0	Stop: 1131	96 %	6675 ppm	Post: 83

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
EDWARDS												
N3-4806-SS02	VS2	6139	—	8/22/13	120" H_2O	Initial: —	300 cc	Initial: —	Start: 1301	54.9%	2.3 %	Initial: 75
Notes: ROOM PID: 0 PPb					Initial Vacuum: -30" Hg				Mid: —	—	—	
					Final Vacuum: -5	Post: ~~B~~ A 0.0		Post: 0	Stop: 1307	92.4%	12.3%	Post: 75

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (ppb__)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
EDWARDS												
N3-4806-SS03	VS2	6149	—	8/22/13	120" H_2O	Initial: —	300 cc	Initial: —	Start: 1412	55 %	300 ppm	Initial: 74
Notes: ROOM PID: 0 ppb					Initial Vacuum: -27.5				Mid: —	—	—	
					Final Vacuum: -5	Post: +0.5		Post: 0	Stop: 1419	88.8 %	6675 ppm	Post: 74

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (ppb__)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
N3-4806-SS03	VS2D2	A7820	—	8/22/13	120" H_2O	Initial: —	300 cc	Initial: —	Start: 1412	55 %	300 ppm	Initial: 74
Notes: ROOM PID: 0 ppb					Initial Vacuum: -27.5				Mid: —	—	—	
					Final Vacuum: -5	Post: +0.5		Post: 0	Stop: 1419	88.8%	6675 ppm	Post: 74

Sampler Name(s): M. Miles, V. Rodarte
Date: 8/22/13
Project Number: 60277061
Project Name: 006 - VIP
Analytical Methods: TO-15

Comments:

Sub Slab Vapor Well Field Data Sheet

PID Used: FPD Rae 3000
He Detector: MGD-2002
PA Meter: Omni Guard 4

Building: 4806

Page (2) of 2

EDWARDS Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (ppb)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
X N3.4806.SS04	VS2	6154	-	8/22/13	120" H2O	Initial: —	300 cc	Initial: 0	Start: 1518	56.5 %	650 ppm	Initial: 68
Notes: Room PID: 0					Initial Vacuum: -28				Mid: —	—	—	
					Final Vacuum: -5	Post: -4.0		Post: 0	Stop: 1524	61.6%	425 ppm	Post: 68

EDWARDS Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (ppb)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
X N3.4806.SS05	VS2	5274	—	8/22/13	120" H2O	Initial: —	300 cc	Initial: 0	Start: 1338	54.9%	700 ppm	Initial: 79
Notes: Room PID: 0					Initial Vacuum: -30" Hg				Mid: —	—	—	
					Final Vacuum: -5" Hg	Post: +2.5		Post: 0	Stop: 1345	64.6 %	2450	Post: 78

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Sampler Name(s): M. Mikes / Vonnie Rodarte
Date: 8/22/13
Project Number: 60277061
Project Name: OU6 - VIP
Analytical Methods: TO-15 low level

Comments:

Building: 4806
Date: 8/20/13
Project No.: 60277001
Project Name: OU6 VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE NOTES BELOW
Windows open during measurements? ~~Yes / No~~ SEE NOTES BELOW
Instrument used to measure~~ment~~ temperature: ~~OAKTRON~~ (VR) CEN-TECH #93984
Instrument used to measure pressure: OMNIGUARD IV
PID ppbRAE 3000

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: SEE °F (avoid direct sunlight)
Outside pressure: WEATHER LOG Pa (avoid windy location)

Time: 1:15 PM

Room (12) — PID -1.5 PPB — Purpose — Occupants ~~1~~ Ø — HVAC ~~SWAMP~~ COOLER OFF
Ø Pa — 87 °F — Piping/Conduit: (Yes) / No — Comments: / CONDUITS OBSERVED ON STORAGE ROOM / EAST SIDE OF RM WALL

Room (8) — PID Ø PPB — Purpose — Occupants ~~1~~ Ø — HVAC ~~SWAMP~~ COOLER ON
+2.5 Pa — 79 °F — Piping/Conduit: (Yes) / No — Comments: STORAGE AREA DRAIN IN CENTER OF RM STREET SWEEPER IS OCCASIONALLY PARKED IN HERE BUT NOT TODAY

Room (10) — PID ~~+3.0~~ 0 PPB — Purpose — Occupants 1 — HVAC AC WINDOW UNIT
+3.0 ~~Ø~~ VR Pa — 76 °F — Piping/Conduit: (VR) Yes / (No) — Comments: OCCUPIED 3 DAYS/WK

Room (7) — PID 0 PPB — Purpose — Occupants Ø — HVAC ON
+1.5 Pa — 74 °F — Piping/Conduit: (Yes) / No — Comments: RESTROOM / DRAIN

Room (6) — PID 0 — Purpose — Occupants — HVAC
0.0 Pa — 76 °F — Piping/Conduit: Yes / No — Comments:

Additional Comments: UP TO 6 PEOPLE OCCUPY THE BLDG ONLY 2 PEOPLE WORKING TODAY.

Building: 4806
Date: 8/20/13
Project No.: 60277061
Project Name: OU6 VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE NOTES BELOW
Windows open during measurements? ~~Yes / No~~ SEE NOTES BELOW
Instrument used to measurement temperature: ~~OAKTRON~~ (UP) GEO-TECH #93984
Instrument used to measure pressure: OMNIGUARD IV
PID ppBRAE 3000

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: SEE °F (avoid direct sunlight)
Outside pressure: WEATHER LOG Pa (avoid windy location)

Time: 2:00 PM

Room (9) PID Ø PPB Purpose ____ Occupants 1 HVAC FAN
+2.0 Pa 75 °F Piping/Conduit: (Yes) / No Comments:
MAINTENANCE SHOP
SMALL TRUCK PARKED INSIDE / HANGAR DOOR OPEN IN RM (5)

Room (5) PID 4 PPB Purpose ____ Occupants ____ HVAC SWAP COOLER ON
0.0 Pa 77 °F Piping/Conduit: (Yes) / No Comments:
~~MAINTENA~~ (UP) MAINTENANCE SHOP
VEHICLE PARKED INSIDE, HANGAR DOOR OPEN

Room (1) PID 26 PPB Purpose ____ Occupants 1 HVAC ON
+3.5 Pa 66 °F Piping/Conduit: Yes / (No) Comments:

Room (2) PID 18 PPB Purpose ____ Occupants ____ HVAC ON
+3.0 Pa 67 °F Piping/Conduit: Yes / (No) Comments:

BLDG 4807

Room (11) PID 220 PPB Purpose ____ Occupants Ø HVAC YES/ON
+2.0 Pa ____ °F Piping/Conduit: (Yes) / No Comments:
STORAGE ROOM FOR EQUIPMENT (E.G., GENERATORS)
(UP) ~~HYDRAULIC~~ SMALL MOTORS, HYDRAULIC EQUIPMENT

Additional Comments:

Building: 4806
Date: 8/20/13
Project No.: 60277061
Project Name: OU6 VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE NOTES BELOW
Windows open during measurements? ~~Yes / No~~ SEE NOTES BELOW
Instrument used to measurement temperature: ~~OAKTRONICS~~ CEN-TECH #93984
Instrument used to measure pressure: OMNIGUARD IV
PID PPBRAE 3000

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: SEE °F (avoid direct sunlight)
Outside pressure: WEATHER LOG Pa (avoid windy location)

Time: 2:15 PM

Room 3 PID 50 PPB Purpose ____ Occupants ____ HVAC ON
+3.5 Pa 67 °F Piping/Conduit: Yes / No Comments:

NOT OCCUPIED ON FULL-TIME BASIS
ONLY USED FOR INTERMITTANT ACTIVITIES

Room 4 PID 84 PPB Purpose ____ Occupants ____ HVAC ON
+4.0 Pa 68 °F Piping/Conduit: Yes / No Comments:

NOT OCCUPIED ON FULL-TIME BASIS

Room PID ____ Purpose ____ Occupants ____ HVAC ____
____ Pa ____ °F Piping/Conduit: Yes / No Comments:

Room PID ____ Purpose ____ Occupants ____ HVAC ____
____ Pa ____ °F Piping/Conduit: Yes / No Comments:

Room PID ____ Purpose ____ Occupants ____ HVAC ____
____ Pa ____ °F Piping/Conduit: Yes / No Comments:

Additional Comments:

Building: 4806
Date: 8/28/13
Project No.: 60277061
Project Name: OU6 VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE NOTES FROM 8/20/13
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CEN TECH #93984
Instrument used to measure pressure: OMNIGUARD TU
PID PPB RAE 3000

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: SEE °F (avoid direct sunlight)
Outside pressure: WEATHER LOG Pa (avoid windy location)

Time: 1:20 PM

Room 5 SHOP PID 0 PPB Purpose ____ Occupants ____ HVAC ____
+0.5 Pa 79 °F Piping/Conduit: Yes / No Comments: ____

Room 3 BREAK ROOM (FORMER OFFICE) PID 0 PPB Purpose ____ Occupants ____ HVAC ____
+6.5 Pa 70 °F Piping/Conduit: Yes / No Comments: ____

Room 8 SHOP PID 0 PPB Purpose ____ Occupants ____ HVAC ____
+1.0 Pa 80 °F Piping/Conduit: Yes / No Comments: ____

Room 10 OFFICE PID 5 PPB Purpose ____ Occupants ____ HVAC ____
+1.0 Pa 77 °F Piping/Conduit: Yes / No Comments: ____

Room 12 PID 158 PPB Purpose ____ Occupants ____ HVAC ____
+1.0 Pa 83 °F Piping/Conduit: Yes / No Comments: ____

Additional Comments: ____

Indoor and Outdoor Ambient Air Field Data Sheet

Building: 4806

Page 1 of 2

Location	Sample ID	Cannister	Controller ID	Sample Date	Sample Start Time	Sample End Time	PID Measurement (ppb) INITIAL	Initial Vacuum "Hg	Initial Temp °F	Final Vacuum "Hg	Final Temp °F	Comments
EDWRD-N3-4806IAØ1	AS 2	5484	2050	8/21/13	0725	1655	Ø	-28	SEE WEATHER LOG	3.5	SEE WEATHER LOG	FINAL PID = Ø PPB
	AS202	5420	2050	8/21/13	0725	1655	Ø	-28		3.5		
EDWRD-N3 4806IAØ1	AS2	3578	2099	8/21/13	0735	1520	Ø	-28		-5		FINAL PID = Ø PPB
EDWRD-N3 4806IAØ1	AS2	1399	2040	8/21/13	0740	1545	Ø	-29		-4		FINAL PID = Ø PPB
EDWRD-N3-4806IAØ1	AS2	3136	2136	8/21/13	0813	1550	Ø	-29	~~75~~	-3.5	~~80~~	FINAL PID = Ø PPB
	AS202	1453	2136	8/21/13	0813	1550	Ø	-29	~~75~~ 75°	3.5	~~80~~ 80°	" " = Ø PPB
EDWRD-N3-4806IAØ2	AS2	3734	6112	8/21/13	0824	1540	Ø	-28	75	-3	77°	FINAL PID = Ø PPB

Sampler Name(s): M. MILES / V. RODARTE

Date: 8/21/13

Project Number: 60277061

Project Name: OU6 VIP STUDY

Analytical Methods: TO-15 ~~TO-15~~

Comments:

Indoor and Outdoor Ambient Air Field Data Sheet

Building: 4806

Location	Sample ID	Cannister	Controller ID	Sample Date	Sample Start Time	Sample End Time	PID Measurement (ppB)	Initial Vacuum "Hg	Initial Temp °F	Final Vacuum "Hg	Final Temp °F	Comments
EDWARD-N3-4806IAØ3	AS2	1443	2041	8/21/13	0820	1545	Ø	-29	77°	-3.5	81	FINAL PID = Ø PPB
EDWARD-N3-4806IAØ4	AS2	5480	2008	8/21/13	0830	1610	Ø	-29	70°	-5	70°	FINAL PID = Ø PPB
EDWARD-N3-4806IAØ5	AS2	2415	2013	8/21/13	0828	1600	~~360~~ 326 VP	-29	76°	-5	~~79~~ VP 79°	FINAL PID = Ø PPB SEE NOTE BELOW

Sampler Name(s): V RODARTE/M. MILES

Date: 8/21/13

Project Number: 60277061

Project Name: OU6 VIPSTUDY

Analytical Methods: TO-15

Comments: IN THE AFTERNOON BHOP (5) HAD OPEN DOORS WITH TWO VERY LARGE (INDUSTRIAL) FANS RUNNING UNTIL CLOSING OF BUSINESS (1600 HRS).

Sub Slab Vapor Well Field Data Sheet

PID Used: PPb RAE 3000
He Detector: RAPIDTECTOR MGD-2002
PA Meter: ~~GEN-TECH IR THERMOMETER~~ (OMN. GUARD 4) WELL

Building: 4807

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EDWARDS Location	Sample ID	Cannister	Controller	Date	Shut In Test ~~(Hg/min)~~	Differential Pressure (Pa)	Purge Time	PID Measurement (ppb) WELL	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
X N3-4807-SS01	VS2	A7659	—	8/22/13	120" H_2O	Initial: —	300 CC ~~3 vol.~~	Initial: —	Start: 1010	60.7 %	< 5% 8100 (ppm)	Initial: 71
Notes: Shroud 60.7 % AMBIENT ROOM 5 (ppb)					Initial Vacuum: Hg - 28"				Mid: —	—	—	
					Final Vacuum: Hg - 5"	Post: 0.0		Post: 0	Stop: 1016	50.8%	< 5% 9250 (ppm)	Post: 71

EDWARDS Location	Sample ID	Cannister	Controller	Date	Shut In Test ~~(Hg/min)~~	Differential Pressure (Pa)	Purge Time	PID Measurement (ppb)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
X N3-4807-SS02	VS2	A7654	—	8/22/13	120" H_2O	Initial: —	300 CC	Initial: —	Start: 1047	50.6 %	< 5% 1250	Initial: 74
Notes: ROOM PID = 3 (ppb)					Initial Vacuum: - 30" Hg				Mid: —	—	—	
					Final Vacuum: - 5"	Post: +0.5		Post: 57	Stop: 1051	69 %	725	Post: 74

EDWARDS Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (ppb)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
N3-4807-SS03	VS2	A8062	—	8/22/13	120" H_2O	Initial: —	300 CC	Initial: —	Start: 1452	50.2 %	800 ppm	Initial: 77
Notes: X ROOM PID = 124 ppb					Initial Vacuum: - 30 Hg				Mid: —	—	—	
					Final Vacuum: -3 Hg	Post: + 1.5		Post: 260	Stop: 1458	51.2	5000 ppm	Post: 77

EDWARDS Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (ppb)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
N3-4807-SS04	VS2	A8954	—	8/22/13	120" H_2O	Initial: —	300 CC	Initial: —	Start: 1603	57.7 %	400 ppm	Initial: 80
Notes: X ROOM PID: 0 ppb					Initial Vacuum: -28				Mid: —	—	—	
					Final Vacuum: -5	Post: -5.0		Post: 0	Stop: 1610	55.5 %	6400 ppm	Post: 80

Sampler Name(s): M. Miles, V. Rodarte
Date: 8/22/13
Project Number: 60277061
Project Name: OU6-VIP
Analytical Methods: TO-15

Comments:

Building: 4807
Date: 8/20/2013
Project No.: 60277661
Project Name: OU6 VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: OFF
Windows open during measurements? Yes / (No)
Instrument used to measurement temperature: CEN-TECH #93984
Instrument used to measure pressure: OMNI GUARD IV
PID ppB RAE 3000

Pressure and Temperature Readings
(Note location where measurements were taken on sketch)

Outside temperature: SEE WEATHER °F (avoid direct sunlight)
Outside pressure: " " " Pa (avoid windy location)

Time: 2:55 PM

Room (6) PID 71 PPB Purpose ____ Occupants ____ HVAC OFF
+1.5 Pa 72 °F Piping/Conduit: Yes / (No) Comments:

Room (7) PID 81 PPB Purpose ____ Occupants Ø HVAC OFF
+1.0 Pa ~~77~~ ~~87~~ (VR) °F Piping/Conduit: Yes / (No) Comments:
BASKET BALL COURT IS NOT USED
~~MAINLY~~ (VR) MAINLY USED FOR STORAGE

Room (4) PID 90 PPB Purpose ____ Occupants Ø HVAC OFF
+1.0 Pa 76 °F Piping/Conduit: (Yes) / No Comments:
RESTROOM/DRAIN

Room (2) PID 84 PPB Purpose ____ Occupants Ø HVAC OFF
0.0 Pa 75 °F Piping/Conduit: (Yes) / No Comments:
SHOWER ROOM/DRAIN

Room (1) PID 87 PPB Purpose ____ Occupants ____ HVAC OFF
-1.5 Pa 76 °F Piping/Conduit: (VR) ~~Yes / No~~ Comments:
LOCKER ROOM NO

Additional Comments:
BUILDING NOT IN USE
DURING BUILDING SURVEY

Building: 4807
Date: 8/20/2013
Project No.: 60277061
Project Name: OU6 VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: OFF
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CEN-TECH #93984
Instrument used to measure pressure: OMNIGUARD IV
PID PPB RAE 3000

Pressure and Temperature Readings
(Note location where measurements were taken on sketch)

Outside temperature: SEE WEATHERLOG °F (avoid direct sunlight)
Outside pressure: " " " Pa (avoid windy location)

Time: 3:15 PM

Room 5 PID 106 Purpose ____ Occupants Ø HVAC OFF
-6.0 Pa 72 °F Piping/Conduit: Yes / No Comments:
STORAGE ROOM

Room 8 PID — Purpose ____ Occupants Ø HVAC —
— Pa — °F Piping/Conduit: Yes / No Comments:
STORAGE ROOM WAS NOT ACCESSIBLE FOR BUILDING SURVEY.

Room PID ____ Purpose ____ Occupants ____ HVAC ____
____ Pa ____ °F Piping/Conduit: Yes / No Comments:

Room PID ____ Purpose ____ Occupants ____ HVAC ____
____ Pa ____ °F Piping/Conduit: Yes / No Comments:

Room PID ____ Purpose ____ Occupants ____ HVAC ____
____ Pa ____ °F Piping/Conduit: Yes / No Comments:

Additional Comments:

Building: 4807
Date: 8/28/13
Project No.: 60277061
Project Name: OU6 VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: ON
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CEN-TECH #93984
Instrument used to measure pressure: OMNIGUARD IV
PID ppBRAE 3000

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: SEE °F (avoid direct sunlight)
Outside pressure: WEATHER LOG Pa (avoid windy location)

Time: 1:10 PM

Room 6 — +1.0 Pa — 72 °F — PID 30 PPB — Purpose ____ — Occupants ____ — HVAC ____
Piping/Conduit: Yes / No — Comments:

Room 1 — -0.5 Pa — 70 °F — PID 0 PPB — Purpose ____ — Occupants ____ — HVAC ____
Piping/Conduit: Yes / No — Comments:

Room 8 — +0.5 Pa — 82 °F — PID 79 PPB — Purpose ____ — Occupants ____ — HVAC ____
Piping/Conduit: Yes / No — Comments:

Room 11 — +0.5 Pa — 75 °F — PID 120 PPB — Purpose ____ — Occupants ____ — HVAC ____
Piping/Conduit: Yes / No — Comments:

Room ____ — ____ Pa — ____ °F — PID ____ — Purpose ____ — Occupants ____ — HVAC ____
Piping/Conduit: Yes / No — Comments:

Additional Comments:

Indoor and Outdoor Ambient Air Field Data Sheet

Building: 4807

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Location	Sample ID	Cannister	Controller ID	Sample Date	Sample Start Time	Sample End Time	PID Measurement (ppb)	" Hg Initial Vacuum	°F Initial Temp	" Hg Final Vacuum	°F Final Temp	Comments
EDWRD-N3-4807IA01	AS2	6062	2189	8/21/13	0855	1530	Ø	-29	71	-3	71	FINAL PID = Ø PPB
EDWRD-N3-4807IA02	AS2	3178	2112	8/21/13	0856	1535	Ø	-29	74	-2	74	FINAL PID = Ø PPB
EDWRD-N3-4807IA03	AS2	5951	2122	8/21/13	0819	1605	13	-28	77	-3	77	FINAL PID = 26 PPB
EDWRD-N3-4807IA04	AS2	5435	2113	8/21/13	0910	1630	73	-29	82	-4	82	FINAL PID = Ø PPB

Sampler Name(s): V. RODARTE / M. MILES

Date: 8/21/13

Project Number: 60277601

Project Name: OU6 VIP STUDY

Analytical Methods: TO-15

Comments:

Sub Slab Vapor Well Field Data Sheet

PID Used: PPb RAE 3000
He Detector: MGD 2002
PA Meter: DWDI GUARD 4

Building: 4810

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EDWARDS X Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (ppb)	Sample Time	Shroud ~~Leak~~ Test (Helium)	Well Leak Test (Helium)	Temp (°F)
N7.4810.SS01	VS2	A7796	—	8/23/13	120" H_2O	Initial: —	300 cc	Initial: —	Start: 0806	66.1 %	0	Initial: 75
Notes: Room PID: 86 ppb					Initial Vacuum: 29 Hg				Mid: —	—	—	
					Final Vacuum: 5 Hg	Post: 0.0		Post: 0.0	Stop: 0812	53.5 %	3400 ppm	Post: 75

EDWARDS X Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (ppb)	Sample Time	Shroud ~~Leak~~ Test (Helium)	Well Leak Test (Helium)	Temp (°F)
N7.4810.SS02	VS2	5916	—	8/23/13	120" H_2O	Initial: —	300cc	Initial: —	Start: 0947	54.8 %	Ø	Initial: 76
Notes: Room PID: 70 ppb					Initial Vacuum: -29 Hg				Mid: —	—	—	
					Final Vacuum: -5 Hg	Post: +3.5		Post: 0	Stop: 0953	58.4	Ø	Post: 76

EDWARDS X Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (ppb)	Sample Time	Shroud ~~Leak~~ Test (Helium)	Well Leak Test (Helium)	Temp (°F)
N7.4810.SS03	VS2	3837	—	8/23/13	110" H_2O	Initial: —	300 cc	Initial: —	Start: 0914	57 %	350 ppm	Initial: 80
Notes: Room PID: 130 ppb					Initial Vacuum: -28.5 Hg				Mid: —	—	—	
					Final Vacuum: -5 Hg	Post: Ø		Post: Ø	Stop: 0921	58.6 %	325 ppm	Post: 80

EDWARD Location X	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (ppb)	Sample Time	Shroud ~~Leak~~ Test (Helium)	Well Leak Test (Helium)	Temp (°F)
N7.4810.SS04	VS2	A7653	—	8/23/13	120 H_2O	Initial: —	300 cc	Initial: —	Start: 0843	56.2 %	6050 ppm	Initial: 75
Notes: Room PID: 215 ppb					Initial Vacuum: 28 Hg				Mid: —	—	-	
					Final Vacuum: 4 Hg	Post: Ø		Post: 320	Stop: 0849	56.7 %	2.7 %	Post: 75

Sampler Name(s): M. Miles / V. Rodarte
Date: 8/23/13
Project Number: 60277061
Project Name: OU6 - VIP
Analytical Methods: TO.15

Comments:

Sub Slab Vapor Well Field Data Sheet

PID Used: PPb RAE 3000
He Detector: MGD 2002
PA Meter: OMNI GUARD 4

Building: 4810

Page 2 of 2

EDWARD Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (ppb)	Sample Time	Shroud ~~Leak~~ Test (Helium)	Well Leak Test (Helium)	Temp (°F)
X N7.4810.SSØ4	VS202	5265	—	8/23/13	120" H_2O	Initial: —	300 CC	Initial: —	Start: 0843	56.2%	6050 ppm	Initial: 75
Notes: ROOM PID: 215 ppb					Initial Vacuum: -27				Mid: —	—	—	
					Final Vacuum: -5	Post: Ø		Post: 320	Stop: 0849	56.7%	2.7%	Post: 75

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Sampler Name(s): M. Miles / V. RODARTE
Date: 8/23/13
Project Number: 60277061
Project Name: OU6- VIP
Analytical Methods: TO-15

Comments:

Building: 4810
Date: 8/21/2013
Project No.: 60277061
Project Name: OU6 VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: ON
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CEN-TECH #93984
Instrument used to measure pressure: OMNIGUARD IV
PID PPBRAE 3000

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: SEE °F (avoid direct sunlight)
Outside pressure: WEATHER LOG Pa (avoid windy location)

Time: 10:20 AM

Room ~~MENS~~ LADIES RESTRM (R1) PID Ø PPB Purpose ____ Occupants ____ HVAC ____
-1.5 Pa (VB) 75 °F Piping/Conduit: Yes / No Comments: DRAIN

Room MENS RESTROOM (R2) PID Ø PPB Purpose ____ Occupants ____ HVAC ____
0.0 Pa 78 °F Piping/Conduit: Yes / ~~No~~ Comments: DRAIN

Room (1A) PID Ø PPB Purpose ____ Occupants ____ HVAC ____
+0.5 Pa 75 °F Piping/Conduit: Yes / No Comments:

Room (1) PID Ø PPB Purpose ____ Occupants ____ HVAC ____
0.0 Pa 73 °F Piping/Conduit: Yes / No Comments:

Room ~~1C~~ (UP) 1C PID Ø PPB Purpose ____ Occupants ____ HVAC ____
0.0 Pa 73 °F Piping/Conduit: Yes / No Comments:

Additional Comments: UP TO ~75 PEOPLE OCCUPY THIS BUILDING

Building: 4810
Date: 8/21/13
Project No.: 60277061
Project Name: OU6 VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: ON
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CEN-TECH #93984
Instrument used to measure pressure: OMNIGUARD IV
PID ppBRAE 3000

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: SEE °F (avoid direct sunlight)
Outside pressure: WEATHER LOG Pa (avoid windy location)

Time: 10:45

Room KITCHEN PID Ø PPB Purpose ____ Occupants ____ HVAC ____
0.0 Pa 82 °F Piping/Conduit: Yes / No Comments: ____

Room UTILITY CLOSET IN KITCHEN PID Ø PPB Purpose ____ Occupants ____ HVAC ____
0.0 Pa — °F Piping/Conduit: Yes / No Comments: ____

Room 4 PID Ø PPB Purpose ____ Occupants ____ HVAC ____
0.0 Pa 72 °F Piping/Conduit: Yes / No Comments: ____

Room 4A PID Ø PPB Purpose ____ Occupants ____ HVAC ____
+0.5 Pa 70 °F Piping/Conduit: Yes / No Comments: ____

Room RESTROOM R3 PID Ø Purpose ____ Occupants ____ HVAC ____
-2.0 Pa 74 °F Piping/Conduit: Yes / No Comments: ____

Additional Comments: ____

Building: 4810
Date: 8/21/13
Project No.: 60277061
Project Name: OU6 VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: ON
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CEN-TECH #93984
Instrument used to measure pressure: OMNIGUARD IV
PID PPB RAE 3000

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 11:05

Room RESTROOM (R4) PID Ø PPB Purpose _____ Occupants _____ HVAC _____
-20 Pa 73 °F Piping/Conduit: Yes / No Comments: _____

TIME: 12:55

Room 5 PID Ø Purpose _____ Occupants _____ HVAC _____
+0.5 Pa 74 °F Piping/Conduit: Yes / No Comments: _____

Room BREAKROOM (12) PID Ø Purpose _____ Occupants _____ HVAC _____
-0.5 Pa 75 °F Piping/Conduit: Yes / No Comments: _____

Room 13 PID Ø Purpose _____ Occupants _____ HVAC _____
-0.5 Pa 73 °F Piping/Conduit: Yes / No Comments: _____

Room 10 PID Ø Purpose _____ Occupants _____ HVAC _____
0.0 Pa 73 °F Piping/Conduit: Yes / No Comments: _____

Additional Comments: _____

Building: 4810
Date: 8/21/13
Project No.: 60277001
Project Name: OU6 VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: ON
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CEN-TECH #93984
Instrument used to measure pressure: OMNIGUARD IV
PID PPB RAE 3000

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: SEE °F (avoid direct sunlight)
Outside pressure: WEATHER LINK Pa (avoid windy location)

Time: 1:10 PM

Room 11
0.0 Pa 73 °F PID Ø PPB Purpose ____ Occupants ____ HVAC ____
Piping/Conduit: Yes / No Comments: ____

Room 9
0.0 Pa 73 °F PID Ø PPB Purpose ____ Occupants ____ HVAC ____
Piping/Conduit: Yes / No Comments: ____

Room 8
0.0 Pa 73 °F PID Ø PPB Purpose ____ Occupants ____ HVAC ____
Piping/Conduit: Yes / No Comments: ____

Room 7
0.0 Pa 72 °F PID Ø PPB Purpose ____ Occupants ____ HVAC ____
Piping/Conduit: Yes / No Comments: ____

Room 6 VR
~~0.0~~ Pa 72 °F PID Ø Purpose ____ Occupants ____ HVAC ____
0.0
Piping/Conduit: Yes / No Comments: ____

Additional Comments: APPROXIMATELY ~~8~~ 7 PEOPLE OCCUPY THIS AREA

Building: 4810
Date: 8/21/13
Project No.: 60277061
Project Name: OU6 VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: ON
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CEN-TECH #93984
Instrument used to measure pressure: OMNIGUARD II
PID PPB RAE 3000

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: SEE °F (avoid direct sunlight)
Outside pressure: WEATHER LOG Pa (avoid windy location)

Time: 1:35 PM

Room 15A
+0.5 Pa 71 °F PID Ø Purpose Occupants HVAC
Piping/Conduit: Yes / No Comments:

Room 15B
+2.5 Pa 72 °F PID Ø Purpose Occupants HVAC
Piping/Conduit: Yes / No Comments:

16A
Room ~~16A~~ NO2
+1.5 Pa 74 °F PID Ø PPB Purpose Occupants HVAC
Piping/Conduit: Yes / No Comments:

Room 15
0.0 Pa 74 °F PID Ø PPB Purpose Occupants HVAC
Piping/Conduit: Yes / No Comments:

Room RESTROOM 5
+1.0 Pa 76 °F PID Ø PPB Purpose Occupants HVAC
Piping/Conduit: Yes / No Comments:

Additional Comments: APPROXIMATELY 2-3 PEOPLE OCCUPY THIS SECTION OF THE BLDG.

Building: 4810
Date: 8/28/13
Project No.: 60277061
Project Name: OU6 VIP STUDY

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE NOTES ON 8/21/10
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CEN-TECH #93984
Instrument used to measure pressure: OMNIGUARD IV
PID PPB RAE 3000

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: SEE °F (avoid direct sunlight)
Outside pressure: WEATHER LOG Pa (avoid windy location)

Time: 1:45 PM

Room 2 PID 23 PPB Purpose ____ Occupants ____ HVAC ____
+0.5 Pa 71 °F Piping/Conduit: Yes / No Comments:

Room HALL WAY NEAR 12/13 PID 53 PPB Purpose ____ Occupants ____ HVAC ____
-0.5 Pa 74 °F Piping/Conduit: Yes / No Comments:

Room 16 PID 80 PPB Purpose ____ Occupants ____ HVAC ____
0.0 Pa 82 °F Piping/Conduit: Yes / No Comments:
BACK ROLL UP DOOR WAS OPEN

Room CREW CRIB PID Ø PPB Purpose ____ Occupants ____ HVAC ____
+2.0 Pa 83 °F Piping/Conduit: Yes / No Comments:

Room PID ____ Purpose ____ Occupants ____ HVAC ____
____ Pa ____ °F Piping/Conduit: Yes / No Comments:

Additional Comments:

Indoor and Outdoor Ambient Air Field Data Sheet

Building: 4810

Location	Sample ID	Cannister	Controller ID	Sample Date	Sample Start Time	Sample End Time	PID Measurement (ppb)	"Hg Initial Vacuum	°F Initial Temp	"Hg Final Vacuum	°F Final Temp	Comments
EDWRD-N7-4810OA01	AS2	3554	2042	8/22/13	0750	1650	40	-28	SEE WEATHER LOG	-5.5	SEE WEATHER LOG	FINAL PID = 2 PPB
	AS202	3647	2046	8/22/13	0750	1650	40	-28		-5.5		FINAL PID = 2 PPB
EDWRD-N7-4810OA02	AS2	2422	2005	8/22/13	0815	1530	34	-29		-4		FINAL PID = Ø PPB
EDWRD-N7-4810OA03	AS2	1408	1937	8/22/13	0735	1523	35	-27.5		-5		FINAL PID = Ø PPB
							215					
EDWRD-N7-4810IA01	AS2	5920	1938	8/22/13	0900	1633	~~28.5~~ OR	-28.5	71	-5	71	FINAL PID = Ø PPB
EDWRD-N7-4810IA02	AS2	3621	2108	8/22/13	0940	1640	84	-28	74	-5	74	FINAL PID = Ø PPB
	AS202	1365	2073	8/22/13	0940	1640	84	-29	74	-5	74	" " = Ø PPB

Sampler Name(s): V RODARTE / MMILES

Date: 8/22/13

Project Number: 60277061

Project Name: OU6 VIP STUDY

Analytical Methods: TO-15

Comments:

Indoor and Outdoor Ambient Air Field Data Sheet

Building: 4810

Location	Sample ID	Cannister	Controller ID	Sample Date	Sample Start Time	Sample End Time	PID Measurement (ppB)	"Hg Initial Vacuum	°F Initial Temp	"Hg Final Vacuum	°F Final Temp	Comments
EDWRD-N7-4810IA03	AS2	1437	2017	8/22/13	0910	1628	160	-29	79	-6	81	FINAL PID = Ø PPB
EDWRD-N7-4810IA04	AS2	5478	2089	8/22/13	0930	1629	41	-28	79	-5	82	FINAL PID = Ø PPB

Sampler Name(s): V. RODARTE / M. MILES

Date: 8/22/10

Project Number: 60277061

Project Name: 046 VIPSTUDY

Analytical Methods: TO-15

Comments: IN THE AFTERNOON, THE ROLL UP DOOR WAS LEFT OPEN FOR DELIVERIES IN TOOL STORAGE ✓

16

Ambient weather readings during VIP sample collection

Project Name: OU6 VIP STUDY **Project Number:** 60265922

	Morning Readings		Afternoon Readings	
8/20/13	Date: 8/20/2013	Time: 1000	Time: 1615	
	Temperature: 90 F°	Humidity: 28%	Temperature: 98	Humidity: 15%
	Wind speed & direction: 070	5 KNOTS	Wind speed & direction: 240	8 KNOTS
	Barometric pressure: 27.527		Barometric pressure: 27.450	
	Clear/Cloudy PC	Comments:	Clear/Cloudy PC	Comments:
	Recorded by: [signature]		Recorded by: [signature]	
8/21/13	Date: 8/21/13	Time: 0715	Time: 1700	
	Temperature: 75	Humidity: 33%	Temperature: 99	Humidity: 15%
	Wind speed & direction: CALM		Wind speed & direction: 250	20-25 KNOTS
	Barometric pressure: 27.555		Barometric pressure: 27.455	
	Clear/Cloudy PC	Comments:	Clear/Cloudy PC	Comments:
	Recorded by: [signature]		Recorded by: [signature]	
8/22/13	Date: 8/22/13	Time: 0900	Time: 1700	
	Temperature: 84	Humidity: 16%	Temperature: 99	Humidity: 10%
	Wind speed & direction: 160	4 KNOTS	Wind speed & direction: 250	23 KNOTS
	Barometric pressure: 27.565		Barometric pressure: 29.85	
	Clear/Cloudy PC	Comments:	Clear/Cloudy PC	Comments:
	Recorded by: [signature]		Recorded by:	
8/23/13	Date: 8/23/13	Time: 0630	Time: 1000	
	Temperature: 64	Humidity: 34	Temperature: 82	Humidity:
	Wind speed & direction: 160	4 KNOTS	Wind speed & direction: ~~240~~ 270 @ 3 KNOTS	
	Barometric pressure: 29.91		Barometric pressure: 29.91	
	Clear/Cloudy CLEAR	Comments:	Clear/Cloudy CLEAR	Comments:
	Recorded by: [signature]		Recorded by:	
	Date:	Time:	Time:	
	Temperature:	Humidity:	Temperature:	Humidity:
	Wind speed & direction:		Wind speed & direction:	
	Barometric pressure:		Barometric pressure:	
	Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
	Recorded by:		Recorded by:	

Ambient weather readings during VIP sample collection

Project Name:

Project Number:

Morning Readings		Afternoon Readings	
Date: 8/28/13	Time: 0900	Time: ~~8/28/13~~ 1540	
Temperature: 79	Humidity: 42%	Temperature: 97	Humidity: 25
Wind speed & direction: calm		Wind speed & direction: 240	12 KNTS
Barometric pressure: 27.530		Barometric pressure: 29.86	
Clear/Cloudy Clear	Comments:	Clear/Cloudy PC	Comments:
Recorded by: M. Mde		Recorded by: M. M	

Date:	Time:	Time:	
Temperature:	Humidity:	Temperature:	Humidity:
Wind speed & direction:		Wind speed & direction:	
Barometric pressure:		Barometric pressure:	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by:		Recorded by:	

Date:	Time:	Time:	
Temperature:	Humidity:	Temperature:	Humidity:
Wind speed & direction:		Wind speed & direction:	
Barometric pressure:		Barometric pressure:	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by:		Recorded by:	

Date:	Time:	Time:	
Temperature:	Humidity:	Temperature:	Humidity:
Wind speed & direction:		Wind speed & direction:	
Barometric pressure:		Barometric pressure:	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by:		Recorded by:	

Date:	Time:	Time:	
Temperature:	Humidity:	Temperature:	Humidity:
Wind speed & direction:		Wind speed & direction:	
Barometric pressure:		Barometric pressure:	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by:		Recorded by:	

H&P Mobile Geochemistry Inc.

Vapor Sampling with Helium Shroud

Site Address: Edwards AFB | Date: 8-22-13
Company: AECOM | H&P Project #: AE082213-Tech/Tech | Arrival Time: 0630
Field Rep(s): Vunnic | H&P Rep(s): Kurt / Mike | Departure Time: 430

	Edwards Point ID	Summa #	Sample Kit ID #	Start Time	Initial (" Hg)	End / Sample Time	End (" Hg)	Probe Depth (ft)	Tubing Length (ft)	Tubing Dia (in.)	Sand Pack Dia (in.)	Sand Pack Ht (in.)	Dry Bent. Dia (in.)	Dry Bent. Ht (in.)	Purge Vol (mL)	Pump Run Time	Flow Rate (mL/min)	Probe Vac Pressure ("Hg/H2O)	Shut-in Test (✓ if pass)	Shroud % Before	Shroud % After	Probe ppmv	After Sample helium
		Summa Info						Probe Specs							Sample Information					Shroud Info			
1	N3-4807-SS01-V52	A7654		1010	-27	1016	-5	SS	1'	1/4"	1"	3"			300	—	150	-5	✓	60.7	50.7	8100	9350
2	N3-4807-SS02-V52	A7654		1047	-30	1051	-5	SS	1'	1/4	1'	3"			300	—	150	0	✓	50.5	69	1250 / 725	
3	N3-4806-SS01-V52	6153		1124	-30	1131	-5	SS	1'	1/4	1'	3"			300	—	150	0	✓	54.7	96	0 / 11675	
4	N3-4806-SS02-V52	6139		1301	-29	1307	-5	SS	1'	1/4	1'	3"			300	—	150	0	✓	54.9	94.7	2.350 / 12350	
5	N3-4806-SS05-V52	5274		1338		1345	-5	SS	1'	1/4	1'	3"			300	—	150	-10	✓	54.9	64.6	700 - 2450	
6	N3-4806-SS03-V52	6149		1412	27.5	1419	-5	SS	1'	1/4	1'	3"			300	—	150	0	✓	55	88.8	300 - 6675	
7	N3-4806-SS03-V52	A7820		1412	27.5	1419	-5	SS	1'	1/4	1'	3"			300	—	150	0	✓	55	88.8	300 - 6675	
8	N3-4807-SS03-V52	A8062		1452	-30	1458	-3	SS	1'	1/4	1'	3"			300	—	150	0	✓	50.2	52.2	800 - 5000	
9	N3-4806-SS04-V52	6154		1518	-28	1524	-5	SS	1'	1/4	1'	3"			300	—	150	0	✓	51.5	61.6	650 - 405	
* 10	N3-4807-SS04-V52	A8054		1603	-28	1610	-5	SS	1'	1/4"	1'	3"			300	—	150	0	✓	57.7	55.5	400 - 6400	
11																							
12																							
13																							
14																							
15																							

Purge Volume Amount Selected: Selected by:

Shroud Procedure Summary: Shut in test. Add helium. Collect + test tedlar bag. Take sample. Collect + test tedlar bag.

Overtime:

Approved by:

Field and Sample Collection Notes:
630-730 - unit up for list (west gate)
730 - get base badge
820 - following Mark around
900 - safety meeting
930 - working
* switched out flow controller which was leaking, replacement worked fine

H&P Mobile Geochemistry Inc.

Vapor Sampling with Helium Shroud

Site Address: Edwards AFB
Date: 8-23-13
Company: AECOM
H&P Project #: AE082313-Tech/Tech
Arrival Time: 0700
Field Rep(s): Vonnie /
H&P Rep(s): Mike / Kurt
Departure Time: 1030

		Summa Info						Probe Specs							Sample Information					Shroud Info		
	Point ID	Summa #	Sample Kit ID #	Start Time	Initial (" Hg)	End / Sample Time	End (" Hg)	Probe Depth (ft)	Tubing Length (ft)	Tubing Dia (in.)	Sand Pack Dia (in.)	Sand Pack Ht (in.)	Dry Bent. Dia (in.)	Dry Bent. Ht (in.)	Purge Vol (mL)	Pump Run Time	Flow Rate (mL/min)	Probe Vac Pressure ("Hg/H2O)	Shut-in Test (✓ if pass)	Shroud % Before	Shroud % After	Probe ppmv
1	N7-4810-SS01-VS02	A7796		8:06	-29	8:13	-5	SS	1'	1/4"	1"	3"	—	—	300	—	150	0	✓	66.1	53.5	0 – 3400
* 2	N7-4810-SS04-VS02	A7657		8:43	-28	8:49	-5	SS	1'	1/4"	1"	3"	—	—	300	—	150	0	✓	56.2	56.7	6050 – 2.7%
* 3	N7-4810-SS01-VS202	5265		8:43	-27	8:49	-5	SS	1'	1/4	1"	3"	—	—	300	—	150	0	✓	56.2	56.7	6050 – 2.7%
4	N7-4810SS03-VS02	5837		9:14	28.5	9:21	-5	SS	1'	1/4	1"	3"	—	—	300	—	150	0	✓	57	58.6	350 – 325
5	N7-4810-SS02-VS02	5916		9:47	-29	9:53	-5	SS	1'	1/4	1"	3"	—	—	300	—	150	0	✓	50.8	58.4	0 – 0
6																						
7																						
8																						
9																						
10																						
11																						
12																						
13																						
14																						
15																						

Purge Volume Amount Selected: Selected by:

Shroud Procedure Summary:

Overtime:

Approved by:

Field and Sample Collection Notes:

Didn't use bentonite seal.

E082602-01/38

AECOM

Chain-of-Custody Record

Laboratory:
Air Technology Laboratories
18501 E. Gale Avenue Suite 130
City of Industry, CA 91748
Contact: Joann De La Ossa
(626) 964-4032 phone
(626) 964-5832 fax

Client:
AECOM - SJ/EAFB
100 Contractor Hill Road
Edwards, CA 93523

Shipment Number: MA00948
Method of Shipment: Sampler
Air Bill Number:
Cooler Number: TRUCK V
Custody Seal No.:

Project Number: 60277061-08.01
Project Name: OU6 RA
Project Contact: Kimberly Coleman
(916) 361-6406 phone
(916) 361-6401 fax

Sampler's Signature: R. Rodarte

Lab Job:
Ship Date: 8/23/2013
Page: 1 of 3

	Sample	Field Sample ID	Sampling Date	Sampling Time	Matrix Type	Type/Size of Container	Preservation Temp	Preservation Chemical	Filtered	No. of Containers	VOCs (TO15)	Helium (D9946)	~~DUP SAMPLE~~												Remarks
01	01	EDWRD-N3-4806-IA01-VS2	8/21/2013	0813	A	Summa	NA	NA		1	X														
02	02	EDWRD-N3-4806-IA01-VS202	8/21/2013	0813	A	Summa	NA	NA		1	X														
03	03	EDWRD-N3-4806-IA02-VS2	8/21/2013	0824	A	Summa	NA	NA		1	X														
04	04	EDWRD-N3-4806-IA03-VS2	8/21/2013	0820	A	Summa	NA	NA		1	X														
05	05	EDWRD-N3-4806-IA04-VS2	8/21/2013	0830	A	Summa	NA	NA		1	X														
06	06	EDWRD-N3-4806-IA05-VS2	8/21/2013	0828	A	Summa	NA	NA		1	X														
07	07	EDWRD-N3-4806-OA01-VS2	8/21/2013	0725	A	Summa	NA	NA		1	X														
08	08	EDWRD-N3-4806-OA01-VS202	8/21/2013	0725	A	Summa	NA	NA		1	X														
09	09	EDWRD-N3-4806-OA02-VS2	8/21/2013	0735	A	Summa	NA	NA		1	X														
10	10	EDWRD-N3-4806-OA03-VS2	8/21/2013	0740	A	Summa	NA	NA		1	X														
11	11	EDWRD-N3-4806-SS01-VS2	8/22/2013	1124	A	Summa 1L	NA	NA		1	X	X													
12	12	EDWRD-N3-4806-SS02-VS2	8/22/2013	1301	A	Summa	NA	NA		1	X														
13	13	EDWRD-N3-4806-SS03-VS2	8/22/2013	1412	A	Summa	NA	NA		1	X														
14	14	EDWRD-N3-4806-SS03-VS202	8/22/2013	1412	A	Summa	NA	NA		1	X														
15	15	EDWRD-N3-4806-SS04-VS2	8/22/2013	1518	A	Summa	NA	NA		1	X	X													

Relinquished By	Date	Received By	Date	Relinquished By	Date	Received By	Date
Signature: Vonnie Rodarte	8/23/13	Signature: [illegible]	8/23/13	Signature:		Signature:	
Printed: VONNIE RODARTE	Time: 5:05 PM	Printed: DON THOMPSON	Time: 1705	Printed:	Time	Printed:	Time
Company: AECOM		Company: ATLI		Company:		Company:	
Reason:				Reason:			

Comments:
Shipment summary: 38 samples, 1 cooler, 3 COC pages. 6 LITER TO-15 (LOW LEVEL) and 1 LITER (STANDARD LEVEL),Level IV for all samples TAT Type: Standard.
DATA IN ug/m3

Relinquished By	Date	Received By	Date
Signature:		Signature:	
Printed:	Time	Printed:	Time
Company:		Company:	
Reason:			

Distribution: WHITE to Analytical Laboratory Report, YELLOW to Laboratory File, PINK to Courier/Delivery Service or Field Office, GOLDEN to Project Office File

E082602-01/38

AECOM

Chain-of-Custody Record

Laboratory:
Air Technology Laboratories
18501 E. Gale Avenue Suite 130
City of Industry, CA 91748
Contact: Joann De La Ossa
(626) 964-4032 phone
(626) 964-5832 fax

Client:
AECOM - SJ/EAFB
100 Contractor Hill Road
Edwards, CA 93523

Shipment Number: MA00948
Method of Shipment: Sampler
Air Bill Number:
Cooler Number: TRUCK V
Custody Seal No.:

Project Number: 60277061-08.01
Project Name: OU6 RA
Project Contact: Kimberly Coleman
(916) 361-6406 phone
(916) 361-6401 fax

Sampler's Signature: Vonnie R. Rodarte

Lab Job:
Ship Date: 8/23/2013
Page: 2 of 3

	Sample	Field Sample ID	Sampling Date	Sampling Time	Matrix Type	Type/Size of Container	Preservation Temp	Preservation Chemical	Filtered	No. of Containers	VOCs (TO15)	94600	~~TO15 STANDARD~~											Remarks
16	16	EDWRD-N3-4806-SS05-VS2	8/22/2013	1338	A	Summa 1L	NA	NA		1	X	X	X											
17	17	EDWRD-N3-4807-IA01-VS2	8/21/2013	0855	A	Summa	NA	NA		1	X													
18	18	EDWRD-N3-4807-IA02-VS2	8/21/2013	0856	A	Summa	NA	NA		1	X													
19	19	EDWRD-N3-4807-IA03-VS2	8/21/2013	0819	A	Summa	NA	NA		1	X													
20	20	EDWRD-N3-4807-IA04-VS2	8/21/2013	0910	A	Summa	NA	NA		1	X													
21	21	EDWRD-N3-4807-SS01-VS2	8/22/2013	1010	A	Summa 1L	NA	NA		1	X	X	X											
22	22	EDWRD-N3-4807-SS02-VS2	8/22/2013	1047	A	Summa	NA	NA		1	X													
23	23	EDWRD-N3-4807-SS03-VS2	8/22/2013	1452	A	Summa	NA	NA		1	X													
24	24	EDWRD-N3-4807-SS04-VS2	8/22/2013	1603	A	Summa	NA	NA		1	X	X												
25	25	EDWRD-N7-4810-IA01-VS2	8/22/2013	0900	A	Summa	NA	NA		1	X													
26	26	EDWRD-N7-4810-IA02-VS2	8/22/2013	0940	A	Summa	NA	NA		1	X													
27	27	EDWRD-N7-4810-IA02-VS202	8/22/2013	0940	A	Summa	NA	NA		1	X													
28	28	EDWRD-N7-4810-IA03-VS2	8/22/2013	0910	A	Summa	NA	NA		1	X													
29	29	EDWRD-N7-4810-IA04-VS2	8/22/2013	0930	A	Summa	NA	NA		1	X													
30	30	EDWRD-N7-4810-OA01-VS2	8/22/2013	0750	A	Summa	NA	NA		1	X													

Relinquished By	Date	Received By	Date	Relinquished By	Date	Received By	Date
Signature: Vonnie Rodarte	8/23/13	Signature: [illegible]	8/22/13	Signature:		Signature:	
Printed: VONNIE RODARTE	Time: 5:05 PM	Printed: DAN THOMPSON	Time: 1705	Printed:	Time	Printed:	Time
Company: AECOM		Company: ATL		Company:		Company:	
Reason:				Reason:			

Comments:
Shipment summary: 38 samples, 1 cooler, 3 COC pages. 6 LITER TO-15 (LOW LEVEL) and 1 LITER (STANDARD LEVEL) Level IV for all samples TAT Type: Standard. IA/OA
DATA IN ug/m3
SP

Relinquished By	Date	Received By	Date
Signature:		Signature:	
Printed:	Time	Printed:	Time
Company:		Company:	
Reason:			

Distribution: WHITE to Analytical Laboratory Report, YELLOW to Laboratory File, PINK to Courier/Delivery Service or Field Office, GOLDEN to Project Office File

E082602-01/38

AECOM

Chain-of-Custody Record

Laboratory:
Air Technology Laboratories
18501 E. Gale Avenue Suite 130
City of Industry, CA 91748
Contact: Joann De La Ossa
(626) 964-4032 phone
(626) 964-5832 fax

Client:
AECOM - SJ/EAFB
100 Contractor Hill Road
Edwards, CA 93523

Shipment Number: MA00948
Method of Shipment: Sampler
Air Bill Number:
Cooler Number: TRUCK V
Custody Seal No.:

Project Number: 60277061-08.01
Project Name: OU6 RA
Project Contact: Kimberly Coleman
(916) 361-6406 phone
(916) 361-6401 fax

Sampler's Signature: V. Rodarte

Lab Job:
Ship Date: 8/23/2013
Page: 3 of 3

Analyses Requested: VOCs (TO15); Helium (97610); ~~[illegible]~~ (VP)

	Sample	Field Sample ID	Sampling Date	Sampling Time	Matrix Type	Type/Size of Container	Preservation Temp	Preservation Chemical	Filtered	No. of Containers	VOCs (TO15)	Helium (97610)	~~[illegible]~~ (VP)	Remarks
01	31	EDWRD-N7-4810-OA01-VS202	8/22/2013	0750	A	Summa	NA	NA		1	X			6L
02	32	EDWRD-N7-4810-OA02-VS2	8/22/2013	0815	A	Summa	NA	NA		1	X			6L
03	33	EDWRD-N7-4810-OA03-VS2	8/22/2013	0735	A	Summa	NA	NA		1	X			6L
04	34	EDWRD-N7-4810-SS01-VS2	8/23/2013	0806	A	Summa 1L	NA	NA		1	X	X	VP	1L
05	35	EDWRD-N7-4810-SS02-VS2	8/23/2013	0947	A	Summa	NA	NA		1	X			1L
06	36	EDWRD-N7-4810-SS03-VS2	8/23/2013	0914	A	Summa	NA	NA		1	X			1L
07	37	EDWRD-N7-4810-SS04-VS2	8/23/2013	0843	A	Summa	NA	NA		1	X			1L
08	38	EDWRD-N7-4810-SS04-VS202	8/23/2013	0843	A	Summa	NA	NA		1	X	X		1L

Relinquished By	Date	Received By	Date	Relinquished By	Date	Received By	Date
Signature: Vonnie Rodarte	8/23/13	Signature: [illegible]	8/23/13	Signature:		Signature:	
Printed: VONDIE RODARTE	Time: 5:05 PM	Printed: DON THOMPSON	Time: 1705	Printed:	Time	Printed:	Time
Company: AECOM		Company: ATLI		Company:		Company:	
Reason:				Reason:			

Comments:
Shipment summary: 38 samples, 1 cooler, 3 COC pages. 6 LITER TO-15 (LOW LEVEL) and ~~X~~ 1 LITER (STANDARD LEVEL). Level IV for all samples TAT Type: Standard.
PRESENT DATA IN ug/m3.
IA/OA
SS

Distribution: WHITE to Analytical Laboratory Report, YELLOW to Laboratory File, PINK to Courier/Delivery Service or Field Office, GOLDEN to Project Office File

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APPENDIX D

ANALYTICAL RESULTS

APPENDIX D-1 SUB-SLAB VAPOR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806SS1	N3-4806SS2	N3-4806SS3	N3-4806SS3	N3-4806SS4	N3-4806SS5
1,1,1,2-tetrachloroethane		< 14 (U)	< 14 (UJ- q)	< 16 (U)	< 16 (U)	< 15 (U)	< 16 (U)
1,1,1-trichloroethane		< 11 (U)	< 11 (UJ- q)	< 13 (U)	< 13 (U)	< 12 (U)	< 13 (U)
1,1,2,2-tetrachloroethane		< 28 (U)	< 28 (UJ- q)	< 32 (U)	< 32 (U)	< 30 (U)	< 32 (U)
1,1,2-trichloroethane		< 11 (U)	< 11 (UJ- q)	< 13 (U)	< 13 (U)	< 12 (U)	< 13 (U)
1,1,2-trichlorotrifluoroethane		< 15 (U)	< 16 (UJ- q)	< 18 (U)	< 18 (U)	< 17 (U)	< 18 (U)
1,1-dichloroethane		< 8.2 (U)	< 8.3 (UJ- q)	< 9.3 (U)	< 9.3 (U)	< 8.9 (U)	< 9.3 (U)
1,1-dichloroethene		< 8.0 (U)	< 8.2 (UJ- q)	< 9.1 (U)	< 9.1 (U)	< 8.7 (U)	< 9.1 (U)
1,2,4-trichlorobenzene		< 30 (U)	< 31 (UJ- q)	< 34 (U)	< 34 (U)	< 33 (U)	< 34 (U)
1,2,4-trimethylbenzene		4.3 (J a)	3.7 (J- qa)	1.5 (J a)	2.6 (J a)	2.5 (J a)	2.4 (J a)
1,2-dichlorobenzene		< 12 (U)	< 12 (UJ- q)	< 14 (U)	< 14 (U)	< 13 (U)	< 14 (U)
1,2-dichloroethane		< 8.2 (U)	< 8.3 (UJ- q)	< 9.3 (U)	< 9.3 (U)	< 8.9 (U)	< 9.3 (U)
1,2-dichloropropane		< 9.3 (U)	< 9.5 (UJ- q)	< 11 (U)	< 11 (U)	< 10 (U)	< 11 (U)
1,2-dichlorotetrafluoroethane		< 14 (U)	< 14 (UJ- q)	< 16 (U)	< 16 (U)	< 15 (U)	< 16 (U)
1,3,5-trimethylbenzene		1.7 (J a)	< 20 (UJ- q)	< 23 (U)	< 23 (U)	< 22 (U)	< 23 (U)
1,3-butadiene		< 22 (U)	< 23 (UJ- q)	< 25 (U)	< 25 (U)	< 24 (U)	< 25 (U)
1,3-dichlorobenzene		< 12 (U)	< 12 (UJ- q)	< 14 (U)	< 14 (U)	< 13 (U)	< 14 (U)
1,4-dichlorobenzene		< 12 (U)	< 12 (UJ- q)	< 14 (U)	< 14 (U)	< 13 (U)	< 14 (U)
2-butanone (MEK)		9.1	16 (J- q)	4.7 (J a)	7.8	30	33
2-hexanone		< 8.3 (U)	< 8.5 (UJ- q)	< 9.4 (U)	< 9.4 (U)	< 9.0 (U)	8.3 (J a)
4-ethyltoluene		2.9 (J a)	2.4 (J- qa)	< 11 (U)	1.9 (J a)	2.3 (J a)	1.5 (J a)
4-methyl-2-pentanone (MIBK)		< 8.3 (U)	< 8.5 (UJ- q)	< 9.4 (U)	< 9.4 (U)	< 9.0 (U)	24
acetone		110	100 (J- q)	40	68	200	130
acrylonitrile		< 22 (U)	< 22 (UJ- q)	< 25 (U)	< 25 (U)	< 24 (U)	< 25 (U)
benzene		3.8 (J a)	6.5 (J- qa)	1.7 (J a)	2.8 (J a)	33	2.6 (J a)
benzyl chloride		< 10 (UJ- cf)	< 11 (UJ- qcf)	< 12 (UJ- cf)	< 12 (UJ- cf)	< 11 (UJ- cf)	< 12 (UJ- cf)
bromodichloromethane		< 14 (U)	< 14 (UJ- q)	< 15 (U)	< 15 (U)	< 15 (U)	< 15 (U)
bromoform		< 21 (U)	< 21 (UJ- q)	< 24 (U)	< 24 (U)	< 23 (U)	< 24 (U)
bromomethane		< 7.9 (UJ c)	< 8.0 (UJ- cq)	< 8.9 (UJ c)	< 8.9 (UJ c)	< 8.5 (UJ c)	< 8.9 (UJ c)
carbon disulfide		< 3.5 (UJ 1a)	< 8.4 (UJ 1qa)	< 9.8 (UJ 1a)	< 6.0 (UJ 1a)	< 7.4 (UJ 1a)	< 3.1 (UJ 1a)
carbon tetrachloride		< 13 (U)	< 13 (UJ- q)	< 14 (U)	< 14 (U)	< 14 (U)	< 14 (U)
chlorobenzene		< 9.3 (U)	< 9.5 (UJ- q)	< 11 (U)	< 11 (U)	< 10 (U)	< 11 (U)

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Analyte	Sample ID	N3-4806SS1	N3-4806SS2	N3-4806SS3	N3-4806SS3	N3-4806SS4	N3-4806SS5
chloroethane		<5.3 (U)	<5.4 (UJ- q)	<6.1 (U)	<6.1 (U)	<5.8 (U)	<6.1 (U)
chloroform		<9.9 (U)	<10 (UJ- q)	<11 (U)	<11 (U)	19	4.4 (J a)
chloromethane		<8.4 (U)	<8.5 (UJ- q)	<9.5 (U)	<9.5 (U)	<9.1 (U)	<9.5 (U)
cis-1,2-dichloroethene		<8.0 (U)	<8.2 (UJ- q)	<9.1 (U)	<9.1 (U)	<8.7 (U)	<9.1 (U)
cis-1,3-dichloropropene		<9.2 (U)	<9.4 (UJ- q)	<10 (U)	<10 (U)	<10 (U)	<10 (U)
cyclohexane		3.5 (J a)	5.0 (J- qa)	<40 (U)	4.0 (J a)	4.2 (J a)	3.1 (J a)
dibromochloromethane		<17 (U)	<18 (UJ- q)	<20 (U)	<20 (U)	<19 (U)	<20 (U)
dichlorodifluoromethane		2.9 (J a)	3.2 (J- qa)	3.2 (J a)	3.4 (J a)	3.4 (J a)	5.0 (J a)
ethanol		36	120 (J- q)	46	55	69	69
ethyl acetate		<36 (U)	<37 (UJ- q)	<41 (U)	<41 (U)	<40 (U)	<41 (U)
ethylbenzene		2.6 (J a)	4.0 (J- qa)	<10 (U)	1.8 (J a)	3.4 (J a)	1.6 (J a)
ethylene dibromide (EDB)		<16 (U)	<16 (UJ- q)	<18 (U)	<18 (U)	<17 (U)	<18 (U)
hexachlorobutadiene		<22 (U)	<22 (UJ- q)	<25 (U)	<25 (U)	<23 (U)	<25 (U)
isopropanol		8.7 (J a)	20 (J- qa)	<28 (U)	15 (J a)	22 (J a)	32
isopropylbenzene		<9.9 (U)	2.5 (J- qa)	<11 (U)	<11 (U)	2.5 (J a)	<11 (U)
m- & p-xylene		12	18 (J- q)	4.7 (J a)	9.2 (J a)	11	7.2 (J a)
methyl tert-butyl ether (MTBE)		<7.3 (U)	<7.4 (UJ- q)	<8.3 (U)	<8.3 (U)	<7.9 (U)	<8.3 (U)
methylene chloride		<7.0 (U)	<7.2 (UJ- q)	<8.0 (U)	<8.0 (U)	<7.6 (U)	<8.0 (U)
naphthalene		<53 (U)	<54 (UJ- q)	<60 (U)	<60 (U)	<58 (U)	<60 (U)
n-butylbenzene		<11 (U)	<11 (UJ- q)	<13 (U)	<13 (U)	<12 (U)	<13 (U)
n-heptane		<41 (U)	<42 (UJ- q)	<47 (U)	<47 (U)	250	4.2 (J a)
n-hexane		<36 (U)	150 (J- q)	<40 (U)	<40 (U)	310	2.0 (J a)
o-xylene		3.9 (J a)	6.0 (J- qa)	1.8 (J a)	3.3 (J a)	4.0 (J a)	2.4 (J a)
p-isopropyltoluene		2.5 (J a)	2.0 (J- qa)	<13 (U)	<13 (U)	2.0 (J a)	<13 (U)
propene		<17 (U)	<18 (UJ- q)	<20 (U)	<20 (U)	<19 (U)	<20 (U)
sec-butylbenzene		<11 (U)	<11 (UJ- q)	<13 (U)	<13 (U)	<12 (U)	<13 (U)
styrene		<8.6 (U)	<8.8 (UJ- q)	<9.8 (U)	<9.8 (U)	<9.4 (U)	<9.8 (U)
tetrachloroethene (PCE)		4.0 (J a)	16 (J- q)	16	11 (J a)	3.9 (J a)	8.8 (J a)
tetrahydrofuran		<30 (U)	<30 (UJ- q)	<34 (U)	<34 (U)	1.5 (J a)	<34 (U)
toluene		16	16 (J- q)	5.3 (J a)	9.1	14	8.6 (J a)
trans-1,2-dichloroethene		<8.0 (U)	<8.2 (UJ- q)	<9.1 (U)	<9.1 (U)	<8.7 (U)	<9.1 (U)

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Analyte	Sample ID	N3-4806SS1	N3-4806SS2	N3-4806SS3	N3-4806SS3	N3-4806SS4	N3-4806SS5
trans-1,3-dichloropropene		<9.2 (U)	<9.4 (UJ- q)	<10 (U)	<10 (U)	<10 (U)	<10 (U)
trichloroethene (TCE)		1.8 (J a)	<11 (UJ- q)	<12 (U)	<12 (U)	94	79
trichlorofluoromethane		<11 (U)	<12 (UJ- q)	<13 (U)	<13 (U)	<12 (U)	<13 (U)
vinyl chloride		<5.2 (U)	<5.3 (UJ- q)	<5.9 (U)	<5.9 (U)	<5.6 (U)	<5.9 (U)

Notes:

Qualifier definitions are presented in Appendix E.

All concentrations are presented in in micrograms per cubic meter.

APPENDIX D-2 SUB-SLAB VAPOR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4806)
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Analyte	Sample ID	N3-4806SS1	N3-4806SS2	N3-4806SS3	N3-4806SS3	N3-4806SS4	N3-4806SS5
1,1,1,2-tetrachloroethane		<13 (U)	<13 (UJ- q)	<14 (U)	<14 (U)	<14 (U)	<13 (U)
1,1,1-trichloroethane		<10 (U)	<11 (UJ- q)	<11 (U)	<11 (U)	<11 (U)	<11 (U)
1,1,2,2-tetrachloroethane		<26 (U)	<27 (UJ- q)	<27 (U)	<27 (U)	<29 (U)	<27 (U)
1,1,2-trichloroethane		<10 (U)	<11 (UJ- q)	<11 (U)	<11 (U)	<11 (U)	<11 (U)
1,1,2-trichlorotrifluoroethane		<14 (U)	<15 (UJ- q)	<15 (U)	<15 (U)	<16 (U)	<15 (U)
1,1-dichloroethane		<7.6 (U)	<7.9 (UJ- q)	<8.0 (U)	<8.0 (U)	<8.5 (U)	<7.9 (U)
1,1-dichloroethene		<7.4 (U)	<7.7 (UJ- q)	<7.9 (U)	<7.9 (U)	<8.4 (U)	<7.7 (U)
1,2,4-trichlorobenzene		<28 (U)	<29 (UJ- q)	<29 (U)	<29 (U)	<31 (U)	<29 (U)
1,2,4-trimethylbenzene		3.1 (J a)	4.4 (J- qa)	1.2 (J a)	1.3 (J a)	4.5 (J a)	2.5 (J a)
1,2-dichlorobenzene		<11 (U)	<12 (UJ- q)	<12 (U)	<12 (U)	<13 (U)	<12 (U)
1,2-dichloroethane		<7.6 (U)	<7.9 (UJ- q)	<8.0 (U)	<8.0 (U)	<8.5 (U)	<7.9 (U)
1,2-dichloropropane		<8.7 (U)	<9.0 (UJ- q)	<9.2 (U)	<9.2 (U)	<9.7 (U)	<9.0 (U)
1,2-dichlorotetrafluoroethane		<13 (U)	<14 (UJ- q)	<14 (U)	<14 (U)	<15 (U)	<14 (U)
1,3,5-trimethylbenzene		<18 (U)	<19 (UJ- q)	<19 (U)	<19 (U)	1.8 (J a)	<19 (U)
1,3-butadiene		<21 (U)	<22 (UJ- q)	<22 (U)	<22 (U)	<23 (U)	<22 (U)
1,3-dichlorobenzene		<11 (U)	<12 (UJ- q)	<12 (U)	<12 (U)	<13 (U)	<12 (U)
1,4-dichlorobenzene		<11 (U)	<12 (UJ- q)	<12 (U)	<12 (U)	<13 (U)	<12 (U)
2-butanone (MEK)		23	26 (J- q)	17	19	8.1	27
2-hexanone		<7.7 (U)	<8.0 (UJ- q)	<8.1 (U)	<8.1 (U)	<8.6 (U)	<8.0 (U)
4-ethyltoluene		2.1 (J a)	3.0 (J- qa)	<9.7 (U)	<9.7 (U)	4.0 (J a)	1.8 (J a)
4-methyl-2-pentanone (MIBK)		<7.7 (U)	<8.0 (UJ- q)	<8.1 (U)	<8.1 (U)	<8.6 (U)	<8.0 (U)
acetone		140	150 (J- q)	75	86	82	140
acrylonitrile		<20 (U)	<21 (UJ- q)	<22 (U)	<22 (U)	<23 (U)	<21 (U)
benzene		4.9 (J ca)	13 (J- cq)	8.2 (J c)	8.2 (J c)	9.2 (J c)	9.8 (J c)
benzyl chloride		<9.7 (UJ- f)	<10 (UJ- fq)	<10 (UJ- f)	<10 (UJ- f)	<11 (UJ- f)	<10 (UJ- f)
bromodichloromethane		<13 (U)	<13 (UJ- q)	<13 (U)	<13 (U)	<14 (U)	<13 (U)
bromoform		<19 (U)	<20 (UJ- q)	<20 (U)	<20 (U)	<22 (U)	<20 (U)
bromomethane		<7.3 (U)	<7.5 (UJ- q)	<7.7 (U)	<7.7 (U)	<8.2 (U)	<7.5 (U)
carbon disulfide		64	40 (J- q)	97	130	85	240
carbon tetrachloride		<12 (U)	<12 (UJ- q)	<12 (U)	<12 (U)	<13 (U)	<12 (U)
chlorobenzene		<8.6 (U)	<8.9 (UJ- q)	<9.1 (U)	<9.1 (U)	<9.7 (U)	<8.9 (U)

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Analyte	Sample ID	N3-4806SS1	N3-4806SS2	N3-4806SS3	N3-4806SS3	N3-4806SS4	N3-4806SS5
chloroethane		<4.9 (U)	<5.1 (UJ- q)	<5.2 (U)	<5.2 (U)	<5.6 (U)	<5.1 (U)
chloroform		<9.1 (U)	<9.5 (UJ- q)	<9.7 (U)	<9.7 (U)	9.4 (J a)	3.4 (J a)
chloromethane		2.5 (J a)	3.9 (J- qa)	<8.2 (U)	2.3 (J a)	1.8 (J a)	1.7 (J a)
cis-1,2-dichloroethene		<7.4 (U)	<7.7 (UJ- q)	<7.9 (U)	<7.9 (U)	<8.4 (U)	<7.7 (U)
cis-1,3-dichloropropene		<8.5 (U)	<8.8 (UJ- q)	<9.0 (U)	<9.0 (U)	<9.6 (U)	<8.8 (U)
cyclohexane		3.2 (J a)	5.2 (J- qa)	<34 (U)	<34 (U)	<36 (U)	3.3 (J a)
dibromochloromethane		<16 (U)	<17 (UJ- q)	<17 (U)	<17 (U)	<18 (U)	<17 (U)
dichlorodifluoromethane		4.2 (J a)	5.8 (J- qa)	5.3 (J a)	5.5 (J a)	3.3 (J a)	4.0 (J a)
ethanol		90 (J c)	100 (J- cq)	110 (J c)	91 (J c)	27 (J c)	36 (J c)
ethyl acetate		<34 (U)	<35 (UJ- q)	<36 (U)	<36 (U)	<38 (U)	<35 (U)
ethylbenzene		1.9 (J a)	2.6 (J- qa)	<8.6 (U)	<8.6 (U)	2.5 (J a)	1.8 (J a)
ethylene dibromide (EDB)		<14 (U)	<15 (UJ- q)	<15 (U)	<15 (U)	<16 (U)	<15 (U)
hexachlorobutadiene		<20 (U)	<21 (UJ- q)	<21 (U)	<21 (U)	<22 (U)	<21 (U)
isopropanol		16 (J a)	15 (J- qa)	15 (J a)	13 (J a)	<26 (U)	10 (J a)
isopropylbenzene		<9.2 (U)	<9.6 (UJ- q)	<9.7 (U)	<9.7 (U)	<10 (U)	<9.6 (U)
m- & p-xylene		5.3 (J a)	8.2 (J- qa)	3.1 (J a)	3.5 (J a)	8.1 (J a)	5.8 (J a)
methyl tert-butyl ether (MTBE)		1.4 (J a)	1.2 (J- qa)	<7.1 (U)	<7.1 (U)	<7.6 (U)	1.3 (J a)
methylene chloride		<5.4 (UJ ba)	7.7 (J bq)	<4.2 (UJ ba)	<5.0 (UJ ba)	<6.4 (UJ ba)	7.4 (J+ b)
naphthalene		4.7 (J a)	1.4 (J- qa)	1.2 (J a)	1.6 (J a)	<55 (U)	4.3 (J a)
n-butylbenzene		<10 (U)	<11 (UJ- q)	<11 (U)	<11 (U)	<12 (U)	<11 (U)
n-heptane		<38 (U)	<40 (UJ- q)	<41 (U)	<41 (U)	<43 (U)	<40 (U)
n-hexane		<33 (U)	<34 (UJ- q)	1.9 (J a)	2.4 (J a)	<37 (U)	<34 (U)
o-xylene		2.1 (J a)	3.2 (J- qa)	1.3 (J a)	1.2 (J a)	3.4 (J a)	2.0 (J a)
p-isopropyltoluene		<10 (U)	<11 (UJ- q)	<11 (U)	<11 (U)	7.6 (J a)	2.2 (J a)
propene		<16 (U)	<17 (UJ- q)	<17 (U)	<17 (U)	<18 (U)	<17 (U)
sec-butylbenzene		<10 (U)	<11 (UJ- q)	<11 (U)	<11 (U)	<12 (U)	<11 (U)
styrene		<8.0 (U)	<8.3 (UJ- q)	<8.4 (U)	<8.4 (U)	<9.0 (U)	<8.3 (U)
tetrachloroethene (PCE)		12 (J a)	19 (J- q)	11 (J a)	11 (J a)	4.1 (J a)	12 (J a)
tetrahydrofuran		<28 (U)	4.8 (J- qa)	1.5 (J a)	3.1 (J a)	<31 (U)	1.8 (J a)
toluene		7.0 (J a)	9.5 (J- q)	4.5 (J a)	4.9 (J a)	5.4 (J a)	8.2
trans-1,2-dichloroethene		<7.4 (U)	<7.7 (UJ- q)	<7.9 (U)	<7.9 (U)	<8.4 (U)	<7.7 (U)

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Analyte	Sample ID	N3-4806SS1	N3-4806SS2	N3-4806SS3	N3-4806SS3	N3-4806SS4	N3-4806SS5
trans-1,3-dichloropropene		<8.5 (U)	<8.8 (UJ- q)	<9.0 (U)	<9.0 (U)	<9.6 (U)	<8.8 (U)
trichloroethene (TCE)		4.3 (J a)	1.3 (J- qa)	<11 (U)	<11 (U)	110	120
trichlorofluoromethane		3.6 (J a)	2.8 (J- qa)	<11 (U)	<11 (U)	<12 (U)	<11 (U)
vinyl chloride		<4.8 (U)	<5.0 (UJ- q)	<5.1 (U)	<5.1 (U)	<5.4 (U)	<5.0 (U)

Notes:

Qualifier definitions are presented in Appendix E.

All concentrations are presented in in micrograms per cubic meter.

APPENDIX D-3 SUB-SLAB VAPOR ANALYTICAL RESULTS - MARCH 2013
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Analyte	Sample ID	N3-4807SS1	N3-4807SS2	N3-4807SS3	N3-4807SS4
1,1,1,2-tetrachloroethane		<13 (U)	<12 (U)	<15 (UJ- q)	<15 (U)
1,1,1-trichloroethane		<10 (U)	<9.2 (U)	<12 (UJ- q)	<12 (U)
1,1,2,2-tetrachloroethane		<26 (U)	<23 (U)	<30 (UJ- q)	<30 (U)
1,1,2-trichloroethane		<10 (U)	<9.2 (U)	<12 (UJ- q)	<12 (U)
1,1,2-trichlorotrifluoroethane		<14 (U)	<13 (U)	<17 (UJ- q)	<16 (U)
1,1-dichloroethane		<7.6 (U)	<6.8 (U)	<8.9 (UJ- q)	<8.7 (U)
1,1-dichloroethene		<7.4 (U)	<6.7 (U)	<8.7 (UJ- q)	<8.5 (U)
1,2,4-trichlorobenzene		<28 (U)	<25 (U)	<33 (UJ- q)	<32 (U)
1,2,4-trimethylbenzene		6.1 (J a)	2.5 (J a)	2.6 (J- qa)	2.2 (J a)
1,2-dichlorobenzene		<11 (U)	<10 (U)	<13 (UJ- q)	<13 (U)
1,2-dichloroethane		<7.6 (U)	<6.8 (U)	<8.9 (UJ- q)	<8.7 (U)
1,2-dichloropropane		<8.7 (U)	<7.8 (U)	<10 (UJ- q)	<9.9 (U)
1,2-dichlorotetrafluoroethane		<13 (U)	<12 (U)	<15 (UJ- q)	<15 (U)
1,3,5-trimethylbenzene		2.7 (J a)	<17 (U)	<22 (UJ- q)	<21 (U)
1,3-butadiene		<21 (U)	<19 (U)	<24 (UJ- q)	<24 (U)
1,3-dichlorobenzene		<11 (U)	<10 (U)	<13 (UJ- q)	<13 (U)
1,4-dichlorobenzene		<11 (U)	<10 (U)	<13 (UJ- q)	<13 (U)
2-butanone (MEK)		43	45	10 (J- q)	12
2-hexanone		3.2 (J a)	<6.9 (U)	<9.0 (UJ- q)	<8.8 (U)
4-ethyltoluene		5.0 (J a)	1.7 (J a)	1.9 (J- qa)	1.7 (J a)
4-methyl-2-pentanone (MIBK)		11	12	<9.0 (UJ- q)	<8.8 (U)
acetone		520	540	120 (J- q)	45
acrylonitrile		<20 (U)	<18 (U)	<24 (UJ- q)	<23 (U)
benzene		7.0	18	7.5 (J- q)	3.7 (J a)
benzyl chloride		<9.7 (UJ- cf)	<8.7 (UJ- cf)	<11 (UJ- qcf)	<11 (UJ c)
bromodichloromethane		<13 (U)	<11 (U)	<15 (UJ- q)	<14 (U)
bromoform		<19 (U)	<17 (U)	<23 (UJ- q)	<22 (U)
bromomethane		<7.3 (UJ c)	<6.5 (UJ c)	<8.5 (UJ- cq)	<8.4 (UJ c)
carbon disulfide		<6.5 (UJ 1a)	<5.4 (UJ 1a)	<5.6 (UJ- 1qa)	<8.9 (UJ 1a)
carbon tetrachloride		<12 (U)	<11 (U)	<14 (UJ- q)	<14 (U)
chlorobenzene		<8.6 (U)	<7.8 (U)	<10 (UJ- q)	<9.9 (U)

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Analyte	Sample ID	N3-4807SS1	N3-4807SS2	N3-4807SS3	N3-4807SS4
chloroethane		<4.9 (U)	<4.4 (U)	<5.8 (UJ- q)	<5.7 (U)
chloroform		<9.1 (U)	<8.2 (U)	<11 (UJ- q)	<11 (U)
chloromethane		<7.7 (U)	<7.0 (U)	<9.1 (UJ- q)	<8.9 (U)
cis-1,2-dichloroethene		<7.4 (U)	<6.7 (U)	<8.7 (UJ- q)	<8.5 (U)
cis-1,3-dichloropropene		<8.5 (U)	<7.6 (U)	<10 (UJ- q)	<9.8 (U)
cyclohexane		6.4 (J a)	2.0 (J a)	3.1 (J- qa)	3.1 (J a)
dibromochloromethane		<16 (U)	<14 (U)	<19 (UJ- q)	<18 (U)
dichlorodifluoromethane		2.7 (J a)	3.8 (J a)	3.1 (J- qa)	3.7 (J a)
ethanol		71	69	44 (J- q)	27
ethyl acetate		<34 (U)	<30 (U)	<40 (UJ- q)	<39 (U)
ethylbenzene		6.7 (J a)	1.9 (J a)	2.6 (J- qa)	1.6 (J a)
ethylene dibromide (EDB)		<14 (U)	<13 (U)	<17 (UJ- q)	<17 (U)
hexachlorobutadiene		<20 (U)	<18 (U)	<23 (UJ- q)	<23 (U)
isopropanol		27	65	13 (J- qa)	<26 (U)
isopropylbenzene		<9.2 (U)	<8.3 (U)	<11 (UJ- q)	<11 (U)
m- & p-xylene		32	7.8	10 (J- q)	6.9 (J a)
methyl tert-butyl ether (MTBE)		<6.7 (U)	<6.1 (U)	<7.9 (UJ- q)	<7.8 (U)
methylene chloride		<6.5 (U)	<5.9 (U)	<7.6 (UJ- q)	<7.5 (U)
naphthalene		<49 (U)	<44 (U)	<58 (UJ- q)	<56 (U)
n-butylbenzene		<10 (U)	<9.2 (U)	<12 (UJ- q)	<12 (U)
n-heptane		2.1 (J a)	<35 (U)	1.8 (J- qa)	3.4 (J a)
n-hexane		<33 (U)	<30 (U)	2.9 (J- qa)	3.9 (J a)
o-xylene		8.5	2.4 (J a)	3.5 (J- qa)	2.4 (J a)
p-isopropyltoluene		4.0 (J a)	1.6 (J a)	2.5 (J- qa)	<12 (U)
propene		<16 (U)	<15 (U)	<19 (UJ- q)	<19 (U)
sec-butylbenzene		<10 (U)	<9.2 (U)	<12 (UJ- q)	<12 (U)
styrene		<8.0 (U)	<7.2 (U)	<9.4 (UJ- q)	<9.2 (U)
tetrachloroethene (PCE)		17	<11 (U)	<15 (UJ- q)	5.9 (J a)
tetrahydrofuran		2.2 (J a)	1.0 (J a)	2.5 (J- qa)	<32 (U)
toluene		40	12	18 (J- q)	14
trans-1,2-dichloroethene		<7.4 (U)	<6.7 (U)	<8.7 (UJ- q)	<8.5 (U)

APPENDIX D-3 SUB-SLAB VAPOR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4807)
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Analyte	Sample ID	N3-4807SS1	N3-4807SS2	N3-4807SS3	N3-4807SS4
trans-1,3-dichloropropene		<8.5 (U)	<7.6 (U)	<10 (UJ- q)	<9.8 (U)
trichloroethene (TCE)		4.0 (J a)	48	2.5 (J- qa)	3.0 (J a)
trichlorofluoromethane		<11 (U)	<9.5 (U)	3.7 (J- qa)	2.7 (J a)
vinyl chloride		<4.8 (U)	<4.3 (U)	<5.6 (UJ- q)	<5.5 (U)

Notes:

Qualifier definitions are presented in Appendix E.

All concentrations are presented in in micrograms per cubic meter.

APPENDIX D-4 SUB-SLAB VAPOR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4807)
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Analyte	Sample ID	N3-4807SS1	N3-4807SS2	N3-4807SS3	N3-4807SS4
1,1,1,2-tetrachloroethane		<13 (U)	<14 (U)	<13 (U)	<15 (U)
1,1,1-trichloroethane		<10 (U)	<11 (U)	<10 (U)	<12 (U)
1,1,2,2-tetrachloroethane		<26 (U)	<28 (U)	<25 (U)	<30 (U)
1,1,2-trichloroethane		<10 (U)	<11 (U)	<10 (U)	<12 (U)
1,1,2-trichlorotrifluoroethane		<14 (U)	<15 (U)	<14 (U)	<17 (U)
1,1-dichloroethane		<7.6 (U)	<8.2 (U)	<7.4 (U)	<8.9 (U)
1,1-dichloroethene		<7.4 (U)	<8.0 (U)	<7.3 (U)	<8.7 (U)
1,2,4-trichlorobenzene		<28 (U)	<30 (U)	<27 (U)	<33 (U)
1,2,4-trimethylbenzene		2.2 (J a)	1.9 (J a)	4.1 (J a)	3.5 (J a)
1,2-dichlorobenzene		<11 (U)	<12 (U)	<11 (U)	<13 (U)
1,2-dichloroethane		<7.6 (U)	<8.2 (U)	<7.4 (U)	<8.9 (U)
1,2-dichloropropane		<8.7 (U)	<9.3 (U)	<8.5 (U)	<10 (U)
1,2-dichlorotetrafluoroethane		<13 (U)	<14 (U)	<13 (U)	<15 (U)
1,3,5-trimethylbenzene		<18 (U)	<20 (U)	<18 (U)	<22 (U)
1,3-butadiene		<21 (U)	<22 (U)	<20 (U)	<24 (U)
1,3-dichlorobenzene		<11 (U)	<12 (U)	<11 (U)	<13 (U)
1,4-dichlorobenzene		<11 (U)	2.2 (J a)	<11 (U)	<13 (U)
2-butanone (MEK)		20	14	29	17
2-hexanone		<7.7 (U)	<8.3 (U)	<7.5 (U)	<9.0 (U)
4-ethyltoluene		1.6 (J a)	1.4 (J a)	3.2 (J a)	2.7 (J a)
4-methyl-2-pentanone (MIBK)		<7.7 (U)	7.2 (J a)	<7.5 (U)	<9.0 (U)
acetone		210	190	110	78
acrylonitrile		<20 (U)	<22 (U)	<20 (U)	<24 (U)
benzene		8.4 (J c)	14 (J c)	11 (J c)	8.2 (J c)
benzyl chloride		<9.7 (UJ- f)	<10 (UJ- f)	<9.5 (UJ- f)	<11 (UJ- f)
bromodichloromethane		<13 (U)	<14 (U)	<12 (U)	<15 (U)
bromoform		<19 (U)	<21 (U)	<19 (U)	<23 (U)
bromomethane		<7.3 (U)	<7.9 (U)	<7.1 (U)	<8.5 (U)
carbon disulfide		24 (J a)	51	29	28 (J a)
carbon tetrachloride		<12 (U)	<13 (U)	<12 (U)	<14 (U)
chlorobenzene		<8.6 (U)	<9.3 (U)	<8.5 (U)	<10 (U)

APPENDIX D-4 SUB-SLAB VAPOR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4807)
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Analyte	Sample ID	N3-4807SS1	N3-4807SS2	N3-4807SS3	N3-4807SS4
chloroethane		<4.9 (U)	<5.3 (U)	<4.8 (U)	<5.8 (U)
chloroform		<9.1 (U)	1.9 (J a)	<9.0 (U)	<11 (U)
chloromethane		2.3 (J a)	<8.4 (U)	<7.6 (U)	<9.1 (U)
cis-1,2-dichloroethene		<7.4 (U)	<8.0 (U)	<7.3 (U)	<8.7 (U)
cis-1,3-dichloropropene		<8.5 (U)	<9.2 (U)	<8.3 (U)	<10 (U)
cyclohexane		6.3 (J a)	<35 (U)	<32 (U)	<38 (U)
dibromochloromethane		<16 (U)	<17 (U)	<16 (U)	<19 (U)
dichlorodifluoromethane		12	30	37	18
ethanol		96 (J c)	35 (J c)	140 (J c)	160 (J c)
ethyl acetate		<34 (U)	<36 (U)	<33 (U)	<40 (U)
ethylbenzene		1.3 (J a)	1.2 (J a)	2.3 (J a)	3.1 (J a)
ethylene dibromide (EDB)		<14 (U)	<16 (U)	<14 (U)	<17 (U)
hexachlorobutadiene		<20 (U)	<22 (U)	<20 (U)	<23 (U)
isopropanol		25	12 (J a)	31	26 (J a)
isopropylbenzene		<9.2 (U)	<9.9 (U)	<9.0 (U)	<11 (U)
m- & p-xylene		4.2 (J a)	4.0 (J a)	8.1	9.5
methyl tert-butyl ether (MTBE)		5.7 (J a)	1.5 (J a)	3.6 (J a)	<7.9 (U)
methylene chloride		10 (J+ b)	<6.5 (UJ ba)	<6.1 (UJ ba)	<3.1 (UJ ba)
naphthalene		1.3 (J a)	2.4 (J a)	2.6 (J a)	1.5 (J a)
n-butylbenzene		<10 (U)	<11 (U)	<10 (U)	<12 (U)
n-heptane		<38 (U)	<41 (U)	5.1 (J a)	<45 (U)
n-hexane		<33 (U)	<36 (U)	<32 (U)	3.5 (J a)
o-xylene		1.7 (J a)	1.4 (J a)	3.2 (J a)	3.3 (J a)
p-isopropyltoluene		<10 (U)	<11 (U)	<10 (U)	<12 (U)
propene		<16 (U)	<17 (U)	<16 (U)	<19 (U)
sec-butylbenzene		<10 (U)	<11 (U)	<10 (U)	<12 (U)
styrene		<8.0 (U)	<8.6 (U)	<7.8 (U)	<9.4 (U)
tetrachloroethene (PCE)		<13 (U)	<14 (U)	<12 (U)	<15 (U)
tetrahydrofuran		2.6 (J a)	<30 (U)	4.5 (J a)	<32 (U)
toluene		6.0 (J a)	6.5 (J a)	8.9	10
trans-1,2-dichloroethene		<7.4 (U)	<8.0 (U)	<7.3 (U)	<8.7 (U)

APPENDIX D-4 SUB-SLAB VAPOR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4807)
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Analyte	Sample ID	N3-4807SS1	N3-4807SS2	N3-4807SS3	N3-4807SS4
trans-1,3-dichloropropene		<8.5 (U)	<9.2 (U)	<8.3 (U)	<10 (U)
trichloroethene (TCE)		8.2 (J a)	100	2.7 (J a)	<12 (U)
trichlorofluoromethane		3.6 (J a)	3.5 (J a)	3.7 (J a)	5.3 (J a)
vinyl chloride		<4.8 (U)	<5.2 (U)	<4.7 (U)	<5.6 (U)

Notes:

Qualifier definitions are presented in Appendix E.

All concentrations are presented in in micrograms per cubic meter.

APPENDIX D-5 SUB-SLAB VAPOR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4810)
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Analyte	Sample ID	N7-4810SS1	N7-4810SS2	N7-4810SS3	N7-4810SS4	N7-4810SS4[(a)]
1,1,1,2-tetrachloroethane		<12 (U)	<16 (U)	<16 (U)	<15 (U)	<12 (U)
1,1,1-trichloroethane		<9.8 (U)	<13 (U)	<13 (U)	3.6 (J a)	<9.8 (U)
1,1,2,2-tetrachloroethane		<25 (U)	<32 (U)	<32 (U)	<30 (U)	<25 (U)
1,1,2-trichloroethane		<9.8 (U)	<13 (U)	<13 (U)	<12 (U)	<9.8 (U)
1,1,2-trichlorotrifluoroethane		<14 (U)	32	<18 (U)	4.9 (J a)	<14 (U)
1,1-dichloroethane		<7.3 (U)	<9.3 (U)	<9.3 (U)	2.0 (J a)	<7.3 (U)
1,1-dichloroethene		<7.2 (U)	<9.1 (U)	<9.1 (U)	<8.7 (U)	<7.2 (U)
1,2,4-trichlorobenzene		<27 (U)	<34 (U)	<34 (U)	<33 (U)	<27 (U)
1,2,4-trimethylbenzene		2.9 (J a)	2.6 (J a)	2.0 (J a)	2.8 (J a)	2.6 (J a)
1,2-dichlorobenzene		<11 (U)	<14 (U)	<14 (U)	<13 (U)	<11 (U)
1,2-dichloroethane		<7.3 (U)	<9.3 (U)	<9.3 (U)	<8.9 (U)	<7.3 (U)
1,2-dichloropropane		<8.3 (U)	<11 (U)	<11 (U)	<10 (U)	<8.3 (U)
1,2-dichlorotetrafluoroethane		<13 (U)	<16 (U)	<16 (U)	<15 (U)	<13 (U)
1,3,5-trimethylbenzene		<18 (U)	<23 (U)	<23 (U)	2.0 (J a)	<18 (U)
1,3-butadiene		<20 (U)	<25 (U)	<25 (U)	<24 (U)	<20 (U)
1,3-dichlorobenzene		<11 (U)	<14 (U)	<14 (U)	1.2 (J a)	<11 (U)
1,4-dichlorobenzene		<11 (U)	<14 (U)	<14 (U)	1.1 (J a)	<11 (U)
2-butanone (MEK)		62	44	16	23	25
2-hexanone		8.5	6.5 (J a)	<9.4 (U)	9.5	12
4-ethyltoluene		1.9 (J a)	2.1 (J a)	<11 (U)	2.9 (J a)	1.8 (J a)
4-methyl-2-pentanone (MIBK)		43	15	9.1 (J a)	91	120
acetone		430	590	91	100	110
acrylonitrile		<20 (U)	<25 (U)	<25 (U)	<24 (U)	<20 (U)
benzene		3.7 (J a)	4.2 (J a)	3.8 (J a)	4.7 (J a)	3.1 (J a)
benzyl chloride		<9.3 (UJ c)	<12 (UJ c)	<12 (UJ c)	<11 (UJ c)	<9.3 (UJ c)
bromodichloromethane		<12 (U)	<15 (U)	<15 (U)	3.1 (J a)	<12 (U)
bromoform		<19 (U)	<24 (U)	<24 (U)	<23 (U)	<19 (U)
bromomethane		<7.0 (UJ c)	<8.9 (UJ c)	<8.9 (UJ c)	2.2 (J ca)	<7.0 (UJ c)
carbon disulfide		<2.9 (UJ 1a)	<8.2 (UJ 1a)	<11 (UJ 1a)	<3.5 (UJ 1a)	<1.9 (UJ 1a)
carbon tetrachloride		<11 (U)	<14 (U)	<14 (U)	2.5 (J a)	<11 (U)
chlorobenzene		<8.3 (U)	<11 (U)	<11 (U)	1.5 (J a)	<8.3 (U)

APPENDIX D-5 SUB-SLAB VAPOR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4810)

Analyte	Sample ID	N7-4810SS1	N7-4810SS2	N7-4810SS3	N7-4810SS4	N7-4810SS4[(a)]
chloroethane		<4.8 (U)	<6.1 (U)	<6.1 (U)	<5.8 (U)	<4.8 (U)
chloroform		<8.8 (U)	<11 (U)	<11 (U)	2.4 (J a)	<8.8 (U)
chloromethane		<7.5 (U)	<9.5 (U)	<9.5 (U)	1.2 (J a)	0.94 (J a)
cis-1,2-dichloroethene		<7.2 (U)	<9.1 (U)	<9.1 (U)	<8.7 (U)	<7.2 (U)
cis-1,3-dichloropropene		<8.2 (U)	<10 (U)	<10 (U)	0.92 (J a)	<8.2 (U)
cyclohexane		8.0 (J a)	8.5 (J a)	6.3 (J a)	4.2 (J a)	3.0 (J a)
dibromochloromethane		<15 (U)	<20 (U)	<20 (U)	<19 (U)	<15 (U)
dichlorodifluoromethane		2.9 (J a)	5.5 (J a)	<11 (U)	5.1 (J a)	3.5 (J a)
ethanol		95	96	26	32	43
ethyl acetate		<33 (U)	<41 (U)	<41 (U)	<40 (U)	<33 (U)
ethylbenzene		1.6 (J a)	1.8 (J a)	1.5 (J a)	4.3 (J a)	3.7 (J a)
ethylene dibromide (EDB)		<14 (U)	<18 (U)	<18 (U)	<17 (U)	<14 (U)
hexachlorobutadiene		<19 (U)	<25 (U)	<25 (U)	<23 (U)	<19 (U)
isopropanol		68	410	20 (J a)	15 (J a)	29
isopropylbenzene		<8.9 (U)	<11 (U)	<11 (U)	2.4 (J a)	<8.9 (U)
m- & p-xylene		7.1 (J a)	7.9 (J a)	7.1 (J a)	18	19
methyl tert-butyl ether (MTBE)		<6.5 (U)	<8.3 (U)	<8.3 (U)	1.3 (J a)	<6.5 (U)
methylene chloride		<6.3 (U)	<8.0 (U)	<8.0 (U)	<1.9 (UJ ba)	<6.3 (U)
naphthalene		<47 (U)	<60 (U)	<60 (U)	<58 (U)	<47 (U)
n-butylbenzene		<9.9 (U)	<13 (U)	<13 (U)	<12 (U)	<9.9 (U)
n-heptane		<37 (U)	<47 (U)	<47 (U)	2.5 (J a)	<37 (U)
n-hexane		1.5 (J a)	<40 (U)	<40 (U)	3.1 (J a)	<32 (U)
o-xylene		2.6 (J a)	2.9 (J a)	2.9 (J a)	8.8 (J a)	9.0
p-isopropyltoluene		<9.9 (U)	<13 (U)	<13 (U)	1.7 (J a)	<9.9 (U)
propene		<16 (U)	<20 (U)	<20 (U)	<19 (U)	<16 (U)
sec-butylbenzene		<9.9 (U)	<13 (U)	<13 (U)	2.1 (J a)	<9.9 (U)
styrene		<7.7 (U)	<9.8 (U)	<9.8 (U)	<9.4 (U)	<7.7 (U)
tetrachloroethene (PCE)		6.2 (J a)	<16 (U)	<16 (U)	17	<12 (U)
tetrahydrofuran		1.6 (J a)	<34 (U)	1.6 (J a)	1.9 (J a)	<27 (U)
toluene		6.7 (J a)	8.1 (J a)	7.3 (J a)	5.0 (J a)	4.8 (J a)
trans-1,2-dichloroethene		<7.2 (U)	<9.1 (U)	<9.1 (U)	<8.7 (U)	<7.2 (U)

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Analyte	Sample ID	N7-4810SS1	N7-4810SS2	N7-4810SS3	N7-4810SS4	N7-4810SS4[a]
trans-1,3-dichloropropene		<8.2 (U)	<10 (U)	<10 (U)	<10 (U)	<8.2 (U)
trichloroethene (TCE)		<9.7 (U)	<12 (U)	<12 (U)	3.0 (J a)	<9.7 (U)
trichlorofluoromethane		<10 (U)	<13 (U)	<13 (U)	4.7 (J a)	<10 (U)
vinyl chloride		<4.6 (U)	<5.9 (U)	<5.9 (U)	<5.6 (U)	<4.6 (U)

Notes:

Qualifier definitions are presented in Appendix E.

All concentrations are presented in in micrograms per cubic meter.

[a] Duplicate sample.

APPENDIX D-6 SUB-SLAB VAPOR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4810)
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Analyte	Sample ID	N7-4810SS1	N7-4810SS2	N7-4810SS3	N7-4810SS4	N7-4810SS4[a]
1,1,1,2-tetrachloroethane		<14 (U)	<14 (U)	<15 (U)	<14 (U)	<14 (U)
1,1,1-trichloroethane		<11 (U)	<11 (U)	<12 (U)	<11 (U)	<11 (U)
1,1,2,2-tetrachloroethane		<28 (U)	<28 (U)	<30 (U)	<28 (U)	<28 (U)
1,1,2-trichloroethane		<11 (U)	<11 (U)	<12 (U)	<11 (U)	<11 (U)
1,1,2-trichlorotrifluoroethane		<15 (U)	<15 (U)	<16 (U)	<15 (U)	<16 (U)
1,1-dichloroethane		<8.2 (U)	<8.2 (U)	<8.7 (U)	<8.2 (U)	<8.3 (U)
1,1-dichloroethene		<8.0 (U)	<8.0 (U)	<8.5 (U)	<8.0 (U)	<8.2 (U)
1,2,4-trichlorobenzene		<30 (U)	<30 (U)	<32 (U)	<30 (U)	<31 (U)
1,2,4-trimethylbenzene		1.7 (J a)	3.8 (J a)	2.3 (J a)	2.2 (J a)	1.5 (J a)
1,2-dichlorobenzene		<12 (U)	<12 (U)	<13 (U)	<12 (U)	<12 (U)
1,2-dichloroethane		<8.2 (U)	<8.2 (U)	<8.7 (U)	<8.2 (U)	<8.3 (U)
1,2-dichloropropane		<9.3 (U)	<9.3 (U)	<9.9 (U)	<9.3 (U)	<9.5 (U)
1,2-dichlorotetrafluoroethane		<14 (U)	<14 (U)	<15 (U)	<14 (U)	<14 (U)
1,3,5-trimethylbenzene		<20 (U)	<20 (U)	<21 (U)	<20 (U)	<20 (U)
1,3-butadiene		<22 (U)	<22 (U)	<24 (U)	<22 (U)	<23 (U)
1,3-dichlorobenzene		<12 (U)	<12 (U)	<13 (U)	<12 (U)	<12 (U)
1,4-dichlorobenzene		<12 (U)	<12 (U)	<13 (U)	1.1 (J a)	<12 (U)
2-butanone (MEK)		13	35	9.4	28	11
2-hexanone		<8.3 (U)	<8.3 (U)	<8.8 (U)	<8.3 (U)	<8.5 (U)
4-ethyltoluene		<9.9 (U)	3.0 (J a)	<11 (U)	1.6 (J a)	<10 (U)
4-methyl-2-pentanone (MIBK)		<8.3 (U)	<8.3 (U)	<8.8 (U)	<8.3 (U)	<8.5 (U)
acetone		63	100	67	95	89
acrylonitrile		<22 (U)	<22 (U)	<23 (U)	<22 (U)	<22 (U)
benzene		7.3 (J c)	8.5 (J c)	8.8 (J c)	4.6 (J ca)	6.9 (J c)
benzyl chloride		<10 (UJ- f)	<10 (UJ- f)	<11 (UJ- f)	<10 (UJ- f)	<11 (UJ- f)
bromodichloromethane		<14 (U)	<14 (U)	<14 (U)	<14 (U)	<14 (U)
bromoform		<21 (U)	<21 (U)	<22 (U)	<21 (U)	<21 (U)
bromomethane		<7.9 (U)	<7.9 (U)	<8.4 (U)	<7.9 (U)	<8.0 (U)
carbon disulfide		36	240	33	180	76
carbon tetrachloride		<13 (U)	<13 (U)	<14 (U)	<13 (U)	<13 (U)
chlorobenzene		<9.3 (U)	<9.3 (U)	<9.9 (U)	<9.3 (U)	<9.5 (U)

APPENDIX D-6 SUB-SLAB VAPOR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4810)

Analyte	Sample ID	N7-4810SS1	N7-4810SS2	N7-4810SS3	N7-4810SS4	N7-4810SS4[(a)]
chloroethane		<5.3 (U)	<5.3 (U)	<5.7 (U)	<5.3 (U)	<5.4 (U)
chloroform		<9.9 (U)	<9.9 (U)	<11 (U)	<9.9 (U)	<10 (U)
chloromethane		2.7 (J a)	3.3 (J a)	1.4 (J a)	8.3 (J a)	3.2 (J a)
cis-1,2-dichloroethene		<8.0 (U)	4.0 (J a)	<8.5 (U)	<8.0 (U)	<8.2 (U)
cis-1,3-dichloropropene		<9.2 (U)	<9.2 (U)	<9.8 (U)	<9.2 (U)	<9.4 (U)
cyclohexane		<35 (U)	<35 (U)	<37 (U)	<35 (U)	<36 (U)
dibromochloromethane		<17 (U)	<17 (U)	<18 (U)	<17 (U)	<18 (U)
dichlorodifluoromethane		2.5 (J a)	<10 (U)	<11 (U)	2.6 (J a)	2.8 (J a)
ethanol		27 (J c)	140 (J c)	25 (J c)	190 (J c)	10 (J ca)
ethyl acetate		<36 (U)	<36 (U)	<39 (U)	<36 (U)	<37 (U)
ethylbenzene		<8.8 (U)	1.3 (J a)	1.5 (J a)	1.9 (J a)	<9.0 (U)
ethylene dibromide (EDB)		<16 (U)	<16 (U)	<17 (U)	<16 (U)	<16 (U)
hexachlorobutadiene		<22 (U)	<22 (U)	<23 (U)	<22 (U)	<22 (U)
isopropanol		<9.8 (U)	29	<26 (U)	<25 (U)	<25 (U)
isopropylbenzene		<9.9 (U)	<9.9 (U)	<11 (U)	<9.9 (U)	<10 (U)
m- & p-xylene		2.7 (J a)	5.0 (J a)	4.4 (J a)	7.3 (J a)	4.3 (J a)
methyl tert-butyl ether (MTBE)		<7.3 (U)	<7.3 (U)	<7.8 (U)	<7.3 (U)	<7.4 (U)
methylene chloride		<5.0 (UJ ba)	<4.7 (UJ ba)	<5.2 (UJ ba)	<3.8 (UJ ba)	<4.1 (UJ ba)
naphthalene		1.9 (J a)	1.6 (J a)	1.7 (J a)	1.6 (J a)	1.9 (J a)
n-butylbenzene		<11 (U)	<11 (U)	<12 (U)	<11 (U)	<11 (U)
n-heptane		<41 (U)	<41 (U)	<44 (U)	<41 (U)	<42 (U)
n-hexane		<36 (U)	<36 (U)	<38 (U)	<36 (U)	<36 (U)
o-xylene		0.98 (J a)	3.3 (J a)	1.6 (J a)	3.8 (J a)	2.6 (J a)
p-isopropyltoluene		<11 (U)	1.7 (J a)	<12 (U)	3.7 (J a)	1.5 (J a)
propene		<17 (U)	<17 (U)	<19 (U)	<17 (U)	<18 (U)
sec-butylbenzene		<11 (U)	<11 (U)	<12 (U)	<11 (U)	<11 (U)
styrene		<8.6 (U)	<8.6 (U)	<9.2 (U)	<8.6 (U)	<8.8 (U)
tetrachloroethene (PCE)		<14 (U)	<14 (U)	<15 (U)	<14 (U)	<14 (U)
tetrahydrofuran		<30 (U)	5.2 (J a)	<32 (U)	1.7 (J a)	<30 (U)
toluene		4.2 (J a)	5.0 (J a)	6.0 (J a)	8.7	4.2 (J a)
trans-1,2-dichloroethene		<8.0 (U)	<8.0 (U)	<8.5 (U)	<8.0 (U)	<8.2 (U)

APPENDIX D-6 SUB-SLAB VAPOR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4810)
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Analyte	Sample ID	N7-4810SS1	N7-4810SS2	N7-4810SS3	N7-4810SS4	N7-4810SS4[a]
trans-1,3-dichloropropene		<9.2 (U)	<9.2 (U)	<9.8 (U)	<9.2 (U)	<9.4 (U)
trichloroethene (TCE)		<11 (U)	<11 (U)	<12 (U)	<11 (U)	<11 (U)
trichlorofluoromethane		<11 (U)	<11 (U)	3.9 (J a)	<11 (U)	<12 (U)
vinyl chloride		<5.2 (U)	<5.2 (U)	<5.5 (U)	<5.2 (U)	<5.3 (U)

Notes:

Qualifier definitions are presented in Appendix E.

All concentrations are presented in in micrograms per cubic meter.

[a] Duplicate sample.

APPENDIX D-7 INDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806IA1	N3-4806IA1[a]	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	IASL[b]	CA-IASL[c]
1,1,1,2-tetrachloroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	1.66	IASL
1,1,1-trichloroethane		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	22,000	4,400
1,1,2,2-tetrachloroethane		<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	0.21	IASL
1,1,2-trichloroethane		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.77	IASL
1,1,2-trichlorotrifluoroethane		0.54 (J a)	0.56 (J a)	0.60 (J a)	0.56 (J a)	0.57 (J a)	0.57 (J a)	130,000	IASL
1,1-dichloroethane		<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	7.66	IASL
1,1-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	880	IASL
1,2,4-trichlorobenzene		<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	8.8	1.2
1,2,4-trimethylbenzene		1.7 (J a)	1.5 (J a)	2.7	3.4	3.9	3.8	31	IASL
1,2-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,2-dichloroethane		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.47	IASL
1,2-dichloropropane		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	1.23	IASL
1,2-dichlorotetrafluoroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	130,000	IASL
1,3,5-trimethylbenzene		0.54 (J a)	0.46 (J a)	0.75 (J a)	0.92 (J a)	1.1 (J a)	1.0 (J a)	153	IASL
1,3-butadiene		<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	0.41	0.07
1,3-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,4-dichlorobenzene		0.14 (J a)	<0.089 (U)	<0.089 (U)	<0.089 (U)	<0.089 (U)	<0.089 (U)	1.11	IASL
2-butanone (MEK)		6.5	3.4	2.8	2.5	2.6	2.8	22,000	IASL
2-hexanone		<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	130	IASL
4-ethyltoluene		1.7	1.4	2.4	3.0	3.3	3.2	440	IASL
4-methyl-2-pentanone (MIBK)		<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	13,000	IASL
acetone		18	15	17	17	19	12	140,000	IASL
acrylonitrile		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	0.18	0.04
benzene		1.1	1.0	1.3	1.5	1.8	1.8	1.57	0.42
benzyl chloride		<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	0.25	IASL
bromodichloromethane		<0.069 (U)	<0.069 (U)	<0.069 (U)	<0.069 (U)	<0.069 (U)	<0.069 (U)	0.33	IASL
bromoform		<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	11.15	IASL
bromomethane		0.12 (J ca)	0.17 (J ca)	0.19 (J ca)	0.18 (J ca)	0.22 (J ca)	0.21 (J ca)	22	IASL
carbon disulfide		2.2 (J a)	1.2 (J a)	0.69 (J a)	0.46 (J a)	0.28 (J a)	1.5 (J a)	3,100	IASL
carbon tetrachloride		0.46 (J a)	0.44 (J a)	0.42 (J a)	0.43 (J a)	0.44 (J a)	0.41 (J a)	2.04	0.29
chlorobenzene		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	220	IASL

APPENDIX D-7 INDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806IA1	N3-4806IA1[a]	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	IASL[b]	CA-IASL[c]
chloroethane		<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	44,000	IASL
chloroform		<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	20	<0.14 (U)	0.53	IASL
chloromethane		1.3	1.2	1.3	1.3	1.4	1.2	390	IASL
cis-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	150
cis-1,3-dichloropropene		0.28 (J a)	0.11 (J a)	0.077 (J a)	0.060 (J a)	0.071 (J a)	<0.053 (U)	3.07	0.77
cyclohexane		0.64 (J a)	0.78 (J a)	1.2 (J a)	1.4 (J a)	1.6 (J a)	1.3 (J a)	26,000	IASL
dibromochloromethane		<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	0.45	IASL
dichlorodifluoromethane		2.5	2.5	2.7	2.7	2.8	2.8	440	IASL
ethanol		16	37	21	23	30	27	31,000	IASL
ethyl acetate		<3.6 (U)	0.63 (J a)	0.69 (J a)	0.90 (J a)	0.90 (J a)	1.1 (J a)	31,000	IASL
ethylbenzene		1.9	1.2	1.6	2.0	2.2	2.0	4.9	IASL
ethylene dibromide (EDB)		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.02	IASL
hexachlorobutadiene		<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	0.56	IASL
isopropanol		2.3 (J a)	4.0	2.0 (J a)	2.6	11	3.9	31,000	IASL
isopropylbenzene		0.56 (J a)	0.20 (J a)	<0.98 (U)	0.14 (J a)	0.17 (J a)	0.14 (J a)	1,800	IASL
m- & p-xylene		5.1	4.3	6.7	8.1	9.0	8.7	440	IASL
methyl tert-butyl ether (MTBE)		<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	47	IASL
methylene chloride		<0.40 (UJ ba)	<0.45 (UJ ba)	<0.43 (UJ ba)	<0.42 (UJ ba)	<0.42 (UJ ba)	<0.41 (UJ ba)	1,200	12
naphthalene		<0.095 (U)	<0.095 (U)	0.63 (J a)	0.83 (J a)	0.94 (J a)	0.89 (J a)	0.36	IASL
n-butylbenzene		0.36 (J a)	0.20 (J a)	0.35 (J a)	0.45 (J a)	0.72 (J a)	0.52 (J a)	1,800	IASL
n-heptane		1.1 (J a)	1.2 (J a)	1.8 (J a)	2.0 (J a)	2.1 (J a)	2.0 (J a)	3,100	IASL
n-hexane		2.1 (J a)	1.5 (J a)	4.0	5.4	8.2	10	3,100	IASL
o-xylene		1.9	1.6	2.5	3.0	3.3	3.1	440	IASL
p-isopropyltoluene		0.87 (J a)	0.65 (J a)	<1.1 (U)	0.55 (J a)	0.16 (J a)	0.42 (J a)	1,800	IASL
propene		<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	13,000	IASL
sec-butylbenzene		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	1,800	IASL
styrene		0.22 (J a)	0.22 (J a)	0.15 (J a)	0.15 (J a)	0.19 (J a)	0.21 (J a)	4,400	3,900
tetrachloroethene (PCE)		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	47.15	2.1
tetrahydrofuran		0.25 (J a)	0.56 (J a)	0.28 (J a)	0.18 (J a)	0.19 (J a)	0.53 (J a)	8,800	IASL
toluene		5.5	6.0	8.5	9.3	10	10	22,000	1,300
trans-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	IASL

APPENDIX D-7 INDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806IA1	N3-4806IA1[a]	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	IASL[b]	CA-IASL[c]
trans-1,3-dichloropropene		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	3.07	0.77
trichloroethene (TCE)		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	2.99	IASL
trichlorofluoromethane		2.5	2.5	1.7	1.8	1.5	1.3	3,100	IASL
vinyl chloride		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	2.79	0.16

Notes:

Qualifier definitions are presented in Appendix E.

Shaded cell indicates sample concentration exceeds IASL or CA-IASL.

All concentrations are presented in in micrograms per cubic meter.

[a] Duplicate sample.

[b] See Table 2 for details.

[c] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level
IASL Indoor air screening level

APPENDIX D-8 INDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806IA1	N3-4806IA1[a]	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	IASL[b]	CA-IASL[c]
1,1,1,2-tetrachloroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	1.66	IASL
1,1,1-trichloroethane		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	22,000	4,400
1,1,2,2-tetrachloroethane		<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	0.21	IASL
1,1,2-trichloroethane		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.77	IASL
1,1,2-trichlorotrifluoroethane		0.59 (J a)	0.56 (J a)	0.60 (J a)	0.56 (J a)	0.58 (J a)	0.59 (J a)	130,000	IASL
1,1-dichloroethane		<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	7.66	IASL
1,1-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	880	IASL
1,2,4-trichlorobenzene		<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	8.8	1.2
1,2,4-trimethylbenzene		2.6	2.7	0.38 (J a)	0.35 (J a)	0.51 (J a)	0.61 (J a)	31	IASL
1,2-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,2-dichloroethane		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.47	IASL
1,2-dichloropropane		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	1.23	IASL
1,2-dichlorotetrafluoroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	130,000	IASL
1,3,5-trimethylbenzene		0.68 (J a)	0.71 (J a)	<2.0 (U)	<2.0 (U)	<2.0 (U)	0.23 (J a)	153	IASL
1,3-butadiene		<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	0.41	0.07
1,3-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,4-dichlorobenzene		<0.089 (U)	<0.089 (U)	0.15 (J a)	<0.089 (U)	<0.089 (U)	<0.089 (U)	1.11	IASL
2-butanone (MEK)		4.5	3.8	5.0	1.8	2.6	6.4	22,000	IASL
2-hexanone		<0.82 (U)	<0.82 (U)	<0.82 (U)	0.28 (J a)	<0.82 (U)	<0.82 (U)	130	IASL
4-ethyltoluene		2.2	2.2	0.27 (J a)	0.21 (J a)	0.36 (J a)	0.55 (J a)	440	IASL
4-methyl-2-pentanone (MIBK)		<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	13,000	IASL
acetone		110	110	21	14	12	20	140,000	IASL
acrylonitrile		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	0.18	0.04
benzene		1.2 (J+ 1c)	0.85 (J+ 1c)	0.91 (J+ 1c)	0.93 (J+ 1c)	0.77 (J+ 1c)	0.94 (J+ 1c)	1.57	0.42
benzyl chloride		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.24 (J a)	0.25	IASL
bromodichloromethane		<0.069 (U)	<0.069 (U)	0.49 (J a)	0.15 (J a)	<0.069 (U)	<0.069 (U)	0.33	IASL
bromoform		<2.1 (U)	<2.1 (U)	<2.1 (U)	0.34 (J a)	<2.1 (U)	<2.1 (U)	11.15	IASL
bromomethane		<0.78 (U)	<0.78 (U)	<0.78 (U)	<0.78 (U)	<0.78 (U)	<0.78 (U)	22	IASL
carbon disulfide		8.1	4.1	0.72 (J a)	0.41 (J a)	2.2 (J a)	140	3,100	IASL
carbon tetrachloride		0.43 (J a)	0.42 (J a)	0.48 (J a)	0.46 (J a)	0.39 (J a)	0.43 (J a)	2.04	0.29
chlorobenzene		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	220	IASL

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Analyte	Sample ID	N3-4806IA1	N3-4806IA1[a]	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	IASL[b]	CA-IASL[c]
chloroethane		<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	44,000	IASL
chloroform		<0.14 (U)	<0.14 (U)	0.21 (J a)	0.14 (J a)	7.9	1.1	0.53	IASL
chloromethane		1.4	1.2	1.6	1.3	1.2	1.6	390	IASL
cis-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	150
cis-1,3-dichloropropene		<0.053 (U)	<0.053 (U)	<0.053 (U)	<0.053 (U)	<0.053 (U)	0.097 (J a)	3.07	0.77
cyclohexane		0.67 (J a)	0.66 (J a)	<3.4 (U)	<3.4 (U)	<3.4 (U)	1.1 (J a)	26,000	IASL
dibromochloromethane		<0.20 (U)	<0.20 (U)	<0.20 (U)	0.42 (J a)	<0.20 (U)	<0.20 (U)	0.45	IASL
dichlorodifluoromethane		8.6	8.8	10	13	3.1	3.9	440	IASL
ethanol		20 (J c)	14 (J c)	28 (J c)	5.4 (J c)	20 (J c)	14 (J c)	31,000	IASL
ethyl acetate		<3.6 (U)	<3.6 (U)	<3.6 (U)	<3.6 (U)	<3.6 (U)	<3.6 (U)	31,000	IASL
ethylbenzene		1.5	1.5	0.29 (J a)	0.15 (J a)	0.22 (J a)	0.29 (J a)	4.9	IASL
ethylene dibromide (EDB)		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.02	IASL
hexachlorobutadiene		<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	0.56	IASL
isopropanol		3.0	2.1 (J a)	24	1.9 (J a)	5.3	64	31,000	IASL
isopropylbenzene		<0.98 (U)	<0.98 (U)	<0.98 (U)	<0.98 (U)	<0.98 (U)	<0.98 (U)	1,800	IASL
m- & p-xylene		6.8	7.1	0.99	0.77 (J a)	0.87	1.2	440	IASL
methyl tert-butyl ether (MTBE)		<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	47	IASL
methylene chloride		<0.52 (UJ ba)	<0.46 (UJ ba)	<0.69 (U)	<0.69 (U)	<0.18 (UJ ba)	<0.69 (U)	1,200	12
naphthalene		0.42 (J a)	0.46 (J a)	0.72 (J a)	0.22 (J a)	0.26 (J a)	1.0 (J a)	0.36	IASL
n-butylbenzene		0.39 (J a)	0.30 (J a)	0.77 (J a)	0.25 (J a)	0.33 (J a)	<1.1 (U)	1,800	IASL
n-heptane		0.97 (J a)	0.84 (J a)	<4.1 (U)	<4.1 (U)	<4.1 (U)	<4.1 (U)	3,100	IASL
n-hexane		9.4	9.3	2.8 (J a)	2.3 (J a)	5.7	220	3,100	IASL
o-xylene		2.3	2.4	0.35 (J a)	0.21 (J a)	0.32 (J a)	1.2	440	IASL
p-isopropyltoluene		0.64 (J a)	0.24 (J a)	0.41 (J a)	<1.1 (U)	0.38 (J a)	3.3	1,800	IASL
propene		<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	13,000	IASL
sec-butylbenzene		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	1,800	IASL
styrene		0.51 (J a)	0.42 (J a)	0.16 (J a)	<0.85 (U)	<0.85 (U)	0.13 (J a)	4,400	3,900
tetrachloroethene (PCE)		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	47.15	2.1
tetrahydrofuran		<2.9 (U)	<2.9 (U)	0.52 (J a)	<2.9 (U)	<2.9 (U)	0.36 (J a)	8,800	IASL
toluene		79	83	3.0	2.2	1.3	1.6	22,000	1,300
trans-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	IASL

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Analyte	Sample ID	N3-4806IA1	N3-4806IA1[a]	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	IASL[b]	CA-IASL[c]
trans-1,3-dichloropropene		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	3.07	0.77
trichloroethene (TCE)		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	2.99	IASL
trichlorofluoromethane		6.3	6.4	2.3	2.6	1.4	1.9	3,100	IASL
vinyl chloride		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	2.79	0.16

Notes:

Qualifier definitions are presented in Appendix E.

Shaded cell indicates sample concentration exceeds IASL or CA-IASL.

All concentrations are presented in in micrograms per cubic meter.

[a] Duplicate sample.

[b] See Table 2 for details.

[c] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level
IASL Indoor air screening level

APPENDIX D-9 INDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4807)
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Analyte	Sample ID	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA4	IASL[a]	CA-IASL[b]
1,1,1,2-tetrachloroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	1.66	IASL
1,1,1-trichloroethane		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	22,000	4,400
1,1,2,2-tetrachloroethane		<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	0.21	IASL
1,1,2-trichloroethane		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.77	IASL
1,1,2-trichlorotrifluoroethane		0.64 (J a)	0.59 (J a)	0.56 (J a)	0.60 (J a)	130,000	IASL
1,1-dichloroethane		<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	7.66	IASL
1,1-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	880	IASL
1,2,4-trichlorobenzene		<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	8.8	1.2
1,2,4-trimethylbenzene		2.0	2.4	13	8.2	31	IASL
1,2-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,2-dichloroethane		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.47	IASL
1,2-dichloropropane		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	1.23	IASL
1,2-dichlorotetrafluoroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	130,000	IASL
1,3,5-trimethylbenzene		0.59 (J a)	0.70 (J a)	3.9	2.5	153	IASL
1,3-butadiene		<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	0.41	0.07
1,3-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,4-dichlorobenzene		<0.089 (U)	<0.089 (U)	<0.089 (U)	<0.089 (U)	1.11	IASL
2-butanone (MEK)		3.0	2.3	6.1	2.6	22,000	IASL
2-hexanone		<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	130	IASL
4-ethyltoluene		1.7	2.1	11	6.5	440	IASL
4-methyl-2-pentanone (MIBK)		<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	13,000	IASL
acetone		18	16	30	19	140,000	IASL
acrylonitrile		<0.17 (U)	<0.17 (U)	1.3 (J a)	<0.17 (U)	0.18	0.04
benzene		1.7	2.0	8.3	4.8	1.57	0.42
benzyl chloride		<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	0.25	IASL
bromodichloromethane		<0.069 (U)	<0.069 (U)	<0.069 (U)	<0.069 (U)	0.33	IASL
bromoform		<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	11.15	IASL
bromomethane		0.20 (J ca)	0.21 (J ca)	0.28 (J ca)	0.17 (J ca)	22	IASL
carbon disulfide		0.75 (J a)	2.1 (J a)	1.6 (J a)	1.1 (J a)	3,100	IASL
carbon tetrachloride		0.42 (J a)	0.42 (J a)	0.42 (J a)	0.39 (J a)	2.04	0.29
chlorobenzene		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	220	IASL

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(BUILDING 4807)
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Analyte	Sample ID	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA4	IASL[a]	CA-IASL[b]
chloroethane		<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	44,000	IASL
chloroform		<0.14 (U)	<0.14 (U)	0.18 (J a)	<0.14 (U)	0.53	IASL
chloromethane		1.5	1.3	1.4	1.3	390	IASL
cis-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	150
cis-1,3-dichloropropene		0.11 (J a)	0.056 (J a)	0.16 (J a)	<0.053 (U)	3.07	0.77
cyclohexane		1.3 (J a)	1.6 (J a)	11	3.7	26,000	IASL
dibromochloromethane		<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	0.45	IASL
dichlorodifluoromethane		2.7	2.7	2.8	2.7	440	IASL
ethanol		25	23	150	47	31,000	IASL
ethyl acetate		1.2 (J a)	0.86 (J a)	7.3	1.9 (J a)	31,000	IASL
ethylbenzene		1.4	1.6	8.3	4.3	4.9	IASL
ethylene dibromide (EDB)		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.02	IASL
hexachlorobutadiene		<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	0.56	IASL
isopropanol		240	38	4.3	5.3	31,000	IASL
isopropylbenzene		<0.98 (U)	<0.98 (U)	0.63 (J a)	0.39 (J a)	1,800	IASL
m- & p-xylene		5.3	6.5	34	18	440	IASL
methyl tert-butyl ether (MTBE)		<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	47	IASL
methylene chloride		<0.44 (UJ ba)	<0.42 (UJ ba)	<0.69 (U)	<0.47 (UJ ba)	1,200	12
naphthalene		<0.095 (U)	<0.095 (U)	1.9 (J a)	1.5 (J a)	0.36	IASL
n-butylbenzene		0.33 (J a)	0.26 (J a)	1.4	1.4	1,800	IASL
n-heptane		1.8 (J a)	2.1 (J a)	11	4.9	3,100	IASL
n-hexane		3.7	4.3	34	11	3,100	IASL
o-xylene		1.9	2.4	12	6.4	440	IASL
p-isopropyltoluene		<1.1 (U)	0.17 (J a)	0.63 (J a)	0.61 (J a)	1,800	IASL
propene		<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	13,000	IASL
sec-butylbenzene		<1.1 (U)	<1.1 (U)	0.21 (J a)	0.35 (J a)	1,800	IASL
styrene		0.23 (J a)	0.26 (J a)	0.55 (J a)	0.62 (J a)	4,400	3,900
tetrachloroethene (PCE)		<1.4 (U)	<1.4 (U)	0.27 (J a)	<1.4 (U)	47.15	2.1
tetrahydrofuran		1.7 (J a)	<2.9 (U)	0.17 (J a)	0.24 (J a)	8,800	IASL
toluene		7.6	8.9	43	24	22,000	1,300
trans-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	IASL

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Analyte	Sample ID	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA4	IASL[a]	CA-IASL[b]
trans-1,3-dichloropropene		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	3.07	0.77
trichloroethene (TCE)		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	2.99	IASL
trichlorofluoromethane		2.8	3.4	5.0	3.2	3,100	IASL
vinyl chloride		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	2.79	0.16

Notes:

Qualifier definitions are presented in Appendix E.

Shaded cell indicates sample concentration exceeds IASL or CA-IASL.

All concentrations are presented in in micrograms per cubic meter.

[b] See Table 2 for details.

[c] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level
IASL Indoor air screening level

APPENDIX D-10 INDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4807)

Analyte	Sample ID	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA4	IASL[(a)]	CA-IASL[(b)]
1,1,1,2-tetrachloroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	1.66	IASL
1,1,1-trichloroethane		0.17 (J a)	<1.1 (U)	<1.1 (U)	<1.1 (U)	22,000	4,400
1,1,2,2-tetrachloroethane		<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	0.21	IASL
1,1,2-trichloroethane		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.77	IASL
1,1,2-trichlorotrifluoroethane		0.59 (J a)	0.58 (J a)	0.51 (J a)	0.53 (J a)	130,000	IASL
1,1-dichloroethane		<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	7.66	IASL
1,1-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	880	IASL
1,2,4-trichlorobenzene		<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	8.8	1.2
1,2,4-trimethylbenzene		3.6	5.1	33	1.1 (J a)	31	IASL
1,2-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,2-dichloroethane		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.47	IASL
1,2-dichloropropane		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	1.23	IASL
1,2-dichlorotetrafluoroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	130,000	IASL
1,3,5-trimethylbenzene		1.1 (J a)	1.5 (J a)	11	0.28 (J a)	153	IASL
1,3-butadiene		<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	0.41	0.07
1,3-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,4-dichlorobenzene		<0.089 (U)	<0.089 (U)	<0.089 (U)	0.14 (J a)	1.11	IASL
2-butanone (MEK)		2.9	3.0	170	3.6	22,000	IASL
2-hexanone		<0.82 (U)	<0.82 (U)	1.9	<0.82 (U)	130	IASL
4-ethyltoluene		3.2	4.5	32	0.84 (J a)	440	IASL
4-methyl-2-pentanone (MIBK)		<0.82 (U)	<0.82 (U)	<0.82 (U)	0.62 (J a)	13,000	IASL
acetone		17	19	72	19	140,000	IASL
acrylonitrile		<0.17 (U)	<0.17 (U)	2.0 (J a)	<0.17 (U)	0.18	0.04
benzene		1.6 (J+ 1c)	1.2 (J+ 1c)	7.4 (J c)	0.93 (J+ 1c)	1.57	0.42
benzyl chloride		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.25	IASL
bromodichloromethane		<0.069 (U)	0.14 (J a)	<0.069 (U)	<0.069 (U)	0.33	IASL
bromoform		<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	11.15	IASL
bromomethane		<0.78 (U)	<0.78 (U)	<0.78 (U)	<0.78 (U)	22	IASL
carbon disulfide		9.9	2.3 (J a)	13	2.7 (J a)	3,100	IASL
carbon tetrachloride		0.44 (J a)	0.41 (J a)	0.37 (J a)	0.43 (J a)	2.04	0.29
chlorobenzene		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	220	IASL

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Analyte	Sample ID	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA4	IASL[a]	CA-IASL[b]
chloroethane		<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	44,000	IASL
chloroform		0.24 (J a)	0.28 (J a)	<0.14 (U)	0.38 (J a)	0.53	IASL
chloromethane		0.70 (J a)	1.3	4.7	1.2	390	IASL
cis-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	150
cis-1,3-dichloropropene		0.057 (J a)	<0.053 (U)	<0.053 (U)	<0.053 (U)	3.07	0.77
cyclohexane		<3.4 (U)	1.4 (J a)	11	0.52 (J a)	26,000	IASL
dibromochloromethane		<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	0.45	IASL
dichlorodifluoromethane		0.24 (J a)	7.8	16	3.7	440	IASL
ethanol		25 (J c)	30 (J c)	430 (J c)	18 (J c)	31,000	IASL
ethyl acetate		<3.6 (U)	<3.6 (U)	<3.6 (U)	<3.6 (U)	31,000	IASL
ethylbenzene		1.9	2.4	18	0.60 (J a)	4.9	IASL
ethylene dibromide (EDB)		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.02	IASL
hexachlorobutadiene		<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	0.56	IASL
isopropanol		27	14	17	19	31,000	IASL
isopropylbenzene		0.17 (J a)	0.20 (J a)	1.3	<0.98 (U)	1,800	IASL
m- & p-xylene		7.8	10	74	2.3	440	IASL
methyl tert-butyl ether (MTBE)		<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	47	IASL
methylene chloride		<0.69 (U)	<0.39 (UJ ba)	<0.69 (U)	<0.25 (UJ ba)	1,200	12
naphthalene		0.56 (J a)	0.58 (J a)	1.7 (J a)	0.30 (J a)	0.36	IASL
n-butylbenzene		0.41 (J a)	0.82 (J a)	3.2	0.49 (J a)	1,800	IASL
n-heptane		1.5 (J a)	1.7 (J a)	14	0.52 (J a)	3,100	IASL
n-hexane		25	34	41	55	3,100	IASL
o-xylene		2.8	3.9	28	0.76 (J a)	440	IASL
p-isopropyltoluene		0.43 (J a)	0.39 (J a)	0.41 (J a)	0.38 (J a)	1,800	IASL
propene		<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	13,000	IASL
sec-butylbenzene		<1.1 (U)	<1.1 (U)	0.46 (J a)	<1.1 (U)	1,800	IASL
styrene		0.27 (J a)	0.27 (J a)	1.9	0.19 (J a)	4,400	3,900
tetrachloroethene (PCE)		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	47.15	2.1
tetrahydrofuran		1.0 (J a)	0.14 (J a)	<2.9 (U)	<2.9 (U)	8,800	IASL
toluene		11	11	58	4.5	22,000	1,300
trans-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	IASL

APPENDIX D-10 INDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4807)

Analyte	Sample ID	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA4	IASL[a]	CA-IASL[b]
trans-1,3-dichloropropene		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	3.07	0.77
trichloroethene (TCE)		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	2.99	IASL
trichlorofluoromethane		6.7	7.1	3.9	5.3	3,100	IASL
vinyl chloride		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	2.79	0.16

Notes:

Qualifier definitions are presented in Appendix E.

Shaded cell indicates sample concentration exceeds IASL or CA-IASL.

All concentrations are presented in in micrograms per cubic meter.

[b] See Table 2 for details.

[c] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level
IASL Indoor air screening level

APPENDIX D-11 INDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4810)

Analyte	Sample ID	N7-4810IA1	N7-4810IA2	N7-4810IA3	N7-4810IA4	N7-4810IA4[a]	IASL[b]	CA-IASL[c]
1,1,1,2-tetrachloroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	1.66	IASL
1,1,1-trichloroethane		0.52 (J a)	0.37 (J a)	<1.1 (U)	<1.1 (U)	<1.1 (U)	22,000	4,400
1,1,2,2-tetrachloroethane		<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	0.21	IASL
1,1,2-trichloroethane		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.77	IASL
1,1,2-trichlorotrifluoroethane		0.94 (J a)	0.78 (J a)	0.56 (J a)	0.57 (J a)	0.54 (J a)	130,000	IASL
1,1-dichloroethane		<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	7.66	IASL
1,1-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	880	IASL
1,2,4-trichlorobenzene		<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	8.8	1.2
1,2,4-trimethylbenzene		1.1 (J a)	0.64 (J a)	0.23 (J a)	0.095 (J a)	0.066 (J a)	31	IASL
1,2-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,2-dichloroethane		0.19 (J a)	<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.47	IASL
1,2-dichloropropane		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	1.23	IASL
1,2-dichlorotetrafluoroethane		0.45 (J a)	0.51 (J a)	<1.4 (U)	<1.4 (U)	<1.4 (U)	130,000	IASL
1,3,5-trimethylbenzene		0.34 (J a)	0.21 (J a)	<2.0 (U)	<2.0 (U)	<2.0 (U)	153	IASL
1,3-butadiene		<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	0.41	0.07
1,3-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,4-dichlorobenzene		0.15 (J a)	0.11 (J a)	<0.089 (U)	<0.089 (U)	<0.089 (U)	1.11	IASL
2-butanone (MEK)		4.2	3.0	2.0	2.3	2.5	22,000	IASL
2-hexanone		<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	130	IASL
4-ethyltoluene		0.97 (J a)	0.58 (J a)	0.22 (J a)	<0.98 (U)	<0.98 (U)	440	IASL
4-methyl-2-pentanone (MIBK)		0.94	0.66 (J a)	<0.82 (U)	<0.82 (U)	<0.82 (U)	13,000	IASL
acetone		32	25	31	120	18	140,000	IASL
acrylonitrile		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	0.18	0.04
benzene		1.2	0.81	0.39 (J a)	0.38 (J a)	0.27 (J a)	1.57	0.42
benzyl chloride		<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	0.25	IASL
bromodichloromethane		<0.069 (U)	<0.069 (U)	<0.069 (U)	<0.069 (U)	<0.069 (U)	0.33	IASL
bromoform		<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	11.15	IASL
bromomethane		<0.78 (UJ c)	0.21 (J ca)	0.13 (J ca)	0.22 (J ca)	0.16 (J ca)	22	IASL
carbon disulfide		0.45 (J a)	2.1 (J a)	0.65 (J a)	<0.63 (UJ 1a)	4.7	3,100	IASL
carbon tetrachloride		0.66 (J a)	0.54 (J a)	0.40 (J a)	0.43 (J a)	0.41 (J a)	2.04	0.29
chlorobenzene		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	220	IASL

APPENDIX D-11 INDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4810)

Analyte	Sample ID	N7-4810IA1	N7-4810IA2	N7-4810IA3	N7-4810IA4	N7-4810IA4[a]	IASL[b]	CA-IASL[c]
chloroethane		<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	44,000	IASL
chloroform		0.35 (J a)	0.21 (J a)	<0.14 (U)	<0.14 (U)	<0.14 (U)	0.53	IASL
chloromethane		1.9	1.7	1.4	1.8	1.3	390	IASL
cis-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	150
cis-1,3-dichloropropene		<0.053 (U)	<0.053 (U)	<0.053 (U)	<0.053 (U)	<0.053 (U)	3.07	0.77
cyclohexane		0.76 (J a)	0.48 (J a)	<3.4 (U)	<3.4 (U)	<3.4 (U)	26,000	IASL
dibromochloromethane		<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	0.45	IASL
dichlorodifluoromethane		3.9	3.3	<0.99 (U)	2.6	2.5	440	IASL
ethanol		220	120	33	12	16	31,000	IASL
ethyl acetate		1.7 (J a)	0.73 (J a)	<3.6 (U)	<3.6 (U)	<3.6 (U)	31,000	IASL
ethylbenzene		1.8	1.6	4.4	0.13 (J a)	<0.12 (U)	4.9	IASL
ethylene dibromide (EDB)		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.02	IASL
hexachlorobutadiene		<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	0.56	IASL
isopropanol		21	18	68	28	9.8	31,000	IASL
isopropylbenzene		0.19 (J a)	<0.98 (U)	<0.98 (U)	<0.98 (U)	<0.98 (U)	1,800	IASL
m- & p-xylene		4.2	4.0	11	0.33 (J a)	0.23 (J a)	440	IASL
methyl tert-butyl ether (MTBE)		0.69 (J a)	0.43 (J a)	<0.72 (U)	<0.72 (U)	<0.72 (U)	47	IASL
methylene chloride		1.3 (J+ b)	0.81 (J+ b)	<0.42 (UJ ba)	<0.28 (UJ ba)	<0.25 (UJ ba)	1,200	12
naphthalene		0.74 (J a)	0.51 (J a)	<0.095 (U)	<0.095 (U)	<0.095 (U)	0.36	IASL
n-butylbenzene		<1.1 (U)	0.14 (J a)	0.24 (J a)	<1.1 (U)	<1.1 (U)	1,800	IASL
n-heptane		0.90 (J a)	0.52 (J a)	<4.1 (U)	<4.1 (U)	<4.1 (U)	3,100	IASL
n-hexane		1.5 (J a)	1.9 (J a)	0.35 (J a)	0.15 (J a)	<3.5 (U)	3,100	IASL
o-xylene		1.3	1.1	2.2	0.097 (J a)	0.088 (J a)	440	IASL
p-isopropyltoluene		1.1	0.81 (J a)	0.61 (J a)	<1.1 (U)	1.3	1,800	IASL
propene		<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	13,000	IASL
sec-butylbenzene		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	1,800	IASL
styrene		2.0	1.0	0.14 (J a)	<0.85 (U)	<0.85 (U)	4,400	3,900
tetrachloroethene (PCE)		0.66 (J a)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	47.15	2.1
tetrahydrofuran		0.50 (J a)	0.65 (J a)	2.0 (J a)	0.20 (J a)	<2.9 (U)	8,800	IASL
toluene		9.6	6.9	13	0.66 (J a)	0.41 (J a)	22,000	1,300
trans-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	IASL

APPENDIX D-11 INDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4810)

Analyte	Sample ID	N7-4810IA1	N7-4810IA2	N7-4810IA3	N7-4810IA4	N7-4810IA4[a]	IASL[b]	CA-IASL[c]
trans-1,3-dichloropropene		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	3.07	0.77
trichloroethene (TCE)		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	2.99	IASL
trichlorofluoromethane		1.9	1.5	1.2	1.3	1.2	3,100	IASL
vinyl chloride		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	2.79	0.16

Notes:

Qualifier definitions are presented in Appendix E.

Shaded cell indicates sample concentration exceeds IASL or CA-IASL.

All concentrations are presented in in micrograms per cubic meter.

[a] Duplicate sample.

[b] See Table 2 for details.

[c] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level
IASL Indoor air screening level

APPENDIX D-12 INDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4810)
(Page 1 of 3)

Analyte	Sample ID	N7-4810IA1	N7-4810IA2	N7-4810IA2[a]	N7-4810IA3	N7-4810IA4	IASL[b]	CA-IASL[c]
1,1,1,2-tetrachloroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	1.66	IASL
1,1,1-trichloroethane		0.40 (J a)	0.25 (J a)	0.24 (J a)	<1.1 (U)	<1.1 (U)	22,000	4,400
1,1,2,2-tetrachloroethane		<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	0.21	IASL
1,1,2-trichloroethane		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.77	IASL
1,1,2-trichlorotrifluoroethane		0.53 (J a)	0.52 (J a)	0.52 (J a)	0.53 (J a)	0.51 (J a)	130,000	IASL
1,1-dichloroethane		<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	7.66	IASL
1,1-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	880	IASL
1,2,4-trichlorobenzene		1.4 (J a)	<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	8.8	1.2
1,2,4-trimethylbenzene		2.9	2.0	1.2 (J a)	1.7 (J a)	0.18 (J a)	31	IASL
1,2-dichlorobenzene		0.39 (J a)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,2-dichloroethane		0.14 (J a)	<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.47	IASL
1,2-dichloropropane		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	1.23	IASL
1,2-dichlorotetrafluoroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	130,000	IASL
1,3,5-trimethylbenzene		2.9	0.55 (J a)	0.32 (J a)	0.48 (J a)	<2.0 (U)	153	IASL
1,3-butadiene		<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	0.41	0.07
1,3-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,4-dichlorobenzene		0.43 (J a)	<0.089 (U)	<0.089 (U)	<0.089 (U)	<0.089 (U)	1.11	IASL
2-butanone (MEK)		63	3.4	3.3	5.5	1.9	22,000	IASL
2-hexanone		6.0	<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	130	IASL
4-ethyltoluene		2.6	1.7	1.0	1.5	0.16 (J a)	440	IASL
4-methyl-2-pentanone (MIBK)		<0.82 (U)	<0.82 (U)	0.80 (J a)	<0.82 (U)	<0.82 (U)	13,000	IASL
acetone		<2.4 (U)	16	15	22	11	140,000	IASL
acrylonitrile		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	0.18	0.04
benzene		2.0 (J c)	1.2 (J+ 1c)	1.0 (J+ 1c)	1.1 (J+ 1c)	<0.091(UJ 1ca)	1.57	0.42
benzyl chloride		0.54 (J a)	<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.25	IASL
bromodichloromethane		<0.069 (U)	0.14 (J a)	<0.069 (U)	<0.069 (U)	<0.069 (U)	0.33	IASL
bromoform		<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	11.15	IASL
bromomethane		0.83	<0.78 (U)	<0.78 (U)	<0.78 (U)	<0.78 (U)	22	IASL
carbon disulfide		<3.1 (U)	19	3.2	6.3	29	3,100	IASL
carbon tetrachloride		0.43 (J a)	0.43 (J a)	0.46 (J a)	0.43 (J a)	0.38 (J a)	2.04	0.29
chlorobenzene		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	220	IASL

APPENDIX D-12 INDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4810)
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Analyte	Sample ID	N7-4810IA1	N7-4810IA2	N7-4810IA2[a]	N7-4810IA3	N7-4810IA4	IASL[b]	CA-IASL[c]
chloroethane		<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	44,000	IASL
chloroform		<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	0.53	IASL
chloromethane		<0.83 (U)	1.3	1.2	1.8	1.1	390	IASL
cis-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	150
cis-1,3-dichloropropene		<0.053 (U)	<0.053 (U)	<0.053 (U)	<0.053 (U)	<0.053 (U)	3.07	0.77
cyclohexane		1.5 (J a)	0.87 (J a)	0.52 (J a)	0.92 (J a)	<3.4 (U)	26,000	IASL
dibromochloromethane		<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	0.45	IASL
dichlorodifluoromethane		2.3	2.4	2.3	2.4	2.3	440	IASL
ethanol		1,800 (J c)	57 (J c)	56 (J c)	31 (J c)	16 (J c)	31,000	IASL
ethyl acetate		<3.6 (U)	0.67 (J a)	<3.6 (U)	<3.6 (U)	<3.6 (U)	31,000	IASL
ethylbenzene		2.4	1.3	0.85 (J a)	1.4	0.17 (J a)	4.9	IASL
ethylene dibromide (EDB)		2.2	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.02	IASL
hexachlorobutadiene		<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	0.56	IASL
isopropanol		<2.5 (U)	5.9	5.2	58	39	31,000	IASL
isopropylbenzene		0.25 (J a)	<0.98 (U)	<0.98 (U)	<0.98 (U)	<0.98 (U)	1,800	IASL
m- & p-xylene		11	5.2	3.3	5.5	0.66 (J a)	440	IASL
methyl tert-butyl ether (MTBE)		<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	47	IASL
methylene chloride		<0.28 (UJ ba)	<0.25 (UJ ba)	<0.17 (UJ ba)	<0.21 (UJ ba)	<0.69 (U)	1,200	12
naphthalene		1.1 (J a)	0.30 (J a)	0.19 (J a)	0.31 (J a)	0.14 (J a)	0.36	IASL
n-butylbenzene		0.90 (J a)	0.33 (J a)	0.53 (J a)	0.30 (J a)	<1.1 (U)	1,800	IASL
n-heptane		2.3 (J a)	1.3 (J a)	0.67 (J a)	1.2 (J a)	<4.1 (U)	3,100	IASL
n-hexane		3.4 (J a)	2.2 (J a)	1.5 (J a)	2.6 (J a)	0.47 (J a)	3,100	IASL
o-xylene		3.5	1.8	1.1	1.8	0.22 (J a)	440	IASL
p-isopropyltoluene		3.8	3.4	0.29 (J a)	1.1	0.24 (J a)	1,800	IASL
propene		<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	13,000	IASL
sec-butylbenzene		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	1,800	IASL
styrene		2.0	0.20 (J a)	0.12 (J a)	0.16 (J a)	<0.85 (U)	4,400	3,900
tetrachloroethene (PCE)		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	47.15	2.1
tetrahydrofuran		<2.9 (U)	2.3 (J a)	3.4	11	0.52 (J a)	8,800	IASL
toluene		10	5.9	3.5	5.9	1.0	22,000	1,300
trans-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	IASL

APPENDIX D-12 INDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4810)
(Page 3 of 3)

Analyte	Sample ID	N7-4810IA1	N7-4810IA2	N7-4810IA2[a]	N7-4810IA3	N7-4810IA4	IASL[b]	CA-IASL[c]
trans-1,3-dichloropropene		0.31 (J a)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	3.07	0.77
trichloroethene (TCE)		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	2.99	IASL
trichlorofluoromethane		1.3	1.4	1.3	1.4	1.2	3,100	IASL
vinyl chloride		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	2.79	0.16

Notes:

Qualifier definitions are presented in Appendix E.

Shaded cell indicates sample concentration exceeds IASL or CA-IASL.

All concentrations are presented in in micrograms per cubic meter.

[a] Duplicate sample.

[b] See Table 2 for details.

[c] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level
IASL Indoor air screening level

APPENDIX D-13 OUTDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806OA1	N3-4806OA1[a]	N3-4806OA2	N3-4806OA3	IASL[b]	CA-IASL[c]
1,1,1,2-tetrachloroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	1.66	IASL
1,1,1-trichloroethane		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	22,000	4,400
1,1,2,2-tetrachloroethane		<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	0.21	IASL
1,1,2-trichloroethane		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.77	IASL
1,1,2-trichlorotrifluoroethane		0.62 (J a)	0.63 (J a)	0.56 (J a)	0.63 (J a)	130,000	IASL
1,1-dichloroethane		<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	7.66	IASL
1,1-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	880	IASL
1,2,4-trichlorobenzene		<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	8.8	1.2
1,2,4-trimethylbenzene		0.17 (J a)	0.17 (J a)	0.26 (J a)	0.61 (J a)	31	IASL
1,2-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,2-dichloroethane		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.47	IASL
1,2-dichloropropane		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	1.23	IASL
1,2-dichlorotetrafluoroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	130,000	IASL
1,3,5-trimethylbenzene		<2.0 (U)	<2.0 (U)	<2.0 (U)	0.18 (J a)	153	IASL
1,3-butadiene		<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	0.41	0.07
1,3-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,4-dichlorobenzene		<0.089 (U)	<0.089 (U)	<0.089 (U)	<0.089 (U)	1.11	IASL
2-butanone (MEK)		2.6	2.2	2.7	4.0	22,000	IASL
2-hexanone		<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	130	IASL
4-ethyltoluene		0.15 (J a)	0.14 (J a)	0.21 (J a)	0.54 (J a)	440	IASL
4-methyl-2-pentanone (MIBK)		<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	13,000	IASL
acetone		15	14	15	12	140,000	IASL
acrylonitrile		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	0.18	0.04
benzene		0.43 (J a)	0.43 (J a)	0.48 (J a)	0.79	1.57	0.42
benzyl chloride		<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	0.25	IASL
bromodichloromethane		<0.069 (U)	<0.069 (U)	<0.069 (U)	<0.069 (U)	0.33	IASL
bromoform		<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	11.15	IASL
bromomethane		0.21 (J ca)	0.24 (J ca)	0.15 (J ca)	0.23 (J ca)	22	IASL
carbon disulfide		0.43 (J a)	0.41 (J a)	1.4 (J a)	2.2 (J a)	3,100	IASL
carbon tetrachloride		0.43 (J a)	0.44 (J a)	0.44 (J a)	0.46 (J a)	2.04	0.29
chlorobenzene		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	220	IASL

APPENDIX D-13 OUTDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806OA1	N3-4806OA1[a]	N3-4806OA2	N3-4806OA3	IASL[b]	CA-IASL[c]
chloroethane		<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	44,000	IASL
chloroform		<0.14 (U)	0.41 (J a)	<0.14 (U)	<0.14 (U)	0.53	IASL
chloromethane		1.5	1.4	1.4	1.4	390	IASL
cis-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	150
cis-1,3-dichloropropene		0.084 (J a)	<0.053 (U)	<0.053 (U)	<0.053 (U)	3.07	0.77
cyclohexane		0.15 (J a)	0.15 (J a)	0.21 (J a)	0.38 (J a)	26,000	IASL
dibromochloromethane		<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	0.45	IASL
dichlorodifluoromethane		2.5	2.6	2.6	2.8	440	IASL
ethanol		6.1	6.5	7.6	12	31,000	IASL
ethyl acetate		<3.6 (U)	<3.6 (U)	<3.6 (U)	<3.6 (U)	31,000	IASL
ethylbenzene		0.17 (J a)	0.17 (J a)	0.21 (J a)	0.46 (J a)	4.9	IASL
ethylene dibromide (EDB)		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.02	IASL
hexachlorobutadiene		<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	0.56	IASL
isopropanol		1.5 (J a)	0.84 (J a)	1.1 (J a)	1.3 (J a)	31,000	IASL
isopropylbenzene		<0.98 (U)	<0.98 (U)	<0.98 (U)	<0.98 (U)	1,800	IASL
m- & p-xylene		0.43 (J a)	0.42 (J a)	0.63 (J a)	1.6	440	IASL
methyl tert-butyl ether (MTBE)		<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	47	IASL
methylene chloride		<0.36 (UJ ba)	<0.40 (UJ ba)	<0.38 (UJ ba)	<0.40 (UJ ba)	1,200	12
naphthalene		<0.095 (U)	<0.095 (U)	<0.095 (U)	<0.095 (U)	0.36	IASL
n-butylbenzene		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	1,800	IASL
n-heptane		0.20 (J a)	0.19 (J a)	0.25 (J a)	0.62 (J a)	3,100	IASL
n-hexane		0.37 (J a)	0.36 (J a)	0.51 (J a)	1.2 (J a)	3,100	IASL
o-xylene		0.19 (J a)	0.18 (J a)	0.27 (J a)	0.62 (J a)	440	IASL
p-isopropyltoluene		0.43 (J a)	<1.1 (U)	1.3	<1.1 (U)	1,800	IASL
propene		<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	13,000	IASL
sec-butylbenzene		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	1,800	IASL
styrene		0.16 (J a)	<0.85 (U)	0.16 (J a)	0.16 (J a)	4,400	3,900
tetrachloroethene (PCE)		<1.4 (U)	0.93 (J a)	<1.4 (U)	<1.4 (U)	47.15	2.1
tetrahydrofuran		0.27 (J a)	0.21 (J a)	0.18 (J a)	0.41 (J a)	8,800	IASL
toluene		1.1	1.1	1.6	2.4	22,000	1,300
trans-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	IASL

APPENDIX D-13 OUTDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4806)
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Analyte	Sample ID	N3-4806OA1	N3-4806OA1[a]	N3-4806OA2	N3-4806OA3	IASL[b]	CA-IASL[c]
trans-1,3-dichloropropene		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	3.07	0.77
trichloroethene (TCE)		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	2.99	IASL
trichlorofluoromethane		1.2	1.3	1.2	1.3	3,100	IASL
vinyl chloride		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	2.79	0.16

Notes:

Qualifier definitions are presented in Appendix E.

Shaded cell indicates sample concentration exceeds IASL or CA-IASL.

All concentrations are presented in in micrograms per cubic meter.

[a] Duplicate sample.

[b] See Table 2 for details.

[c] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level
IASL Indoor air screening level

APPENDIX D-14 OUTDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4806)
(Page 1 of 3)

Analyte	Sample ID	N3-4806OA1	N3-4806OA1[a]	N3-4806OA2	N3-4806OA3	IASL[b]	CA-IASL[c]
1,1,1,2-tetrachloroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	1.66	IASL
1,1,1-trichloroethane		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	22,000	4,400
1,1,2,2-tetrachloroethane		<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	0.21	IASL
1,1,2-trichloroethane		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.77	IASL
1,1,2-trichlorotrifluoroethane		0.51 (J a)	0.57 (J a)	0.53 (J a)	0.53 (J a)	130,000	IASL
1,1-dichloroethane		<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	7.66	IASL
1,1-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	880	IASL
1,2,4-trichlorobenzene		<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	8.8	1.2
1,2,4-trimethylbenzene		0.37 (J a)	0.72 (J a)	0.21 (J a)	0.35 (J a)	31	IASL
1,2-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,2-dichloroethane		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.47	IASL
1,2-dichloropropane		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	1.23	IASL
1,2-dichlorotetrafluoroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	130,000	IASL
1,3,5-trimethylbenzene		<2.0 (U)	0.36 (J a)	<2.0 (U)	<2.0 (U)	153	IASL
1,3-butadiene		<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	0.41	0.07
1,3-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,4-dichlorobenzene		<0.089 (U)	<0.089 (U)	<0.089 (U)	<0.089 (U)	1.11	IASL
2-butanone (MEK)		3.5	8.3	4.6	3.2	22,000	IASL
2-hexanone		<0.82 (U)	1.7	<0.82 (U)	<0.82 (U)	130	IASL
4-ethyltoluene		0.19 (J a)	0.24 (J a)	0.15 (J a)	0.29 (J a)	440	IASL
4-methyl-2-pentanone (MIBK)		<0.82 (U)	0.89	<0.82 (U)	<0.82 (U)	13,000	IASL
acetone		13	20	8.5	10	140,000	IASL
acrylonitrile		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	0.18	0.04
benzene		<0.091 (UJ 1ca)	<0.091 (UJ 1ca)	0.80 (J+ 1c)	0.95 (J+ 1c)	1.57	0.42
benzyl chloride		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.25	IASL
bromodichloromethane		<0.069 (U)	<0.069 (U)	<0.069 (U)	<0.069 (U)	0.33	IASL
bromoform		<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	11.15	IASL
bromomethane		<0.78 (U)	<0.78 (U)	<0.78 (U)	<0.78 (U)	22	IASL
carbon disulfide		3.4	2.3 (J a)	2.4 (J a)	3.1	3,100	IASL
carbon tetrachloride		0.41 (J a)	0.44 (J a)	0.40 (J a)	0.43 (J a)	2.04	0.29
chlorobenzene		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	220	IASL

APPENDIX D-14 OUTDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806OA1	N3-4806OA1[a]	N3-4806OA2	N3-4806OA3	IASL[b]	CA-IASL[c]
chloroethane		<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	44,000	IASL
chloroform		<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	0.53	IASL
chloromethane		1.3	1.2	1.2	1.3	390	IASL
cis-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	150
cis-1,3-dichloropropene		<0.053 (U)	<0.053 (U)	<0.053 (U)	<0.053 (U)	3.07	0.77
cyclohexane		<3.4 (U)	<3.4 (U)	<3.4 (U)	<3.4 (U)	26,000	IASL
dibromochloromethane		<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	0.45	IASL
dichlorodifluoromethane		2.3	2.4	2.4	2.4	440	IASL
ethanol		6.4 (J c)	9.4 (J c)	5.4 (J c)	6.6 (J c)	31,000	IASL
ethyl acetate		<3.6 (U)	<3.6 (U)	<3.6 (U)	<3.6 (U)	31,000	IASL
ethylbenzene		<0.87 (U)	0.13 (J a)	<0.87 (U)	0.23 (J a)	4.9	IASL
ethylene dibromide (EDB)		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.02	IASL
hexachlorobutadiene		<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	0.56	IASL
isopropanol		2.8	5.1	1.4 (J a)	0.94 (J a)	31,000	IASL
isopropylbenzene		<0.98 (U)	<0.98 (U)	<0.98 (U)	<0.98 (U)	1,800	IASL
m- & p-xylene		0.47 (J a)	0.47 (J a)	0.47 (J a)	0.97	440	IASL
methyl tert-butyl ether (MTBE)		<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	47	IASL
methylene chloride		<0.69 (U)	<0.19 (UJ ba)	<0.69 (U)	<0.16 (UJ ba)	1,200	12
naphthalene		0.18 (J a)	0.23 (J a)	0.81 (J a)	0.30 (J a)	0.36	IASL
n-butylbenzene		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	1,800	IASL
n-heptane		<4.1 (U)	<4.1 (U)	<4.1 (U)	0.24 (J a)	3,100	IASL
n-hexane		0.58 (J a)	0.56 (J a)	2.8 (J a)	0.98 (J a)	3,100	IASL
o-xylene		0.15 (J a)	0.18 (J a)	0.14 (J a)	0.30 (J a)	440	IASL
p-isopropyltoluene		0.76 (J a)	0.67 (J a)	0.46 (J a)	1.1	1,800	IASL
propene		<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	13,000	IASL
sec-butylbenzene		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	1,800	IASL
styrene		0.12 (J a)	<0.85 (U)	<0.85 (U)	0.14 (J a)	4,400	3,900
tetrachloroethene (PCE)		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	47.15	2.1
tetrahydrofuran		<2.9 (U)	0.17 (J a)	<2.9 (U)	0.12 (J a)	8,800	IASL
toluene		0.75	0.69 (J a)	0.76	1.4	22,000	1,300
trans-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	IASL

APPENDIX D-14 OUTDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806OA1	N3-4806OA1[a]	N3-4806OA2	N3-4806OA3	IASL[b]	CA-IASL[c]
trans-1,3-dichloropropene		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	3.07	0.77
trichloroethene (TCE)		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	2.99	IASL
trichlorofluoromethane		1.2	1.2	1.2	1.2	3,100	IASL
vinyl chloride		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	2.79	0.16

Notes:

Qualifier definitions are presented in Appendix E.

Shaded cell indicates sample concentration exceeds IASL or CA-IASL.

All concentrations are presented in in micrograms per cubic meter.

[a] Duplicate sample.

[b] See Table 2 for details.

[c] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level
IASL Indoor air screening level

APPENDIX D-15 OUTDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4810)

Analyte	Sample ID	N7-4810OA1	N7-4810OA2	N7-4810OA3	N7-4810OA3[a]	IASL[b]	CA-IASL[c]
1,1,1,2-tetrachloroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	1.66	IASL
1,1,1-trichloroethane		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	22,000	4,400
1,1,2,2-tetrachloroethane		<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	0.21	IASL
1,1,2-trichloroethane		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.77	IASL
1,1,2-trichlorotrifluoroethane		0.52 (J a)	0.53 (J a)	0.54 (J a)	0.59 (J a)	130,000	IASL
1,1-dichloroethane		<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	7.66	IASL
1,1-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	880	IASL
1,2,4-trichlorobenzene		<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	8.8	1.2
1,2,4-trimethylbenzene		0.41 (J a)	0.13 (J a)	0.11 (J a)	<2.0 (U)	31	IASL
1,2-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,2-dichloroethane		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.47	IASL
1,2-dichloropropane		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	1.23	IASL
1,2-dichlorotetrafluoroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	130,000	IASL
1,3,5-trimethylbenzene		<2.0 (U)	<2.0 (U)	<2.0 (U)	<2.0 (U)	153	IASL
1,3-butadiene		<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	0.41	0.07
1,3-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,4-dichlorobenzene		<0.089 (U)	<0.089 (U)	<0.089 (U)	<0.089 (U)	1.11	IASL
2-butanone (MEK)		3.4	3.1	4.6	5.4	22,000	IASL
2-hexanone		<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	130	IASL
4-ethyltoluene		0.30 (J a)	<0.98 (U)	<0.98 (U)	0.14 (J a)	440	IASL
4-methyl-2-pentanone (MIBK)		<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	13,000	IASL
acetone		6.5	8.8	9.4	10	140,000	IASL
acrylonitrile		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	0.18	0.04
benzene		0.52 (J a)	0.48 (J a)	0.44 (J a)	0.38 (J a)	1.57	0.42
benzyl chloride		<0.11 (UJ- cf)	<0.11 (UJ- cf)	<0.11 (UJ- cf)	<0.11 (UJ- cf)	0.25	IASL
bromodichloromethane		<0.069 (U)	<0.069 (U)	<0.069 (U)	<0.069 (U)	0.33	IASL
bromoform		<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	11.15	IASL
bromomethane		<0.78 (UJ c)	0.21 (J ca)	0.15 (J ca)	0.15 (J ca)	22	IASL
carbon disulfide		3.6	2.8 (J a)	2.7 (J a)	7.4	3,100	IASL
carbon tetrachloride		0.42 (J a)	0.46 (J a)	0.43 (J a)	0.44 (J a)	2.04	0.29
chlorobenzene		<0.92 (U)	<0.92 (U)	0.12 (J a)	<0.92 (U)	220	IASL

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(BUILDING 4810)

Analyte	Sample ID	N7-4810OA1	N7-4810OA2	N7-4810OA3	N7-4810OA3[a]	IASL[b]	CA-IASL[c]
chloroethane		<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	44,000	IASL
chloroform		<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	0.53	IASL
chloromethane		1.4	1.4	1.3	1.4	390	IASL
cis-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	150
cis-1,3-dichloropropene		<0.053 (U)	<0.053 (U)	0.089 (J a)	0.53 (J a)	3.07	0.77
cyclohexane		0.17 (J a)	<3.4 (U)	<3.4 (U)	<3.4 (U)	26,000	IASL
dibromochloromethane		<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	0.45	IASL
dichlorodifluoromethane		2.6	2.6	2.6	2.5	440	IASL
ethanol		13	2.7	66	8.6	31,000	IASL
ethyl acetate		<3.6 (U)	<3.6 (U)	<3.6 (U)	<3.6 (U)	31,000	IASL
ethylbenzene		0.25 (J a)	0.23 (J a)	0.23 (J a)	0.21 (J a)	4.9	IASL
ethylene dibromide (EDB)		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.02	IASL
hexachlorobutadiene		<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	0.56	IASL
isopropanol		1.5 (J a)	<2.5 (U)	5.9	4.4	31,000	IASL
isopropylbenzene		<0.98 (U)	<0.98 (U)	<0.98 (U)	<0.98 (U)	1,800	IASL
m- & p-xylene		0.77 (J a)	0.53 (J a)	0.62 (J a)	0.49 (J a)	440	IASL
methyl tert-butyl ether (MTBE)		<0.72 (U)	<0.72 (U)	<0.72 (U)	0.53 (J a)	47	IASL
methylene chloride		<0.30 (UJ ba)	<0.31 (UJ ba)	<0.46 (UJ ba)	<0.30 (UJ ba)	1,200	12
naphthalene		<0.095 (U)	<0.095 (U)	<0.095 (U)	0.50 (J a)	0.36	IASL
n-butylbenzene		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	1,800	IASL
n-heptane		0.28 (J a)	<4.1 (U)	0.22 (J a)	<4.1 (U)	3,100	IASL
n-hexane		0.49 (J a)	0.22 (J a)	0.19 (J a)	<3.5 (U)	3,100	IASL
o-xylene		0.28 (J a)	0.19 (J a)	0.20 (J a)	0.16 (J a)	440	IASL
p-isopropyltoluene		0.78 (J a)	1.3	3.5	9.9	1,800	IASL
propene		<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	13,000	IASL
sec-butylbenzene		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	1,800	IASL
styrene		0.23 (J a)	<0.85 (U)	0.11 (J a)	0.28 (J a)	4,400	3,900
tetrachloroethene (PCE)		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	47.15	2.1
tetrahydrofuran		<2.9 (U)	0.18 (J a)	0.91 (J a)	1.9 (J a)	8,800	IASL
toluene		1.3	0.71 (J a)	1.3	0.70 (J a)	22,000	1,300
trans-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	IASL

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(BUILDING 4810)
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Analyte	Sample ID	N7-4810OA1	N7-4810OA2	N7-4810OA3	N7-4810OA3[a]	IASL[b]	CA-IASL[c]
trans-1,3-dichloropropene		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	3.07	0.77
trichloroethene (TCE)		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	2.99	IASL
trichlorofluoromethane		1.2	1.2	1.2	1.2	3,100	IASL
vinyl chloride		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	2.79	0.16

Notes:

Qualifier definitions are presented in Appendix E.

Shaded cell indicates sample concentration exceeds IASL or CA-IASL.

All concentrations are presented in in micrograms per cubic meter.

[a] Duplicate sample.

[b] See Table 2 for details.

[c] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level
IASL Indoor air screening level

APPENDIX D-16 OUTDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4810)
(Page 1 of 3)

Analyte	Sample ID	N7-4810OA1	N7-4810OA1[a]	N7-4810OA2	N7-4810OA3	IASL[b]	CA-IASL[c]
1,1,1,2-tetrachloroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	1.66	IASL
1,1,1-trichloroethane		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	22,000	4,400
1,1,2,2-tetrachloroethane		<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	0.21	IASL
1,1,2-trichloroethane		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.77	IASL
1,1,2-trichlorotrifluoroethane		0.53 (J a)	0.56 (J a)	0.56 (J a)	0.59 (J a)	130,000	IASL
1,1-dichloroethane		<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	7.66	IASL
1,1-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	880	IASL
1,2,4-trichlorobenzene		<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	8.8	1.2
1,2,4-trimethylbenzene		0.53 (J a)	0.48 (J a)	0.38 (J a)	0.22 (J a)	31	IASL
1,2-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,2-dichloroethane		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.47	IASL
1,2-dichloropropane		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	1.23	IASL
1,2-dichlorotetrafluoroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	130,000	IASL
1,3,5-trimethylbenzene		0.15 (J a)	<2.0 (U)	0.15 (J a)	<2.0 (U)	153	IASL
1,3-butadiene		<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	0.41	0.07
1,3-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,4-dichlorobenzene		<0.089 (U)	<0.089 (U)	<0.089 (U)	<0.089 (U)	1.11	IASL
2-butanone (MEK)		2.5	1.7	2.5	2.5	22,000	IASL
2-hexanone		1.1	<0.82 (U)	<0.82 (U)	<0.82 (U)	130	IASL
4-ethyltoluene		0.37 (J a)	0.35 (J a)	0.30 (J a)	0.17 (J a)	440	IASL
4-methyl-2-pentanone (MIBK)		<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	13,000	IASL
acetone		11	11	8.9	8.1	140,000	IASL
acrylonitrile		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	0.18	0.04
benzene		<0.091 (UJ 1ca)	<0.091 (UJ 1ca)	1.7 (J c)	<0.091 (UJ 1ca)	1.57	0.42
benzyl chloride		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.25	IASL
bromodichloromethane		<0.069 (U)	<0.069 (U)	<0.069 (U)	<0.069 (U)	0.33	IASL
bromoform		<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	11.15	IASL
bromomethane		<0.78 (U)	<0.78 (U)	<0.78 (U)	<0.78 (U)	22	IASL
carbon disulfide		1.3 (J a)	1.8 (J a)	2.1 (J a)	7.2	3,100	IASL
carbon tetrachloride		0.41 (J a)	0.44 (J a)	0.40 (J a)	0.46 (J a)	2.04	0.29
chlorobenzene		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	220	IASL

APPENDIX D-16 OUTDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4810)

Analyte	Sample ID	N7-4810OA1	N7-4810OA1[a]	N7-4810OA2	N7-4810OA3	IASL[b]	CA-IASL[c]
chloroethane		<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	44,000	IASL
chloroform		<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	0.53	IASL
chloromethane		1.2	1.2	1.1	1.1	390	IASL
cis-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	150
cis-1,3-dichloropropene		<0.053 (U)	<0.053 (U)	<0.053 (U)	<0.053 (U)	3.07	0.77
cyclohexane		<3.4 (U)	<3.4 (U)	0.24 (J a)	<3.4 (U)	26,000	IASL
dibromochloromethane		<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	0.45	IASL
dichlorodifluoromethane		2.4	2.4	2.4	2.5	440	IASL
ethanol		7.7 (J c)	8.3 (J c)	4.6 (J c)	5.8 (J c)	31,000	IASL
ethyl acetate		<3.6 (U)	<3.6 (U)	<3.6 (U)	<3.6 (U)	31,000	IASL
ethylbenzene		0.21 (J a)	0.22 (J a)	0.27 (J a)	0.20 (J a)	4.9	IASL
ethylene dibromide (EDB)		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.02	IASL
hexachlorobutadiene		<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	0.56	IASL
isopropanol		11	14	<2.5 (U)	<2.5 (U)	31,000	IASL
isopropylbenzene		<0.98 (U)	<0.98 (U)	<0.98 (U)	<0.98 (U)	1,800	IASL
m- & p-xylene		0.94	0.97	1.5	0.62 (J a)	440	IASL
methyl tert-butyl ether (MTBE)		<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	47	IASL
methylene chloride		<0.19 (UJ ba)	<0.69 (U)	<0.69 (U)	<0.69 (U)	1,200	12
naphthalene		0.16 (J a)	0.17 (J a)	0.25 (J a)	0.23 (J a)	0.36	IASL
n-butylbenzene		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	1,800	IASL
n-heptane		<4.1 (U)	0.28 (J a)	0.39 (J a)	<4.1 (U)	3,100	IASL
n-hexane		2.0 (J a)	1.8 (J a)	0.63 (J a)	0.56 (J a)	3,100	IASL
o-xylene		0.34 (J a)	0.37 (J a)	0.44 (J a)	0.21 (J a)	440	IASL
p-isopropyltoluene		1.3	0.55 (J a)	0.48 (J a)	1.1	1,800	IASL
propene		<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	13,000	IASL
sec-butylbenzene		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	1,800	IASL
styrene		<0.85 (U)	<0.85 (U)	0.17 (J a)	<0.85 (U)	4,400	3,900
tetrachloroethene (PCE)		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	47.15	2.1
tetrahydrofuran		<2.9 (U)	0.17 (J a)	<2.9 (U)	<2.9 (U)	8,800	IASL
toluene		1.1	1.3	2.4	1.2	22,000	1,300
trans-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	IASL

APPENDIX D-16 OUTDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4810)

Analyte	Sample ID	N7-4810OA1	N7-4810OA1[a]	N7-4810OA2	N7-4810OA3	IASL[b]	CA-IASL[c]
trans-1,3-dichloropropene		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	3.07	0.77
trichloroethene (TCE)		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	2.99	IASL
trichlorofluoromethane		1.3	1.3	1.2	1.2	3,100	IASL
vinyl chloride		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	2.79	0.16

Notes:

Qualifier definitions are presented in Appendix E.

Shaded cell indicates sample concentration exceeds IASL or CA-IASL.

All concentrations are presented in in micrograms per cubic meter.

[a] Duplicate sample.

[b] See Table 2 for details.

[c] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level
IASL Indoor air screening level

APPENDIX E

QUALITY ASSURANCE SUMMARY REPORT

APPENDIX E
QUALITY ASSURANCE SUMMARY REPORT

E.1 INTRODUCTION

This quality assurance summary report (QASR) was prepared for the March and August 2013 sub-slab vapor and indoor/outdoor ambient air samples at Buildings 4806 and 4807 at Site N3 and Building 4810 at Site N7 Operable Unit 6 (OU 6), Edwards Air Force Base (AFB), California. The Building 4806, 4807, and 4810 sampling events include sub-slab vapor and indoor/outdoor ambient air samples collected on 5, 6, and 7 March 2013 and 21, 22, and 23 August 2013. This QASR discusses the quality and usability of the definitive-level analytical data for the soil gas and ambient air samples collected during these sampling events.

The data for the soil gas and ambient air samples for this sampling event were reported as definitive-level data. The results indicate the overall high quality of the definitive-level data collected for this project. The completeness goal of 95 percent (%) for analytical results was achieved.

Data review and validation were performed on the entire definitive-level data set. None of the definitive-level data) were qualified as rejected, and approximately 8.2% were qualified as estimated for exceeding quality assurance objectives specified in the *Edwards AFB Base-wide Generic Uniform Federal Policy Quality Assurance Project Plan* (hereinafter referred to as the Edwards AFB Base-wide G-QAPP) (AECOM Technical Services, Inc. [AECOM], 2012a) for precision, accuracy, representativeness, comparability, and completeness (PARCC), as referenced in the *Vapor Intrusion Sampling Plan and Risk Assessment Work Plan, National Aeronautics and Space Administration, Dryden Flight Research Center, Operable Unit 6, Edwards Air Force Base, California*, (AECOM, 2013). For the 8.2% of the definitive-level data qualified for exceeding PARCC criteria, 3.4% were qualified due to the exceedance of laboratory accuracy and precision criteria, and 4.8% were due to field or matrix-related issues. The remaining definitive-level data met the PARCC criteria.

Definitive-level laboratory analyses were performed by Air Technology Laboratories, Inc. of the City of Industry, California (ATL) according to Environmental Protection Agency (EPA) Method TO-15 (TO-15-U) for volatile organic compounds (VOCs) in soil gas samples, with the American Society for Testing and Materials (ASTM) Method D1946 for helium for leak detection testing in soil gas samples,

and by proprietary modification of EPA Method TO-15 (TO-15-LL-U) with selective ion monitoring (SIM) for VOCs in ambient air samples. The analyses were performed as definitive-level laboratory analyses according to the methods and requirements specified in the Edwards AFB Base-wide G-QAPP. The testing methods used, parameters and analytes reported, and reporting limits (RLs) required are listed in Table 15-1 and Appendix D-4 of the G-QAPP.

The definitive-level analytical data provided by ATL were reported in Air Force Civil Engineer Center (AFCEC) Level I (EPA Level 3) format. This included the case narratives, completed chain-of-custody (COC) documentation, laboratory analysis results reporting forms, and quality control (QC) summary forms. Supplemental definitive-level analytical data were provided by ATL for each sample and QC sample and for the evaluation of calibrations and internal standards in AFCEC Level II (EPA Level 4) format, which included the raw data generated in addition to the information provided under AFCEC Level I format. Raw data consists of sample preparation sheets, instrument run logs, calibration data, chromatograms, mass spectra, calculation sheets, and instrument generated quantitation reports and printouts.

E.2 DATA VALIDATION

The definitive-level analytical data were validated according to the quality assurance (QA) requirements and control limits specified in the Edwards AFB Base-wide G-QAPP. The validation was performed utilizing guidelines and procedures outlined in the *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review* (EPA/540/R-08/01, June 2008) and data validation procedures utilized by the Quality Assurance Section of EPA Region 9. The reviewer's professional judgment was used to evaluate data quality when called for in the Functional Guidelines and in instances with no clear policy or conflicting guidance on how the data should be qualified. The data validation process was performed by the AECOM project chemist in Oakland, California.

Data validation is a systematic and independent process of reviewing and qualifying the definitive-level analytical data against an established set of criteria. Validation is performed to ensure the quality of the definitive-level data and to assess limitations on usability based on the PARCC parameters defined in the Edwards AFB Basewide G-QAPP, as well as to evaluate laboratory compliance with specified

methods and protocols. The following documentation and QC parameters were evaluated, as appropriate for each method.

- Case Narrative
- Data Summary Sheets
- Sample Custody
- Holding Times
- Initial and Continuing Calibrations
- Instrument Tunes
- Method Blanks
- Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD) Recoveries and Relative Percent Differences (RPDs)
- Laboratory Duplicate Sample RPDs
- Surrogate Recoveries for System Monitoring Compounds
- Internal Standards
- Target Compound Identification and Quantitation
- Method Detection Limits (MDL) and RLs
- Instrument Run Logs
- Sample Preparation Sheets
- Field Duplicate RPDs

Qualifiers were assigned by the reviewer to all definitive-level data that failed to meet specified analytical and QC criteria. No data were qualified with the "R" qualifier as rejected and considered unusable. Data qualified with the "J" qualifier are considered estimated and usable for decision-making purposes. "J+" indicates the possibility that the result may be biased high, and that the actual chemical concentration may be lower than the reported result. "J-" indicates the possibility that the result may be biased low, and that the actual chemical concentration may be higher than the reported result or detection limit reported for a non-detected (ND) result. All ND results are qualified with the "U" qualifier. The "U" qualifier is included before the "J" qualifier where applicable. Additional codes indicate the reason for data qualification. A list of these qualifiers and their descriptions is provided in Section E.5.

E.2.1 CHAIN-OF-CUSTODY

The quality of the analytical data collected is highly dependent on the integrity of the samples from site collection to laboratory receipt and eventual analysis. The COC records are an integral link in the legal documentation intended to ensure this integrity. Review of the completed COC records includes all

entries for custody signatures and dates, sample description, sample collection times and dates, sample container types and preservatives, analyses requested, and condition of the sample containers upon receipt at the laboratory.

The sample coolers and containers used in this project were received sealed and intact by the project laboratories. All of the samples were collected in appropriate containers. The COC records were properly signed and dated.

E.2.2 CASE NARRATIVE

The case narratives included with the data packages for all of the sample delivery groups provide a summary and additional information on method, matrix, and QA problems encountered during the analytical process.

E.2.3 HOLDING TIMES

Technical holding times are the maximum allowable times between sample collection and sample preparation or extraction (if applicable) and analysis, and include sample preservation requirements. Technical holding time criteria are derived from requirements specified for the analytical methods used and are specified in Table 19-1 of the Edwards AFB Base-wide G-QAPP.

Holding times are evaluated by comparing the sample collection dates and sample preservation information on the COC records with the sample preparation, extraction, and analysis dates and information shown on the laboratory summary reports, extraction logs, or analysis run logs. When holding time criteria are exceeded, all detected results are estimated and qualified as "J3." If sample integrity and temperature are maintained and the holding time is not grossly exceeded (exceeded by more than two times), ND results for stable analytes are qualified as "J3." If the holding time is grossly exceeded, ND results for stable, unstable, or volatile analytes such as VOCs by EPA Method TO-15 may be rejected and qualified as "R2."

None of the definitive-level data were qualified as estimated or rejected for holding time-related problems.

E.2.4 INSTRUMENT PERFORMANCE CRITERIA

In order to ensure the validity of data generated, several analytical methods specify instrument performance criteria that must be met before sample analysis can proceed. These methods include the gas chromatography/mass spectrometry (GC/MS) analyses of VOCs by EPA Methods TO-15-U and TO-15-LL-U.

The GC/MS performance checks are performed to ensure acceptable mass resolution, correct identification and relative abundance of ions, and acceptable instrument sensitivity, as specified in Worksheet 28 of the Edwards AFB Base-wide G-QAPP. For each analytical method, conformance is demonstrated by analyzing a standard material and meeting specified criteria. Failure to meet the GC/MS instrument performance criteria results in the qualification of the data as either estimated "Jc" or rejected and considered unusable and flagged as "R3" depending on the severity of the problem.

Conformance with the instrument performance criteria is verified by reviewing the appropriate QA summary forms and raw data when available. There were no definitive-level data qualified as either estimated or rejected due to GC/MS instrument performance results.

E.2.5 CALIBRATION

Calibration criteria ensure that the analytical instruments are capable of producing accurate and reproducible data. The Edwards AFB Base-wide G-QAPP specifies the calibration procedures that must be followed, the calibration frequency requirements, and the acceptance criteria that must be met to demonstrate satisfactory conformance based on requirements in the methods and other guidance documents. Worksheet 28 of the Edwards AFB Base-wide G-QAPP summarizes the calibration procedures and criteria used by the laboratories.

For both organic and inorganic analyses, the initial calibration demonstrates that the system is capable of producing acceptable data at the beginning of the analytical sequence utilizing linear response with an acceptable correlation coefficient (r) for the calibration curve. For GC/MS analyses, review of the initial calibration also includes evaluation of the relative response factor (RRF), % relative standard deviation (% RSD) of the RRFs, and retention times for each analyte in the target list.

When the initial calibration (ICAL) correlation coefficient (r) or the % RSD is not within control limits for an analyte or compound, or if the RRF does not meet the minimum criterion of 0.05, associated results are estimated and qualified as "Jc." If the correlation coefficient or the % RSD is grossly outside of control limits (r less than 0.980 or RSD greater than two times the control limit), or if the RRF does not meet the minimum criterion of 0.01, associated ND results are rejected and qualified as "R3" unless each result can be demonstrated to fall within an acceptable portion of the calibration curve for detected results, or unless the response can be demonstrated to be adequate at the limit of detection for ND results. Such results and detected results associated with initial calibrations grossly outside control limits are estimated and qualified as "Jc."

Initial calibration verification (ICV) samples for inorganic methods and continuing calibration verification (CCV) standards for all methods are performed by analyzing standards of known concentration at the frequency specified for each analytical method used. Acceptable recoveries of the ICVs and CCVs indicate conformance with the analytical requirements. For GC/MS analyses, continuing calibration review includes the evaluation of the RRF and the % difference (% D) between the RRF of the continuing calibration standard and the average RRF of the initial calibration curve, or the % drift (also referred to as % D) between the true and reported concentrations of the CCV. Results associated with ICVs or CCVs outside of specified control limits are estimated and qualified as "Jc" if detected or not grossly outside of QC limits, or rejected and qualified as "R3" if ND and grossly outside of QC limits, according to EPA guidelines.

Approximately 3.0% of the definitive-level data were qualified as estimated and none of the definitive-level data were qualified as rejected due to exceeded calibration criteria. The results for benzyl chloride and bromomethane in all 15 soil gas samples and all 23 ambient air samples for the March 2013 sampling event and for benzene and ethanol in all 15 soil gas samples and all 23 ambient air samples for the August 2013 sampling event were qualified as estimated (Jc/UJc) due to high RSDs in the associated initial calibrations. The 31.0 to 36.6% RSDs were not significantly higher than the 30% RSD control limit, and the effect on data quality is not considered to be significant.

E.2.6 FIELD AND LABORATORY BLANKS

Contamination may occur in various stages of the sample collection and laboratory analytical processes, which can affect the validity of the data collected. The results from the analyses of field and laboratory blanks indicate the presence and magnitude of the contamination. The QC requirements and the frequency of collection are specified in the field sampling plan for this project, and are summarized in Worksheet 28 of the Edwards AFB Basewide G-QAPP.

Equipment blanks are used to evaluate the cleanliness of the sampling devices used and reflect the efficiency of the decontamination procedures employed in the field. They are prepared by collecting analyte-free gas passed through the sampling device into an appropriate sample container. Equipment blanks are used for reusable sampling equipment. Equipment blanks were not used for these sampling events, as equipment blanks are used for reusable sampling equipment, and all samples were collected using dedicated or disposable equipment.

Trip blanks are used to evaluate sample VOC contamination that may occur while the samples are in transit from the sampling site to the laboratory. They are prepared in the laboratory and are shipped to the sampling site where they remain unopened. Trip blanks accompany all samples for volatile analyses in the sample coolers in the field, and remain with those samples until returned to the laboratory with each shipment of samples requiring volatile analyses. Trip blanks were not used for these sampling events, as trip blanks are not applicable to samples collected in SUMMA® canisters.

Blanks used to evaluate laboratory contamination consisted of method and calibration (laboratory) blanks. One method blank is extracted and analyzed with each analytical batch of 20 samples or less. Laboratory blanks are analyte-free solutions used to evaluate the cleanliness of the analytical instruments during the analytical runs. Method and calibration blanks are analyzed with each analytical sequence according to frequency requirements specified in Worksheet 28 of the Edwards AFB Base-wide G-QAPP for the analytical method used.

Whenever blank contamination is detected, the analytical data for the associated samples are evaluated to determine if data needs to be qualified. Sample results less than 5 times (10 times for organic common laboratory contaminants) the maximum level found in the associated blanks are qualified according to the blank qualification rules.

Blank-qualified results are considered to be ND at the reported concentration, or at the RL for organic compounds reported at less than the RL; therefore, the "U" qualifier is included with the "J" qualifier according to the blank qualification rules. Results qualified for laboratory blank contamination are estimated and qualified as "UJ1." If, in the data reviewer's professional judgment, a result for a laboratory contaminant reported at less than 5 times (10 times for common laboratory contaminants) the maximum level found in the associated blank is judged to be actually representative of the concentration of that compound in the sample, the result may be blank-qualified as "J+1" without the "U" qualifier to indicate potential high bias.

Approximately 0.7% of the definitive-level data were qualified due to blank contamination. The trace results (results detected below the RL) for benzene in 6 ambient air samples for the August 2013 sampling event and for carbon disulfide in all 15 soil gas samples and 1 ambient air sample for the March 2013 sampling event were blank-qualified "UJ1a" due to laboratory blank contamination. These results should be considered ND at the reported concentrations.

The low concentration results less than 3 times the RL for benzene in 14 ambient air samples from the August 2013 sampling event were qualified "J+1", as the results were above the RL and the blank concentrations were approximately one-half the RL or less. These results should be considered as potentially biased high due to laboratory contamination.

In addition, the trace results for the common laboratory contaminant methylene chloride in 18 ambient air samples and 2 soil gas samples from the March 2013 sampling event, and in 12 ambient air samples and 12 soil gas samples from the August 2013 sampling event were blank-qualified "UJba" as common laboratory contamination. These results should be considered ND at the reported concentrations.

In addition, the low concentration results less than 2 times the RL for methylene chloride in 2 ambient air samples from the March 2013 sampling event and in 3 soil gas samples from the August 2013 sampling event were blank-qualified "J+b" as potentially biased high due to common laboratory contamination. Note that the result for methylene chloride in sample N3-4806-SS02-VS2 is qualified "J" with no bias, as there is positive bias associated with potential laboratory contamination as well as low bias due to potential leakage in the sub-slab collection (refer to Section E.2.16).

All blank detections were at very low concentrations, and blank-qualified results were less than the RL or marginally above the RL, and a small number of results marginally above the RL were qualified for potential high bias. Therefore, the blank-qualifications are not expected to significantly affect project objectives.

E.2.7 SYSTEM MONITORING COMPOUNDS (SURROGATES)

Surrogate standards are used in most organic analyses to help evaluate the accuracy of the data collected. Surrogates are compounds that are not included in the target analyte list and are not expected to be present in environmental samples. A known concentration of the surrogate compound is added to all standards, blanks, and samples before preparation and analysis, and the recovery of the compound is compared to control limits specified in the Edwards AFB Basewide G-QAPP for each organic method to evaluate the performance of the analytical system and determine if there is any matrix interference affecting the method performance. The surrogate compounds and acceptance criteria for each method and matrix are shown in Worksheet 28 of the Edwards AFB Basewide G-QAPP. Samples with unacceptable surrogate recoveries are reanalyzed if possible. If the results of the reanalysis are still outside the limits and acceptable surrogate recoveries are obtained in the method blank and laboratory control sample (LCS) analyses, the problem is attributed to matrix effects.

ND results for samples with surrogate recoveries less than 10% are rejected and qualified as "R1" and detected results for samples with surrogate recoveries less than 10% are estimated and qualified as "J-5L." Results for samples with surrogate recoveries less than the lower control limit (LCL), but greater than 10%, are qualified as "J-4L." Detected results for samples with surrogate recoveries greater than the upper control limit (UCL) are qualified as "J+4K."

None of the definitive-level data were qualified as estimated or rejected due to surrogate recoveries outside the acceptance criteria.

E.2.8 MATRIX SPIKE/MATRIX SPIKE DUPLICATES (MS/MSD)

Matrix-specific accuracy is evaluated using MS/MSD recoveries. Matrix spike samples are actual environmental samples spiked with known concentrations of analytes, which are processed like regular samples. The MS/MSD recoveries are indicators of interference specific to the sample matrix. Such

interference includes the possibility of instrument response suppression or enhancement due to chemical or physical interference, and digestion or extraction efficiency for the sample matrix. When MS/MSD recoveries are outside the control limits and LCS results are acceptable, matrix-related interference is indicated. Acceptance criteria for MS/MSD recoveries are established for each method by matrix, and are shown in Worksheet 28 of the Edwards AFB Basewide G-QAPP.

Only the results for the parent sample are associated and qualified for organic data with outlying MS/MSD results. ND organic results in the parent QC sample are rejected and qualified as "Rm" and detected organic results are estimated and qualified as "J6" for MS and/or MSD % recoveries less than 10%. ND inorganic results associated with MS/MSD recoveries less than 30% are rejected and qualified as "Rm." Detected inorganic results associated with MS/MSD recoveries less than 10% or greater than 150% are estimated and qualified as "J6." All remaining inorganic results not within specified control limits are estimated and qualified as "JM."

Matrix spike analyses were not performed, as they are not applicable to samples collected in SUMMA® canisters, as specified for this method and laboratory in the Edwards AFB Base-wide G-QAPP.

E.2.9 LABORATORY CONTROL SAMPLES/LABORATORY CONTROL SAMPLE DUPLICATES

Laboratory accuracy is evaluated using LCS recoveries. LCSs are reagent water or contamination-free soil or sand spiked with known concentrations of analytes that are processed like regular samples. Since LCSs are matrix interference free, they are indicators of laboratory and method performance. Acceptance criteria for LCS recoveries are established for each method by matrix, and are shown in Worksheet 28 of the Edwards AFB Base-wide G-QAPP.

ND results associated with LCS recoveries less 10% for organic analyses or less than 50% for aqueous inorganic analyses are rejected and qualified as "Rf." ND results for analyses associated with LCS recoveries less than the LCL and greater than 10% for organics or 50% for inorganics are qualified as "Jf." Detected results associated with LCS recoveries outside of specified control limits are qualified as "Jf."

Approximately 0.6% of the definitive-level data were qualified as estimated, and no data were qualified as rejected due to LCS recoveries outside the acceptance criteria. The ND results for benzyl chloride

in 9 soil gas samples and 5 ambient air samples from the March 2013 sampling event and in all 15 soil gas samples from the August 2013 sampling event were qualified as estimated (UJ-f) due to low LCS or LCSD recoveries.

E.2.10 LABORATORY DUPLICATE PRECISION

Laboratory precision is evaluated using the RPDs between results for the analysis of laboratory duplicate samples for some inorganic analyses, and of MS/MSD results for all other analyses. In the event that MS/MSD analyses were not performed, LCS/LCSD results are evaluated. RPDs are compared with acceptance criteria specified for each method, analyte, and matrix in Worksheet 28 of the Edwards AFB Base-wide G-QAPP for LCS/LCSDs. For laboratory duplicate, MS/MSD, or LCS/LCSD analyses RPDs outside of control limits, associated sample results are estimated and qualified as "Jd." Only the results for the parent sample are associated and qualified for organic data with outlying MS/MSD results. For LCS/LCSDs and inorganic MS/MSDs, all sample results from the same preparation and/or analytical batch are associated and estimated if specified criteria are exceeded.

MS/MSD RPDs were not evaluated, as matrix spike analyses are not applicable to samples collected in SUMMA® canisters, as specified for EPA Method TO-15 in the Edwards AFB Base-wide G-QAPP. None of the definitive-level data were qualified as estimated due to RPDs greater than the acceptance limits in the LCS/LCSD analyses.

E.2.11 FIELD DUPLICATE PRECISION

Field precision is evaluated for definitive-level data using field duplicate samples for ambient air and soil gas samples. Field duplicate samples are collected at an approximate frequency of 10% of the original number of samples per matrix and method on a project-wide basis (rather than a sampling-round or site-specific basis). The field duplicate samples were analyzed for all requested methods, and the results compared with established acceptance criteria specified for each method, analyte, and matrix, as presented in Worksheet 28 of the Edwards AFB Base-wide G-QAPP.

For these sample events, 4 field duplicate soil gas samples were collected for 26 parent soil gas samples for EPA Method TO-15-U and ASTM Method D1945-MOD (21.1% frequency, 2 field duplicate samples for each sampling event), and 8 field duplicate ambient air samples were collected for

38 parent ambient air samples for EPA Method TO-15-LL-U (15.4% frequency, 4 field duplicate samples for each sampling event). The field duplicate results were compared with established acceptance criteria specified for each method, analyte, and matrix, as presented in Worksheet 28 of the Edwards AFB Base-wide G-QAPP.

All results were within specified criteria, with the following exceptions. The results that exceeded field duplicate sample criteria are presented below.

Field Samples: N3-4806-IA01-VS1/N3-4806-IA01-VS2
Sampling Date: 5 March 2013
Matrix: Ambient Air
Units: micrograms per cubic meter ($\mu g/M^3$)

Analyte	Result 1	Result 2	RL	Difference	RPD	QC Limits (RPD/Difference)	Qualifier
2-butanone (MEK)	3.4	6.5	0.59	3.1	62.6	<45 RPD/<1xRL	NA
ethanol	37	16	1.9	21	79.3	<45 RPD/<1xRL	NA

Field Samples: N3-4810-IA04-VS1/N3-4810-IA04-VS2
Sampling Date: 6 March 2013
Matrix: Ambient Air
Units: $\mu g/M^3$

Analyte	Result 1	Result 2	RL	Difference	RPD	QC Limits (RPD/Difference)	Qualifier
acetone	18	120	2.4	102	148	<45 RPD/<1xRL	NA
carbon disulfide	4.7	0.63	3.1	4.07	NC	<45 RPD/<1xRL	NA
isopropanol	28	9.8	2.5	18.2	96.3	<45 RPD/<1xRL	NA

Field Samples: N3-4810-OA03-VS1/N3-4810-OA03-VS2
Sampling Date: 6 March 2013
Matrix: Ambient Air
Units: $\mu g/M^3$

Analyte	Result 1	Result 2	RL	Difference	RPD	QC Limits (RPD/Difference)	Qualifier
carbon disulfide	2.7	7.4	3.1	4.7	NC	<45 RPD/<1xRL	NA
ethanol	8.6	66	1.9	57.4	154	<45 RPD/<1xRL	NA
p-isopropyltoluene	9.9	3.5	1.1	4.7	95.5	<45 RPD/<1xRL	NA

Field Samples: N3-4806-SS03-VS1/N3-4806-SS03-VS201
Sampling Date: 6 March 2013
Matrix: Soil Gas
Units: $\mu g/M^3$

Analyte	Result 1	Result 2	RL	Difference	RPD	QC Limits (RPD/Difference)	Qualifier
acetone	68	40	27	28	NC	<45 RPD/<1xRL	NA

Field Samples: N3-4810-SS04-VS1/N3-4810-SS04-VS2
Sampling Date: 7 March 2013
Matrix: Soil Gas
Units: $\mu g/M^3$

Analyte	Result 1	Result 2	RL	Difference	RPD	QC Limits (RPD/Difference)	Qualifier
isopropanol	29	15	9.2	14	NC	<45 RPD/<1xRL	NA

Field Samples: N3-4806-IA01-VS2/N3-4806-IA01-VS202
Sampling Date: 21 August 2013
Matrix: Ambient Air
Units: $\mu g/M^3$

Analyte	Result 1	Result 2	RL	Difference	RPD	QC Limits (RPD/Difference)	Qualifier
carbon disulfide	4.1	8.1	3.1	4.0	NC	<45 RPD/<1xRL	NA

Field Samples: N3-4806-OA01-VS2/N3-4806-OA01-VS202
Sampling Date: 21 August 2013
Matrix: Ambient Air
Units: $\mu g/M^3$

Analyte	Result 1	Result 2	RL	Difference	RPD	QC Limits (RPD/Difference)	Qualifier
2-butanone (MEK)	8.3	3.5	0.59	4.8	81.4	<45 RPD/<1xRL	NA
2-hexanone	1.7	ND (<0.27)	0.82	1.43	NC	<45 RPD/<1xRL	NA

Field Samples: N7-4810-IA02-VS2/N7-4810-IA02-VS202
Sampling Date: 22 August 2013
Matrix: Ambient Air
Units: $\mu g/M^3$

Analyte	Result 1	Result 2	RL	Difference	RPD	QC Limits (RPD/Difference)	Qualifier
carbon disulfide	3.2	19	3.1	15.8	142	<45 RPD/<1xRL	NA
p-isopropyltoluene	0.29	3.4	1.1	3.11	NC	<45 RPD/<1xRL	NA
toluene	3.5	5.9	0.75	2.4	51.1	<45 RPD/<1xRL	NA

Field Samples: N7-4810-SS04-VS2/N7-4810-SS04-VS202
Sampling Date: 23 August 2013
Matrix: Soil Gas
Units: $\mu g/M^3$

Analyte	Result 1	Result 2	RL	Difference	RPD	QC Limits (RPD/Difference)	Qualifier
2-butanone (MEK)	11	28	6.1	17	NC	<45 RPD/<1xRL	NA
carbon disulfide	76	180	32	104	81.3	<45 RPD/<1xRL	NA

ethanol	10	190	19	180	180	<45 RPD/<1xRL	NA

Notes:
NA = Not applicable, no qualifier applied for field duplicate outlier
NC = Not calculated due to ND in one sample
ND = Non-detected

According to the data validation SOP referenced in the *Vapor Intrusion Sampling Plan and Risk Assessment Work* Plan (AECOM 2013) (Appendix B.2.3 - EAFB Data Validation Procedure QA-9), data are not qualified due to field duplicate results (Section 6.4.10 - Field Duplicates). For the results for the VOCs presented above for duplicate sample results, no qualifiers were applied per the data validation SOP. All other field duplicate sample results met the specified criteria.

For the definitive-level data for this data set, 97.5% compliance with the precision criteria presented in Worksheet 28 of the Edwards AFB Base-wide G-QAPP was achieved for all reported results for the field duplicate samples, demonstrating acceptable field and laboratory precision.

E.2.12 INTERNAL STANDARDS

For GC/MS analyses by EPA Method TO-15, internal standard area counts are monitored to ensure that GC/MS sensitivity and response are stable during the analysis. For GC/MS by TO-15, the area counts of the internal standards in the sample must fall within 60 to 140% of the internal standard area counts in the calibration verification standard for the 12-hour tune period. In addition, the retention times of the internal standards in the sample must be within ±30 seconds of the retention times in the calibration standard. ND results associated with extremely low internal standard area counts or internal area counts abruptly dropping off indicating severe loss of sensitivity are considered rejected and qualified as "Ri." Results associated with area counts not within the specified control limits are estimated and qualified as "Ji."

None of the definitive-level data were qualified as rejected or estimated due to associated internal standard results outside the acceptance criteria.

E.2.13 ANALYTE IDENTIFICATION

Qualitative criteria for identifying target analytes were established to minimize the possibility of reporting false positives and false negatives. Most of the identification criteria are directed toward ensuring that a compound is positively identified, and thus toward preventing false positives.

For GC/MS methods, compound identification is made based on comparison of the relative retention times (RRTs) of the chromatographic peaks for the sample and calibration standards, then on comparison of the sample mass spectra against reference mass spectra for each potential target compound. For EPA Method TO-15, positive identification is made when all of the following criteria are met: a) all ions present in the reference mass spectrum at relative intensity greater than 10% are also present in the sample mass spectrum; b) the relative intensities of these ions in the reference and sample mass spectra agree to within 20%; c) all ions greater than 10% in the sample mass spectrum but not in the reference mass spectrum are accounted for; and d) the compound elutes within ± 0.06 RRT units of the RRT for that target compound in the calibration standards. Review of the summary forms and data for GC/MS analyses did not show any problems associated with correct analyte identification for EPA Method TO-15.

Results for which compound or analyte identification is considered to be questionable are estimated as presumptively identified and qualified as "NJ." Examples may include retention times for either column in GC methods not within specified limits, % differences greater than 50% between GC primary and confirmation columns, isotopic ratios exceeding specified control limits, or other reasons a compound or analyte is believed to be misidentified.

None of the definitive-level data were qualified as estimated due to analyte uncertainty.

E.2.14 ANALYTE QUANTITATION

When compound or analyte quantitation is considered questionable, results are estimated and qualified as "Jq" indicating that the results may be quantitatively uncertain. Examples may include unaccountable differences in results between dilutions, related results that do not add up, % differences greater than 50 between GC primary and confirmation columns, or other reasons for quantitative

uncertainty. In addition, usable results quantitated and reported from above the demonstrated calibration range of an instrument are qualified as "J2."

Approximately 3.9% of the definitive-level data were qualified as estimated due to analyte quantitation. The results for all 67 VOCs in sub-slab soil gas samples N3-4806-SS02-VS1 and N3-4807-SS03-VS1 from the March 2013 sampling event and sample N3-4806-SS02-VS2 from the August 2013 sampling event were qualified as estimated (J-q/UJ-q) for potential low bias due to leakage or indoor vapor intrusion into the sub-slab sampling shrouds, as indicated by the laboratory results for helium.

For the sub-slab soil gas sampling, helium is used as a tracer gas for leak detection within the shroud surrounding the vapor sampling point. If the concentration of the tracer compound in the purge sample is greater than or equal to 5% of the tracer compound concentration in the shroud, corrective action is necessary. All helium results were below the 5% corrective action threshold for a leak in the purge air that was collected on-site prior to sampling when tested with the helium meter-; therefore the field sampling protocols were confirmed and are considered valid per the guidelines. However, when analyzed at the laboratory, detected results for helium in the soil gas samples exceeded the 5% criterion, as presented below.

Sample	**Field He %v/v**	**Lab He %v/v**	**Lowest value Shroud %v/v**	**Field Ratio He Sample-to-Shroud**	**Lab Ratio He Sample-to-Shroud**	**Qualifier**
N3-4806-SS02-VS1	1.73	3.6	51.2	3.38	7.03	J-/UJ- q
N3-4806-SS02-VS2	2.3	12	54.9	4.19	19.2	J-/UJ- q
N3-4807-SS03-VS1	1.03	5.2	51.2	2.01	10.2	J-/UJ- q

Notes:
%v/v = percent volume-to-volume
He = helium
Lab = laboratory

A detection of a leak check compound in the sample indicates that the results may be influenced by surface air entering the container. The ratio of helium in the sample to the helium in the shroud indicates the percentage of intrusion of air into the shroud; therefore, the results for VOCs in sample N3-4806-SS02-VS1 from the March 2013 sampling event may be biased low by approximately 7.0%, the results for VOCs in sample N3-4806-SS02-VS2 from the August 2013 sampling event may be biased low by approximately 19.2%, and the results for VOCs in sample N3-4807-SS03-VS1 from the

March 2013 event may be biased low by approximately 10.2%. This air may be ambient air outside the shroud or air communicated through the slab. Because the minimum shroud concentration is used for these calculations, and in some cases the helium shroud concentration was higher at some points in the sampling, the ratio represents the maximum potential bias in the samples. As these potential biases are within the project accuracy goal of ±30%, the bias indicates the results are within project objectives. The results are considered estimated (J-q/UJ-q) for potential low bias and can be used as qualified for project decision-making and risk assessment purposes.

E.2.15 Reporting of Results and Detection Limits

All analytical results and RLs are adjusted for dilutions resulting from the preparation procedures required by the method or to get the result for a compound or analyte within the calibration range of the instrument.

For the sub-slab samples, the Method TO15-SC-U RLs and MDLs are approximately two-times those presented in the work plan due to dilution caused by the pressurization of the canister with laboratory grade nitrogen to facilitate analysis. The ND results are considered ND at less than the MDLs, which are approximately one order of magnitude lower than the RLs. Therefore, the data meet the project objectives for PCE and TCE as reported.

For the definitive-level data, analytical results that are at or above the MDL, but below the RL, are generally reported by the analytical laboratories. Such results are considered estimated due to quantitative uncertainty near the limit of detection, and are qualified as "Ja."

For the definitive-level data, approximately 20.4% of the definitive-level data were qualified as "Ja." These qualifications do not indicate analytical problems, do not affect the PARCC objectives, and are not included in the calculation of data qualification percentages for PARCC parameters.

E.2.16 Method Compliance and Analytical Performance

In addition to the QC parameters discussed above, additional method and QC parameters are evaluated as part of the full data validation process. These parameters are used to assess the laboratory's performance and compliance with the analytical method requirements. The laboratory met the performance criteria specified under each method used.

In addition, for the sub-slab soil gas sampling, helium is used as a tracer gas for leak detection within the shroud surrounding the vapor sampling point. If the concentration of the tracer compound in the purge sample is greater than or equal to 5% of the tracer compound concentration in the shroud, corrective action is necessary. All helium results were below the corrective action threshold for a leak in the purge air that was collected on-site when tested with the helium meter prior to sample collection. The field sampling protocols were confirmed and are considered valid per the guidelines, therefore all leak detection objectives were met. However, laboratory results for helium in 3 samples exceeded the 5% criterion; therefore, the associated data were qualified as estimated (refer to Section E.2.14 above).

E.3 PARCC EVALUATION SUMMARY

The following sections discuss the overall definitive-level data quality in terms of the PARCC goals established for this project.

E.3.1 PRECISION

Precision measures the reproducibility of the experimental value for the same parameter in the same sample under the same conditions. The parameters evaluated to assess precision during the data validation process are the RPDs for field replicates or duplicates. The RPDs were compared against established acceptance criteria specified for each method, analyte, and matrix presented in Worksheet 28 of the Edwards AFB Base-wide G-QAPP. None of the definitive-level data were qualified due to precision for LCS/LCSD analyses.

For the samples included in this QASR, field duplicate soil gas samples were collected at a frequency of 15.4% for EPA Method TO-15-U and ASTM Method D1945-MOD, and field duplicate ambient air samples were collected at a frequency of 21.1% for Method TO-15-LL-U, as presented in Section E.2.11. All the field duplicate sample results met specified criteria with the exceptions noted in Section E.2.11.

For the definitive-level data, 97.5% compliance with the precision criteria presented in Worksheet 28 of the Edwards AFB Base-wide G-QAPP was achieved for all reported results for the field duplicate and field replicate samples, demonstrating acceptable field and laboratory precision.

E.3.2 ACCURACY

One of the major objectives of the data validation process is to evaluate the accuracy of the definitive-level data collected. Accuracy measures the deviation between the reported or experimental value and the true value. To assess accuracy, known concentrations of the analytes of interest are spiked into samples and % recoveries of the spiked analytes are calculated. The parameters evaluated to assess accuracy during the data validation process include surrogate recoveries where applicable, and LCS recoveries. Additional factors affecting accuracy such as calibration, analyte identification and quantitation are also reviewed.

The surrogate recoveries are indicators of interference specific to the sample matrix. LCS recoveries are indicators of laboratory performance. Spike, surrogate, calibration, quantitation problems (including blank-qualifications), and other accuracy-related parameters resulted in rejection of none of the definitive-level data, and an estimation of approximately 7.3% of the definitive-level data.

For the definitive-level data, of the 7.3% of the data qualified as estimated for accuracy-related parameters, 3.4% were qualified due to exceeded laboratory accuracy criteria and 3.9% were due to matrix interference. The remaining data met the accuracy criteria.

E.3.3 REPRESENTATIVENESS

Representativeness measures how accurately the sample data reflect the actual media and environmental conditions being measured. Sampling locations that were representative of the medium being sampled were chosen. Sampling protocols were developed to ensure that samples collected represented the actual medium and that no contamination was introduced during sample collection. Proper sample handling and preservation protocols were observed in the field to ensure that the samples maintained their integrity while being collected and transported to the laboratory for analysis.

The protocols followed by the field crew while collecting the samples are described in the Edwards AFB Base-wide G-QAPP, as referenced in the *Vapor Intrusion Sampling Plan and Risk Assessment Work Plan, National Aeronautics and Space Administration, Dryden Flight Research Center, Operable Unit 6, Edwards Air Force Base, California*, (AECOM, 2013).

E.3.4 COMPLETENESS

Completeness is defined as the percentage of the definitive-level data that are within the acceptance criteria for a given data set and are, therefore, considered valid. Completeness is measured by comparing the total number of acceptable data points (valid data) against the total number of data points reported. Valid or acceptable data consist of analytical results that met all the QC acceptance criteria and analytical results that were estimated and qualified as "J" and can still be used for their intended purpose.

The definitive-level data reviewed for this project showed a technical completeness of 100%, exceeding the project completeness goals of 95% for the analytical portion and 90% for the project as a whole, as specified in the Edwards AFB Base-wide G-QAPP. No critical samples were identified for this sampling event.

E.3.5 COMPARABILITY

Comparability reflects the internal consistency of the measurements and how well the definitive-level data set can be compared to another data set generated by a different organization. The generation of comparable data requires the use of certified or approved laboratories and established and widely accepted protocols that produce comparable results. Review of the data generated by the laboratories for this project indicate the use of approved and nationally accepted sampling and testing methods approved by the EPA, California ELAP, National Environmental Laboratory Accreditation Program and AFCEC, thereby ensuring a high degree of comparability. Analytical methods used for the special analytical services are proprietary methods based on modifications of testing methods approved by the EPA.

E.4 DATA QUALITY AND USABILITY

The data review and validation performed on the entire definitive-level data set indicate the overall high quality of the definitive-level data collected for this project.

None of the definitive-level data were qualified as rejected, and approximately 7.3% were qualified as estimated for exceeding PARCC parameters. Of the 7.3% of the data qualified as estimated, 3.4%

were qualified due to exceedance of laboratory accuracy and precision criteria, and 3.97% were due to matrix-related issues. The remaining definitive-level data met the PARCC criteria.

The data review included assessment of definitive-level data for compliance with the QA elements of the data quality objectives (DQOs) specified throughout the Edwards AFB Base-wide G-QAPP. This includes achievement of DQOs related to sample collection, handling, labeling, and custody; analytical methods and procedures; laboratory data reduction, validation, reporting, and management; data package and electronic deliverables verification, validation, and assessment; and documentation and reporting. The compliance with the QA elements of the DQOs indicates a high level of confidence in the data, allowing the data to be used for its intended purposes within the constraints of the data qualifiers.

No data were qualified with the "R" qualifier as considered technically rejected and unusable. Data qualified with the "J" qualifier are considered estimated and usable within the constraints of the qualifiers for project decision-making purposes. Otherwise, the data as presented are of acceptable quality and can be used to support environmental decision-making.

E.5 DATA QUALIFIERS AND THEIR DEFINITIONS

The following data qualifiers were used by AECOM to qualify the laboratory data generated for this project. Most of these qualifiers were taken from *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review,* (EPA/540/R-08/01, June 2008) and *National Functional Guidelines for Inorganic Data Review* (EPA/540/R-04/004, October 2004), and the AFCEC Quality Assurance Project Plan (Version 4.0, July 2006). Most of the qualifiers taken from these references were modified and made more specific. Additional qualifiers were developed and used when required. Note that multiple reason codes may apply to data qualified for more than one QC parameter.

General Qualifiers:

U (not detected)	The analyte was tested for but was not detected above the detection limit for inorganic analyses, or the RL for organic analyses. This is added before qualifiers for all ND results.
UJ, UJ- (estimated)	The analyte is ND but the result is an estimate due to QC failure or data quality limitations. UJ- indicates detection limit may be biased low.
J, J+, J- (estimated)	The analyte is positively identified but the reported concentration is an estimate due to QC failure or data quality limitations. J+ indicates high bias, J- indicates low bias.
R (unusable)	The result is rejected due to QC failure or data quality limitations. The presence or absence of the analyte in the sample cannot be verified, or the reported result is so severely compromised as to be unusable.
N (unusable)	Presumptively identified. The compound identification is considered qualitatively uncertain.

Qualifiers With Reason Codes:

UJ1	Qualified for laboratory blank contamination according to the blank qualification rules. Reported result is considered to be ND at the reported level, or at the RL for organic compounds reported at less than the RL; therefore, the "U" qualifier is included.
J-1, UJ-1	For EPA Method SW6010B, detected results that are within 5-times the absolute value of negative results for associated ICBs or CCBs.
J+1, J+B, J+b	Qualified for potential analyte contamination. Reported compound is considered to be present in sample, but may be biased high due to laboratory or field contamination.
UJB, JB	Qualified for ambient, equipment, or trip blank contamination.
UJb, Jb	Common laboratory contaminant not found in blank, sample result is less than 10 times the RL. Estimate to alert data user the result may be a laboratory artifact, or apply blank qualification rules as above if the contaminant is a demonstrated systemic contaminant.

J2, J-2	Calibration range exceeded, no diluted result available, quantitatively uncertain.
J/UJ3, J/UJ-3	Analysis exceeds holding time (HT), Detects (and NDs for stable analytes).
J+4K	Surrogate recovery is greater than the UCL, Detects.
J+5K	Surrogate recovery is greater than 150%, Detects.
J-4L, UJ-4L	Surrogate recovery is less than the LCL, Detects. Surrogate recovery is less than the LCL but greater than 10 percent recovery (%R), NDs.
J-5L	Surrogate recovery is less than 10 %R for organics, less than 30 %R for inorganics, Detects.
J+6, J-6	MS and/or MSD greater than 150 %R or less than 10 %R, Detects.
JM, J+M, J/UJ-M	MS and/or MSD results were greater than UCL and less than 150%, Detects; or less than the LCL and greater than 10 %R for organics or less than 30 %R, NDs and Detects.
Ja	Detected above the detection limit but less than the RL for definitive-level data; or detected above the RL but less than the lowest calibration standard for the mobile laboratory data. Considered quantitatively uncertain.
J/UJc, J+c, J/UJ-c	ICV or CCV not within method specific control limits. Result usable but considered estimated.
Jd	Duplicate precision criteria exceeded.
Jf, J+f, J/UJ-f	LCS and/or LCSD greater than UCL, Detects. LCS and/or LCSD less than LCL, Detects; or less than LCL, but greater than 50 %R for organics, 10 %R for inorganics, NDs.
J/UJg	Serial Dilution result greater than 10% D for an element with undiluted result greater than 50 times the MDL in QC sample.
J/UJi	Internal standard area exceeds 50 to 200 %R control limits.
J/UJq	Result quantitatively uncertain. Unaccountable differences in results between dilutions, related results do not add up, baseline uncertainty or other reasons for quantitative uncertainty.
JQ	For EPA Method SW8290, analytes that were qualified with the “Q” laboratory qualifier for ion abundance ratios that did not meet acceptance criteria are considered “estimated maximum possible concentrations” (EMPCs) since their quantitation was based on theoretical ion abundance ratios. The results for these

	SW8290 analytes are estimated for quantitative uncertainty and should be considered to be the maximum potential concentrations of these analytes in these samples.
JX	For TEPH and TVPH, chromatographic pattern does not match calibration fuel.
R1	Surrogate recovery is less than 10 %R, NDs.
R2	Analysis exceeds HT for unstable or volatile analytes, NDs; or analysis grossly exceeds HT (greater than two times HT) for all analytes.
R3	ICV or CCV grossly outside of method specific control limits. Result unusable.
R4	For EPA Method SW8260B and EPA Method SW8270D, the TIC library match is not usable.
Rf	Inorganic analyses: LCS and/or LCSD less than 50 %R for water samples and nonmetals soils, NDs. Organic analyses: LCS and/or LCSD less than 10 %R, NDs.
Ri	Internal standard area less than 25% or abruptly drops off, severe loss of sensitivity, NDs.
Rm	Inorganic: MS and/or MSD less than 30 %R, NDs. Organic: MS and/or MSD less than 10 %R and severe matrix interference likely, NDs.
NJ	Compound presumptively identified and estimated.

APPENDIX F

VIP-RELATED VOC DETERMINATION

APPENDIX F-1
BUILDING 4806 VAPOR INTRUSION PATHWAY DETERMINATION - MARCH 2013
(Page 1 of 2)

Analyte	N3-4806IA1	N3-4806IA1[a]	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	Analyte in indoor air	Analyte in groundwater	Analyte in outdoor air	Analyte in sub-slab vapor	Indoor air higher than or similar to outdoor air	Sub-slab vapor 10 times higher than indoor air	Analyte vapor intrusion pathway related
1,1,1,2-tetrachloroethane	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4							
1,1,1-trichloroethane	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1							
1,1,2,2-tetrachloroethane	<.085	<.085	<.085	<.085	<.085	<.085		**Yes**					
1,1,2-trichloroethane	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19		**Yes**					
1,1,2-trichlorotrifluoroethane	0.54	0.56	0.6	0.56	0.57	0.57	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
1,1-dichloroethane	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81							
1,1-dichloroethene	<0.79	<0.79	<0.79	<0.79	<0.79	<0.79		**Yes**					
1,2,4-trichlorobenzene	<0.38	<0.38	<0.38	<0.38	<0.38	<0.38		**Yes**					
1,2,4-trimethylbenzene	1.7	1.5	2.7	3.4	3.9	3.8	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
1,2-dichlorobenzene	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2		**Yes**					
1,2-dichloroethane	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11		**Yes**					
1,2-dichloropropane	<0.92	<0.92	<0.92	<0.92	<0.92	<0.92		**Yes**	**Yes**				
1,2-dichlorotetrafluoroethane	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4							
1,3,5-trimethylbenzene	0.54	0.46	0.75	0.92	1.1	1	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
1,3-butadiene	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13			**Yes**				
1,3-dichlorobenzene	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2							
1,4-dichlorobenzene	0.14	<0.089	<0.089	<0.089	<0.089	<0.089	**Yes**	**Yes**			**Yes**		**Likely No[d]**
2-butanone (MEK)	6.5	3.4	2.8	2.5	2.6	2.8	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
2-hexanone	<0.82	<0.82	<0.82	<0.82	<0.82	<0.82		**Yes**		**Yes**		**Yes**	
4-ethyltoluene	1.7	1.4	2.4	3	3.3	3.2	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
4-methyl-2-pentanone (MIBK)	<0.82	<0.82	<0.82	<0.82	<0.82	<0.82		**Yes**		**Yes**		**Yes**	
acetone	18	15	17	17	19	12	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
acrylonitrile	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17							
benzene	1.1	1	1.3	1.5	1.8	1.8	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
benzyl chloride	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11							
bromodichloromethane	<0.069	<0.069	<0.069	<0.069	<0.069	<0.069		**Yes**					
bromoform	<2.1	<2.1	<2.1	<2.1	<2.1	<2.1		**Yes**					
bromomethane	0.12	0.17	0.19	0.18	0.22	0.21	**Yes**		**Yes**				**No[b]**
carbon disulfide	2.2	1.2	0.69	0.46	0.28	1.5	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
carbon tetrachloride	0.46	0.44	0.42	0.43	0.44	0.41	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
chlorobenzene	<0.92	<0.92	<0.92	<0.92	<0.92	<0.92		**Yes**					
chloroethane	<0.53	<0.53	<0.53	<0.53	<0.53	<0.53		**Yes**					
chloroform	<0.14	<0.14	<0.14	<0.14	20	<0.14	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
chloromethane	1.3	1.2	1.3	1.3	1.4	1.2	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
cis-1,2-dichloroethene	<0.79	<0.79	<0.79	<0.79	<0.79	<0.79		**Yes**					
cis-1,3-dichloropropene	0.28	0.11	0.077	0.06	0.071	<0.053	**Yes**		**Yes**		**Yes**		**No[b]**
cyclohexane	0.64	0.78	1.2	1.4	1.6	1.3	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
dibromochloromethane	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20		**Yes**					
dichlorodifluoromethane	2.5	2.5	2.7	2.7	2.8	2.8	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
ethanol	16	37	21	23	30	27	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
ethyl acetate	<3.6	0.63	0.69	0.9	0.9	1.1	**Yes**				**Yes**		**No[b]**

APPENDIX F-1
BUILDING 4806 VAPOR INTRUSION PATHWAY DETERMINATION - MARCH 2013
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Analyte	N3-4806IA1	N3-4806IA1[a]	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	Analyte in indoor air	Analyte in groundwater	Analyte in outdoor air	Analyte in sub-slab vapor	Indoor air higher than or similar to outdoor air	Sub-slab vapor 10 times higher than indoor air	Analyte vapor intrusion pathway related
ethylbenzene	1.9	1.2	1.6	2	2.2	2	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
ethylene dibromide (EDB)	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19		**Yes**					
hexachlorobutadiene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25		**Yes**					
isopropanol	2.3	4	2	2.6	11	3.9	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[f]**
isopropylbenzene	0.56	0.2	<0.98	0.14	0.17	0.14	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
m- & p-xylene	5.1	4.3	6.7	8.1	9	8.7	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
methyl tert-butyl ether (MTBE)	<0.72	<0.72	<0.72	<0.72	<0.72	<0.72		**Yes**					
methylene chloride	<0.40	<0.45	<0.43	<0.42	<0.42	<0.41		**Yes**					
naphthalene	<0.095	<0.095	0.63	0.83	0.94	0.89	**Yes**	**Yes**			**Yes**		**Likely No[d]**
n-butylbenzene	0.36	0.2	0.35	0.45	0.72	0.52	**Yes**	**Yes**			**Yes**		**Likely No[d]**
n-heptane	1.1	1.2	1.8	2	2.1	2	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[f]**
n-hexane	2.1	1.5	4	5.4	8.2	10	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[f]**
o-xylene	1.9	1.6	2.5	3	3.3	3.1	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
p-isopropyltoluene	0.87	0.65	<1.1	0.55	0.16	0.42	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
propene	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7							
sec-butylbenzene	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1		**Yes**					
styrene	0.22	0.22	0.15	0.15	0.19	0.21	**Yes**		**Yes**		**Yes**		**No[b]**
tetrachloroethene (PCE)	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4		**Yes**	**Yes**	**Yes**		**Yes**	
tetrahydrofuran	0.25	0.56	0.28	0.18	0.19	0.53	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
toluene	5.5	6	8.5	9.3	10	10	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
trans-1,2-dichloroethene	<0.79	<0.79	<0.79	<0.79	<0.79	<0.79		**Yes**					
trans-1,3-dichloropropene	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17							
trichloroethene (TCE)	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1		**Yes**		**Yes**		**Yes**	
trichlorofluoromethane	2.5	2.5	1.7	1.8	1.5	1.3	**Yes**		**Yes**		**Yes**		**No[b]**
vinyl chloride	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17		**Yes**					

Notes:

[a]Duplicate sample.

[b]Not vapor intrusion pathway related for all samples. The analyte was (1) detected only in indoor air (not in groundwater or outdoor air or sub-slab-vapor) or (2) detected in indoor air and outdoor air, but not in groundwater or sub-slab vapor.

[c]Not likely vapor intrusion pathway related. Analyte was detected in indoor air and sub-slab vapor but not in groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[d]Not likely vapor intrusion pathway related. The analyte was detected in indoor air and groundwater but not in sub-slab vapor. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations, and the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[e]Not likely vapor intrusion pathway related. The analyte was detected in indoor air, groundwater, and sub-slab vapor. However, the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[f]Likely vapor intrusion pathway related. Although the analyte is not a groundwater contaminant of concern, it was detected in indoor air and sub-slab vapor. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were at least 10 times higher than those detected in the indoor air.

[g]Vapor intrusion pathway related. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were 10 times higher than those detected in the indoor air.

APPENDIX F-2
BUILDING 4806 VAPOR INTRUSION PATHWAY DETERMINATION - AUGUST 2013
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Analyte	N3-4806IA1	N3-4806IA1[a]	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	Analyte in indoor air	Analyte in groundwater	Analyte in outdoor air	Analyte in sub-slab vapor	Indoor air higher than or similar to outdoor air	Sub-slab vapor 10 times higher than indoor air	Analyte vapor intrusion pathway related
1,1,1,2-tetrachloroethane	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4							
1,1,1-trichloroethane	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1							
1,1,2,2-tetrachloroethane	<.085	<.085	<.085	<.085	<.085	<.085		**Yes**					
1,1,2-trichloroethane	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19		**Yes**					
1,1,2-trichlorotrifluoroethane	0.59	0.56	0.6	0.56	0.58	0.59	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
1,1-dichloroethane	<0.81	<0.81	<0.81	<0.81	<0.81	<0.81							
1,1-dichloroethene	<0.79	<0.79	<0.79	<0.79	<0.79	<0.79		**Yes**					
1,2,4-trichlorobenzene	<0.38	<0.38	<0.38	<0.38	<0.38	<0.38		**Yes**					
1,2,4-trimethylbenzene	2.6	2.7	0.38	0.35	0.51	0.61	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
1,2-dichlorobenzene	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2		**Yes**					
1,2-dichloroethane	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11		**Yes**					
1,2-dichloropropane	<0.92	<0.92	<0.92	<0.92	<0.92	<0.92		**Yes**					
1,2-dichlorotetrafluoroethane	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4							
1,3,5-trimethylbenzene	0.68	0.71	<2.0	<2.0	<2.0	0.23	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
1,3-butadiene	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13							
1,3-dichlorobenzene	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2							
1,4-dichlorobenzene	<0.089	<0.089	0.15	<0.089	<0.089	<0.089	**Yes**	**Yes**			**Yes**		**Likely No[d]**
2-butanone (MEK)	4.5	3.8	5	1.8	2.6	6.4	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
2-hexanone	<0.82	<0.82	<0.82	0.28	<0.82	<0.82	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
4-ethyltoluene	2.2	2.2	0.27	0.21	0.36	0.55	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[f]**
4-methyl-2-pentanone (MIBK)	<0.82	<0.82	<0.82	<0.82	<0.82	<0.82		**Yes**	**Yes**				
acetone	110	110	21	14	12	20	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
acrylonitrile	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17							
benzene	1.2	0.85	0.91	0.93	0.77	0.94	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
benzyl chloride	<0.11	<0.11	<0.11	<0.11	<0.11	0.24	**Yes**				**Yes**		
bromodichloromethane	<0.069	<0.069	0.49	0.15	<0.069	<0.069	**Yes**	**Yes**			**Yes**		**Likely No[d]**
bromoform	<2.1	<2.1	<2.1	0.34	<2.1	<2.1	**Yes**	**Yes**			**Yes**		**Likely No[d]**
bromomethane	<0.78	<0.78	<0.78	<0.78	<0.78	<0.78							
carbon disulfide	8.1	4.1	0.72	0.41	2.2	140	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
carbon tetrachloride	0.43	0.42	0.48	0.46	0.39	0.43	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
chlorobenzene	<0.92	<0.92	<0.92	<0.92	<0.92	<0.92		**Yes**					
chloroethane	<0.53	<0.53	<0.53	<0.53	<0.53	<0.53		**Yes**					
chloroform	<0.14	<0.14	0.21	0.14	7.9	1.1	**Yes**	**Yes**		**Yes**	**Yes**		**Likely No[e]**
chloromethane	1.4	1.2	1.6	1.3	1.2	1.6	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
cis-1,2-dichloroethene	<0.79	<0.79	<0.79	<0.79	<0.79	<0.79		**Yes**					
cis-1,3-dichloropropene	<0.053	<0.053	<0.053	<0.053	<0.053	0.097	**Yes**				**Yes**		**No[b]**
cyclohexane	0.67	0.66	<3.4	<3.4	<3.4	1.1	**Yes**			**Yes**	**Yes**		**Likely No[c]**
dibromochloromethane	<0.20	<0.20	<0.20	0.42	<0.20	<0.20	**Yes**	**Yes**			**Yes**		**Likely No[d]**
dichlorodifluoromethane	8.6	8.8	10	13	3.1	3.9	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
ethanol	20	14	28	5.4	20	14	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[f]**
ethyl acetate	<3.6	<3.6	<3.6	<3.6	<3.6	<3.6							

APPENDIX F-2
BUILDING 4806 VAPOR INTRUSION PATHWAY DETERMINATION - AUGUST 2013
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Analyte	N3-4806IA1	N3-4806IA1[a]	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	Analyte in indoor air	Analyte in groundwater	Analyte in outdoor air	Analyte in sub-slab vapor	Indoor air higher than or similar to outdoor air	Sub-slab vapor 10 times higher than indoor air	Analyte vapor intrusion pathway related
ethylbenzene	1.5	1.5	0.29	0.15	0.22	0.29	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
ethylene dibromide (EDB)	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19		**Yes**					
hexachlorobutadiene	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25		**Yes**					
isopropanol	3	2.1	24	1.9	5.3	64	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
isopropylbenzene	<0.98	<0.98	<0.98	<0.98	<0.98	<0.98		**Yes**					
m- & p-xylene	6.8	7.1	0.99	0.77	0.87	1.2	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
methyl tert-butyl ether (MTBE)	<0.72	<0.72	<0.72	<0.72	<0.72	<0.72		**Yes**		**Yes**		**Yes**	
methylene chloride	<0.52	<0.46	<0.69	<0.69	<0.18	<0.69		**Yes**		**Yes**		**Yes**	
naphthalene	0.42	0.46	0.72	0.22	0.26	1	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
n-butylbenzene	0.39	0.3	0.77	0.25	0.33	<1.1	**Yes**	**Yes**			**Yes**		**Likely No[d]**
n-heptane	0.97	0.84	<4.1	<4.1	<4.1	<4.1	**Yes**		**Yes**		**Yes**		**No[b]**
n-hexane	9.4	9.3	2.8	2.3	5.7	220	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
o-xylene	2.3	2.4	0.35	0.21	0.32	1.2	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
p-isopropyltoluene	0.64	0.24	0.41	<1.1	0.38	3.3	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
propene	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7							
sec-butylbenzene	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1		**Yes**					
styrene	0.51	0.42	0.16	<0.85	<0.85	0.13	**Yes**		**Yes**		**Yes**		**No[b]**
tetrachloroethene (PCE)	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4		**Yes**		**Yes**		**Yes**	
tetrahydrofuran	<2.9	<2.9	0.52	<2.9	<2.9	0.36	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
toluene	79	83	3	2.2	1.3	1.6	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
trans-1,2-dichloroethene	<0.79	<0.79	<0.79	<0.79	<0.79	<0.79		**Yes**					
trans-1,3-dichloropropene	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17							
trichloroethene (TCE)	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1		**Yes**		**Yes**		**Yes**	
trichlorofluoromethane	6.3	6.4	2.3	2.6	1.4	1.9	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
vinyl chloride	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17		**Yes**					

Notes:

[a]Duplicate sample.

[b]Not vapor intrusion pathway related. The analyte was (1) detected only in indoor air (not in groundwater or outdoor air or sub-slab-vapor) or (2) detected in indoor air and outdoor air, but not in groundwater or sub-slab vapor.

[c]Not likely vapor intrusion pathway related. The analyte was detected in indoor air and sub-slab vapor but not in groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[d]Not likely vapor intrusion pathway related. The analyte was detected in indoor air and groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations, and the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[e]Not likely vapor intrusion pathway related. The analyte was detected in indoor air, groundwater, and sub-slab vapor. However, the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[f]Likely vapor intrusion pathway related. Although the analyte is not a groundwater chemical of concern, it was detected in indoor air and sub-slab vapor. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were at least 10 times higher than those detected in the indoor air.

[g]Vapor intrusion pathway related. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were 10 times higher than those detected in the indoor air.

APPENDIX F-3
BUILDING 4807 VAPOR INTRUSION PATHWAY DETERMINATION - MARCH 2013
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Analyte	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA4	Analyte in indoor air	Analyte in groundwater	Analyte in outdoor air	Analyte in sub-slab vapor	Indoor air higher than or similar to outdoor air	Sub-slab vapor 10 times higher than indoor air	Analyte vapor intrusion pathway related
1,1,1,2-tetrachloroethane	<1.4	<1.4	<1.4	<1.4							
1,1,1-trichloroethane	<1.1	<1.1	<1.1	<1.1							
1,1,2,2-tetrachloroethane	<.085	<.085	<.085	<.085		**Yes**					
1,1,2-trichloroethane	<0.19	<0.19	<0.19	<0.19		**Yes**					
1,1,2-trichlorotrifluoroethane	0.64	0.59	0.56	0.6	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[c]**
1,1-dichloroethane	<0.81	<0.81	<0.81	<0.81							
1,1-dichloroethene	<0.79	<0.79	<0.79	<0.79		**Yes**					
1,2,4-trichlorobenzene	<0.38	<0.38	<0.38	<0.38		**Yes**					
1,2,4-trimethylbenzene	2	2.4	13	8.2	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
1,2-dichlorobenzene	<1.2	<1.2	<1.2	<1.2		**Yes**					
1,2-dichloroethane	<0.11	<0.11	<0.11	<0.11		**Yes**					
1,2-dichloropropane	<0.92	<0.92	<0.92	<0.92		**Yes**	**Yes**				
1,2-dichlorotetrafluoroethane	<1.4	<1.4	<1.4	<1.4							
1,3,5-trimethylbenzene	0.59	0.7	3.9	2.5	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
1,3-butadiene	<0.13	<0.13	<0.13	<0.13			**Yes**				
1,3-dichlorobenzene	<1.2	<1.2	<1.2	<1.2							
1,4-dichlorobenzene	<0.089	<0.089	<0.089	<0.089		**Yes**					
2-butanone (MEK)	3	2.3	6.1	2.6	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[f]**
2-hexanone	<0.82	<0.82	<0.82	<0.82		**Yes**		**Yes**		**Yes**	
4-ethyltoluene	1.7	2.1	11	6.5	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[b]**
4-methyl-2-pentanone (MIBK)	<0.82	<0.82	<0.82	<0.82		**Yes**		**Yes**		**Yes**	
acetone	18	16	30	19	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[f]**
acrylonitrile	<0.17	<0.17	1.3	<0.17	**Yes**				**Yes**		**No[a]**
benzene	1.7	2	8.3	4.8	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
benzyl chloride	<0.11	<0.11	<0.11	<0.11							
bromodichloromethane	<0.069	<0.069	<0.069	<0.069		**Yes**					
bromoform	<2.1	<2.1	<2.1	<2.1		**Yes**					
bromomethane	0.2	0.21	0.28	0.17	**Yes**		**Yes**		**Yes**		**No[a]**
carbon disulfide	0.75	2.1	1.6	1.1	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[c]**
carbon tetrachloride	0.42	0.42	0.42	0.39	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[c]**
chlorobenzene	<0.92	<0.92	<0.92	<0.92		**Yes**					
chloroethane	<0.53	<0.53	<0.53	<0.53		**Yes**					
chloroform	<0.14	<0.14	0.18	<0.14	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[c]**
chloromethane	1.5	1.3	1.4	1.3	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[c]**
cis-1,2-dichloroethene	<0.79	<0.79	<0.79	<0.79		**Yes**					
cis-1,3-dichloropropene	0.11	0.056	0.16	<0.053	**Yes**		**Yes**		**Yes**		**No[a]**
cyclohexane	1.3	1.6	11	3.7	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[b]**
dibromochloromethane	<0.20	<0.20	<0.20	<0.20		**Yes**					
dichlorodifluoromethane	2.7	2.7	2.8	2.7	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[b]**
ethanol	25	23	150	47	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[b]**

APPENDIX F-3
BUILDING 4807 VAPOR INTRUSION PATHWAY DETERMINATION - MARCH 2013
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Analyte	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA4	Analyte in indoor air	Analyte in groundwater	Analyte in outdoor air	Analyte in sub-slab vapor	Indoor air higher than or similar to outdoor air	Sub-slab vapor 10 times higher than indoor air	Analyte vapor intrusion pathway related
ethyl acetate	1.2	0.86	7.3	1.9	**Yes**				**Yes**		**No[a]**
ethylbenzene	1.4	1.6	8.3	4.3	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
ethylene dibromide (EDB)	<0.19	<0.19	<0.19	<0.19		**Yes**					
hexachlorobutadiene	<0.25	<0.25	<0.25	<0.25		**Yes**					
isopropanol	240	38	4.3	5.3	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[b]**
isopropylbenzene	<0.98	<0.98	0.63	0.39	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[c]**
m- & p-xylene	5.3	6.5	34	18	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
methyl tert-butyl ether (MTBE)	<0.72	<0.72	<0.72	<0.72		**Yes**					
methylene chloride	<0.44	<0.42	<0.69	<0.47		**Yes**					
naphthalene	<0.095	<0.095	1.9	1.5	**Yes**	**Yes**			**Yes**		**Likely No[c]**
n-butylbenzene	0.33	0.26	1.4	1.4	**Yes**	**Yes**			**Yes**		**Likely No[c]**
n-heptane	1.8	2.1	11	4.9	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[b]**
n-hexane	3.7	4.3	34	11	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[b]**
o-xylene	1.9	2.4	12	6.4	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
p-isopropyltoluene	<1.1	0.17	0.63	0.61	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
propene	<1.7	<1.7	<1.7	<1.7							
sec-butylbenzene	<1.1	<1.1	0.21	0.35	**Yes**	**Yes**			**Yes**		**Likely No[c]**
styrene	0.23	0.26	0.55	0.62	**Yes**		**Yes**		**Yes**		**No[a]**
tetrachloroethene (PCE)	<1.4	<1.4	0.27	<1.4	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
tetrahydrofuran	1.7	<2.9	0.17	0.24	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[e]**
toluene	7.6	8.9	43	24	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
trans-1,2-dichloroethene	<0.79	<0.79	<0.79	<0.79		**Yes**					
trans-1,3-dichloropropene	<0.17	<0.17	<0.17	<0.17							
trichloroethene (TCE)	<1.1	<1.1	<1.1	<1.1		**Yes**		**Yes**		**Yes**	
trichlorofluoromethane	2.8	3.4	5	3.2	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[b]**
vinyl chloride	<0.17	<0.17	<0.17	<0.17		**Yes**					

Notes:

[a]Not vapor intrusion pathway related. The analyte was (1) detected only in indoor air (not in groundwater or outdoor air or sub-slab-vapor) or (2) detected in indoor air and outdoor air, but not in groundwater or sub-slab vapor.

[b]Not likely vapor intrusion pathway related. The analyte was detected in indoor air and sub-slab vapor but not in groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[c]Not likely vapor intrusion pathway related. The analyte was detected in indoor air and groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations, and the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[d]Not likely vapor intrusion pathway related. The analyte was detected in indoor air, groundwater, and sub-slab vapor. However, the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[e]Likely vapor intrusion pathway related. Although the analyte is not a groundwater contaminant of concern, it was detected in indoor air and sub-slab vapor. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were at least 10 times higher than those detected in the indoor air.

[f]Vapor intrusion pathway related. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were 10 times higher than those detected in the indoor air.

APPENDIX F-4
BUILDING 4807 VAPOR INTRUSION PATHWAY DETERMINATION - AUGUST 2013
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Analyte	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA4	Analyte in indoor air	Analyte in groundwater	Analyte in outdoor air	Analyte in sub-slab vapor	Indoor air higher than or similar to outdoor air	Sub-slab vapor 10 times higher than indoor air	Analyte vapor intrusion pathway related
1,1,1,2-tetrachloroethane	<1.4	<1.4	<1.4	<1.4							
1,1,1-trichloroethane	0.17	<1.1	<1.1	<1.1	**Yes**				**Yes**		**No[a]**
1,1,2,2-tetrachloroethane	<.085	<.085	<.085	<.085		**Yes**					
1,1,2-trichloroethane	<0.19	<0.19	<0.19	<0.19		**Yes**					
1,1,2-trichlorotrifluoroethane	0.59	0.58	0.51	0.53	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[c]**
1,1-dichloroethane	<0.81	<0.81	<0.81	<0.81							
1,1-dichloroethene	<0.79	<0.79	<0.79	<0.79		**Yes**					
1,2,4-trichlorobenzene	<0.38	<0.38	<0.38	<0.38		**Yes**					
1,2,4-trimethylbenzene	3.6	5.1	33	1.1	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
1,2-dichlorobenzene	<1.2	<1.2	<1.2	<1.2		**Yes**					
1,2-dichloroethane	<0.11	<0.11	<0.11	<0.11		**Yes**					
1,2-dichloropropane	<0.92	<0.92	<0.92	<0.92		**Yes**					
1,2-dichlorotetrafluoroethane	<1.4	<1.4	<1.4	<1.4							
1,3,5-trimethylbenzene	1.1	1.5	11	0.28	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[c]**
1,3-butadiene	<0.13	<0.13	<0.13	<0.13							
1,3-dichlorobenzene	<1.2	<1.2	<1.2	<1.2							
1,4-dichlorobenzene	<0.089	<0.089	<0.089	0.14	**Yes**	**Yes**			**Yes**		**Likely No[c]**
2-butanone (MEK)	2.9	3	170	3.6	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
2-hexanone	<0.82	<0.82	1.9	<0.82	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[c]**
4-ethyltoluene	3.2	4.5	32	0.84	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[b]**
4-methyl-2-pentanone (MIBK)	<0.82	<0.82	<0.82	0.62	**Yes**	**Yes**			**Yes**		**Likely No[c]**
acetone	17	19	72	19	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[f]**
acrylonitrile	<0.17	<0.17	2	<0.17	**Yes**				**Yes**		**No[a]**
benzene	1.6	1.2	7.4	0.93	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[f]**
benzyl chloride	<0.11	<0.11	<0.11	<0.11							
bromodichloromethane	<0.069	0.14	<0.069	<0.069	**Yes**	**Yes**			**Yes**		**Likely No[c]**
bromoform	<2.1	<2.1	<2.1	<2.1		**Yes**					
bromomethane	<0.78	<0.78	<0.78	<0.78							
carbon disulfide	9.9	2.3	13	2.7	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[f]**
carbon tetrachloride	0.44	0.41	0.37	0.43	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[c]**
chlorobenzene	<0.92	<0.92	<0.92	<0.92		**Yes**					
chloroethane	<0.53	<0.53	<0.53	<0.53		**Yes**					
chloroform	0.24	0.28	<0.14	0.38	**Yes**	**Yes**		**Yes**	**Yes**		**Likely No[d]**
chloromethane	0.7	1.3	4.7	1.2	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
cis-1,2-dichloroethene	<0.79	<0.79	<0.79	<0.79		**Yes**					
cis-1,3-dichloropropene	0.057	<0.053	<0.053	<0.053	**Yes**				**Yes**		**No[a]**
cyclohexane	<3.4	1.4	11	0.52	**Yes**			**Yes**	**Yes**		**Likely No[b]**
dibromochloromethane	<0.20	<0.20	<0.20	<0.20		**Yes**					
dichlorodifluoromethane	0.24	7.8	16	3.7	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[e]**
ethanol	25	30	430	18	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[b]**
ethyl acetate	<3.6	<3.6	<3.6	<3.6							

APPENDIX F-4
BUILDING 4807 VAPOR INTRUSION PATHWAY DETERMINATION - AUGUST 2013
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Analyte	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA4	Analyte in indoor air	Analyte in groundwater	Analyte in outdoor air	Analyte in sub-slab vapor	Indoor air higher than or similar to outdoor air	Sub-slab vapor 10 times higher than indoor air	Analyte vapor intrusion pathway related
ethylbenzene	1.9	2.4	18	0.6	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
ethylene dibromide (EDB)	<0.19	<0.19	<0.19	<0.19		**Yes**					
hexachlorobutadiene	<0.25	<0.25	<0.25	<0.25		**Yes**					
isopropanol	27	14	17	19	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[b]**
isopropylbenzene	0.17	0.2	1.3	<0.98	**Yes**	**Yes**			**Yes**		**Likely No[c]**
m- & p-xylene	7.8	10	74	2.3	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
methyl tert-butyl ether (MTBE)	<0.72	<0.72	<0.72	<0.72		**Yes**		**Yes**		**Yes**	
methylene chloride	<0.69	<0.39	<0.69	<0.25		**Yes**		**Yes**		**Yes**	
naphthalene	0.56	0.58	1.7	0.3	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
n-butylbenzene	0.41	0.82	3.2	0.49	**Yes**	**Yes**			**Yes**		**Likely No[c]**
n-heptane	1.5	1.7	14	0.52	**Yes**		**Yes**		**Yes**		**No[a]**
n-hexane	25	34	41	55	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[b]**
o-xylene	2.8	3.9	28	0.76	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
p-isopropyltoluene	0.43	0.39	0.41	0.38	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[c]**
propene	<1.7	<1.7	<1.7	<1.7							
sec-butylbenzene	<1.1	<1.1	0.46	<1.1	**Yes**	**Yes**			**Yes**		**Likely No[c]**
styrene	0.27	0.27	1.9	0.19	**Yes**		**Yes**		**Yes**		**No[a]**
tetrachloroethene (PCE)	<1.4	<1.4	<1.4	<1.4		**Yes**					
tetrahydrofuran	1	0.14	<2.9	<2.9	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[b]**
toluene	11	11	58	4.5	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
trans-1,2-dichloroethene	<0.79	<0.79	<0.79	<0.79		**Yes**					
trans-1,3-dichloropropene	<0.17	<0.17	<0.17	<0.17							
trichloroethene (TCE)	<1.1	<1.1	<1.1	<1.1		**Yes**		**Yes**		**Yes**	
trichlorofluoromethane	6.7	7.1	3.9	5.3	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[b]**
vinyl chloride	<0.17	<0.17	<0.17	<0.17		**Yes**					

Notes:

[a]Not vapor intrusion pathway related. The analyte was (1) detected only in indoor air (not in groundwater or outdoor air or sub-slab-vapor) or (2) detected in indoor air and outdoor air, but not in groundwater or sub-slab vapor.

[b]Not likely vapor intrusion pathway related. The analyte was detected in indoor air and sub-slab vapor but not in groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[c]Not likely vapor intrusion pathway related. The analyte was detected in indoor air and groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations, and the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[d]Not likely vapor intrusion pathway related. The analyte was detected in indoor air, groundwater, and sub-slab vapor. However, the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[e]Likely vapor intrusion pathway related. Although the analyte is not a groundwater contaminant of concern, it was detected in indoor air and sub-slab vapor. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were at least 10 times higher than those detected in the indoor air.

[f]Vapor intrusion pathway related. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were 10 times higher than those detected in the indoor air.

APPENDIX F-5
BUILDING 4810 VAPOR INTRUSION PATHWAY DETERMINATION - MARCH 2013
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Analyte	N7-4810IA1	N7-4810IA2	N7-4810IA3	N7-4810IA4	N7-4810IA4[a]	Analyte in indoor air	Analyte in groundwater	Analyte in outdoor air	Analyte in sub-slab vapor	Indoor air higher than or similar to outdoor air	Sub-slab vapor 10 times higher than indoor air	Analyte vapor intrusion pathway related
1,1,1,2-tetrachloroethane	<1.4	<1.4	<1.4	<1.4	<1.4							
1,1,1-trichloroethane	0.52	0.37	<1.1	<1.1	<1.1	**Yes**			**Yes**	**Yes**		**Likely No[c]**
1,1,2,2-tetrachloroethane	<.085	<.085	<.085	<.085	<.085		**Yes**					
1,1,2-trichloroethane	<0.19	<0.19	<0.19	<0.19	<0.19		**Yes**					
1,1,2-trichlorotrifluoroethane	0.94	0.78	0.56	0.57	0.54	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
1,1-dichloroethane	<0.81	<0.81	<0.81	<0.81	<0.81				**Yes**		**Yes**	
1,1-dichloroethene	<0.79	<0.79	<0.79	<0.79	<0.79		**Yes**					
1,2,4-trichlorobenzene	<0.38	<0.38	<0.38	<0.38	<0.38		**Yes**					
1,2,4-trimethylbenzene	1.1	0.64	0.23	0.095	0.066	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
1,2-dichlorobenzene	<1.2	<1.2	<1.2	<1.2	<1.2		**Yes**					
1,2-dichloroethane	0.19	<0.11	<0.11	<0.11	<0.11	**Yes**	**Yes**			**Yes**		**Likely No[d]**
1,2-dichloropropane	<0.92	<0.92	<0.92	<0.92	<0.92		**Yes**					
1,2-dichlorotetrafluoroethane	0.45	0.51	<1.4	<1.4	<1.4	**Yes**				**Yes**		**No[b]**
1,3,5-trimethylbenzene	0.34	0.21	<2.0	<2.0	<2.0	**Yes**	**Yes**		**Yes**	**Yes**		**Likely No[e]**
1,3-butadiene	<0.13	<0.13	<0.13	<0.13	<0.13							
1,3-dichlorobenzene	<1.2	<1.2	<1.2	<1.2	<1.2				**Yes**		**Yes**	
1,4-dichlorobenzene	0.15	0.11	<0.089	<0.089	<0.089	**Yes**	**Yes**		**Yes**	**Yes**		**Likely No[e]**
2-butanone (MEK)	4.2	3	2	2.3	2.5	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
2-hexanone	<0.82	<0.82	<0.82	<0.82	<0.82		**Yes**		**Yes**		**Yes**	
4-ethyltoluene	0.97	0.58	0.22	<0.98	<0.98	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
4-methyl-2-pentanone (MIBK)	0.94	0.66	<0.82	<0.82	<0.82	**Yes**	**Yes**		**Yes**	**Yes**	**Yes**	**Yes[g]**
acetone	32	25	31	120	18	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
acrylonitrile	<0.17	<0.17	<0.17	<0.17	<0.17							
benzene	1.2	0.81	0.39	0.38	0.27	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
benzyl chloride	<0.11	<0.11	<0.11	<0.11	<0.11							
bromodichloromethane	<0.069	<0.069	<0.069	<0.069	<0.069		**Yes**		**Yes**		**Yes**	
bromoform	<2.1	<2.1	<2.1	<2.1	<2.1		**Yes**					
bromomethane	<0.78	0.21	0.13	0.22	0.16	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[f]**
carbon disulfide	0.45	2.1	0.65	<0.63	4.7	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
carbon tetrachloride	0.66	0.54	0.4	0.43	0.41	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
chlorobenzene	<0.92	<0.92	<0.92	<0.92	<0.92		**Yes**	**Yes**	**Yes**		**Yes**	
chloroethane	<0.53	<0.53	<0.53	<0.53	<0.53		**Yes**					
chloroform	0.35	0.21	<0.14	<0.14	<0.14	**Yes**	**Yes**		**Yes**	**Yes**		**Likely No[e]**
chloromethane	1.9	1.7	1.4	1.8	1.3	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
cis-1,2-dichloroethene	<0.79	<0.79	<0.79	<0.79	<0.79		**Yes**					
cis-1,3-dichloropropene	<0.053	<0.053	<0.053	<0.053	<0.053			**Yes**	**Yes**		**Yes**	
cyclohexane	0.76	0.48	<3.4	<3.4	<3.4	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[f]**
dibromochloromethane	<0.20	<0.20	<0.20	<0.20	<0.20		**Yes**					
dichlorodifluoromethane	3.9	3.3	<0.99	2.6	2.5	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
ethanol	220	120	33	12	16	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
ethyl acetate	1.7	0.73	<3.6	<3.6	<3.6	**Yes**				**Yes**		**No[b]**

APPENDIX F-5
BUILDING 4810 VAPOR INTRUSION PATHWAY DETERMINATION - MARCH 2013
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Analyte	N7-4810IA1	N7-4810IA2	N7-4810IA3	N7-4810IA4	N7-4810IA4[a]	Analyte in indoor air	Analyte in groundwater	Analyte in outdoor air	Analyte in sub-slab vapor	Indoor air higher than or similar to outdoor air	Sub-slab vapor 10 times higher than indoor air	Analyte vapor intrusion pathway related
ethylbenzene	1.8	1.6	4.4	0.13	<0.12	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
ethylene dibromide (EDB)	<0.19	<0.19	<0.19	<0.19	<0.19		**Yes**					
hexachlorobutadiene	<0.25	<0.25	<0.25	<0.25	<0.25		**Yes**					
isopropanol	21	18	68	28	9.8	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[f]**
isopropylbenzene	0.19	<0.98	<0.98	<0.98	<0.98	**Yes**	**Yes**			**Yes**		**Likely No[d]**
m- & p-xylene	4.2	4	11	0.33	0.23	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
methyl tert-butyl ether (MTBE)	0.69	0.43	<0.72	<0.72	<0.72	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
methylene chloride	1.3	0.81	<0.42	<0.28	<0.25	**Yes**	**Yes**			**Yes**		**Likely No[d]**
naphthalene	0.74	0.51	<0.095	<0.095	<0.095	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
n-butylbenzene	<1.1	0.14	0.24	<1.1	<1.1	**Yes**	**Yes**			**Yes**		**Likely No[d]**
n-heptane	0.9	0.52	<4.1	<4.1	<4.1	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
n-hexane	1.5	1.9	0.35	0.15	<3.5	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[f]**
o-xylene	1.3	1.1	2.2	0.097	0.088	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
p-isopropyltoluene	1.1	0.81	0.61	<1.1	1.3	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
propene	<1.7	<1.7	<1.7	<1.7	<1.7							
sec-butylbenzene	<1.1	<1.1	<1.1	<1.1	<1.1		**Yes**		**Yes**		**Yes**	
styrene	2	1	0.14	<0.85	<0.85	**Yes**		**Yes**		**Yes**		**No[b]**
tetrachloroethene (PCE)	0.66	<1.4	<1.4	<1.4	<1.4	**Yes**	**Yes**			**Yes**		**Likely No[d]**
tetrahydrofuran	0.5	0.65	2	0.2	<2.9	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
toluene	9.6	6.9	13	0.66	0.41	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
trans-1,2-dichloroethene	<0.79	<0.79	<0.79	<0.79	<0.79		**Yes**					
trans-1,3-dichloropropene	<0.17	<0.17	<0.17	<0.17	<0.17							
trichloroethene (TCE)	<1.1	<1.1	<1.1	<1.1	<1.1		**Yes**		**Yes**		**Yes**	
trichlorofluoromethane	1.9	1.5	1.2	1.3	1.2	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
vinyl chloride	<0.17	<0.17	<0.17	<0.17	<0.17		**Yes**					

Notes:

[a]Duplicate sample.

[b]Not vapor intrusion pathway related. The analyte was (1) detected only in indoor air (not in groundwater or outdoor air or sub-slab-vapor) or (2) detected in indoor air and outdoor air, but not in groundwater or sub-slab vapor.

[c]Not likely vapor intrusion pathway related. The analyte was detected in indoor air and sub-slab vapor but not in groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[d]Not likely vapor intrusion pathway related. The analyte was detected in indoor air and groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations, and the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[e]Not likely vapor intrusion pathway related. The analyte was detected in indoor air, groundwater, and sub-slab vapor. However, the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[f]Likely vapor intrusion pathway related. Although the analyte is not a groundwater contaminant of concern, it was detected in indoor air and sub-slab vapor. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were at least 10 times higher than those detected in the indoor air.

[g]Vapor intrusion pathway related. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were 10 times higher than those detected in the indoor air.

APPENDIX F-6
BUILDING 4810 VAPOR INTRUSION PATHWAY DETERMINATION - AUGUST 2013
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Analyte	N7-4810IA1	N7-4810IA2	N7-4810IA2[a]	N7-4810IA3	N7-4810IA4	Analyte in indoor air	Analyte in groundwater	Analyte in outdoor air	Analyte in sub-slab vapor	Indoor air higher than or similar to outdoor air	Sub-slab vapor 10 times higher than indoor air	Analyte vapor intrusion pathway related
1,1,1,2-tetrachloroethane	<1.4	<1.4	<1.4	<1.4	<1.4							
1,1,1-trichloroethane	0.4	0.25	0.24	<1.1	<1.1	**Yes**				**Yes**		**No[b]**
1,1,2,2-tetrachloroethane	<.085	<.085	<.085	<.085	<.085		**Yes**					
1,1,2-trichloroethane	<0.19	<0.19	<0.19	<0.19	<0.19		**Yes**					
1,1,2-trichlorotrifluoroethane	0.53	0.52	0.52	0.53	0.51	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
1,1-dichloroethane	<0.81	<0.81	<0.81	<0.81	<0.81							
1,1-dichloroethene	<0.79	<0.79	<0.79	<0.79	<0.79		**Yes**					
1,2,4-trichlorobenzene	1.4	<0.38	<0.38	<0.38	<0.38	**Yes**	**Yes**			**Yes**		**Likely No[d]**
1,2,4-trimethylbenzene	2.9	2	1.2	1.7	0.18	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
1,2-dichlorobenzene	0.39	<1.2	<1.2	<1.2	<1.2	**Yes**	**Yes**			**Yes**		**Likely No[d]**
1,2-dichloroethane	0.14	<0.11	<0.11	<0.11	<0.11	**Yes**	**Yes**			**Yes**		**Likely No[d]**
1,2-dichloropropane	<0.92	<0.92	<0.92	<0.92	<0.92		**Yes**					
1,2-dichlorotetrafluoroethane	<1.4	<1.4	<1.4	<1.4	<1.4							
1,3,5-trimethylbenzene	2.9	0.55	0.32	0.48	<2.0	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
1,3-butadiene	<0.13	<0.13	<0.13	<0.13	<0.13							
1,3-dichlorobenzene	<1.2	<1.2	<1.2	<1.2	<1.2							
1,4-dichlorobenzene	0.43	<0.089	<0.089	<0.089	<0.089	**Yes**	**Yes**		**Yes**	**Yes**		**Likely No[e]**
2-butanone (MEK)	63	3.4	3.3	5.5	1.9	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
2-hexanone	6	<0.82	<0.82	<0.82	<0.82	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
4-ethyltoluene	2.6	1.7	1	1.5	0.16	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[f]**
4-methyl-2-pentanone (MIBK)	<0.82	<0.82	0.8	<0.82	<0.82	**Yes**	**Yes**			**Yes**		**Likely No[d]**
acetone	<2.4	16	15	22	11	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
acrylonitrile	<0.17	<0.17	<0.17	<0.17	<0.17							
benzene	2	1.2	1	1.1	<0.091	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
benzyl chloride	0.54	<0.11	<0.11	<0.11	<0.11	**Yes**				**Yes**		**No[b]**
bromodichloromethane	<0.069	0.14	<0.069	<0.069	<0.069	**Yes**	**Yes**			**Yes**		**Likely No[d]**
bromoform	<2.1	<2.1	<2.1	<2.1	<2.1		**Yes**					
bromomethane	0.83	<0.78	<0.78	<0.78	<0.78	**Yes**				**Yes**		**No[b]**
carbon disulfide	<3.1	19	3.2	6.3	29	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
carbon tetrachloride	0.43	0.43	0.46	0.43	0.38	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
chlorobenzene	<0.92	<0.92	<0.92	<0.92	<0.92		**Yes**					
chloroethane	<0.53	<0.53	<0.53	<0.53	<0.53		**Yes**					
chloroform	<0.14	<0.14	<0.14	<0.14	<0.14		**Yes**					
chloromethane	<0.83	1.3	1.2	1.8	1.1	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
cis-1,2-dichloroethene	<0.79	<0.79	<0.79	<0.79	<0.79		**Yes**		**Yes**			
cis-1,3-dichloropropene	<0.053	<0.053	<0.053	<0.053	<0.053							
cyclohexane	1.5	0.87	0.52	0.92	<3.4	**Yes**		**Yes**		**Yes**		**No[b]**
dibromochloromethane	<0.20	<0.20	<0.20	<0.20	<0.20		**Yes**					
dichlorodifluoromethane	2.3	2.4	2.3	2.4	2.3	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
ethanol	1,800	57	56	31	16	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[f]**
ethyl acetate	<3.6	0.67	<3.6	<3.6	<3.6	**Yes**				**Yes**		**No[b]**

APPENDIX F-6
BUILDING 4810 VAPOR INTRUSION PATHWAY DETERMINATION - AUGUST 2013
(Page 2 of 2)

Analyte	N7-4810IA1	N7-4810IA2	N7-4810IA2[a]	N7-4810IA3	N7-4810IA4	Analyte in indoor air	Analyte in groundwater	Analyte in outdoor air	Analyte in sub-slab vapor	Indoor air higher than or similar to outdoor air	Sub-slab vapor 10 times higher than indoor air	Analyte vapor intrusion pathway related
ethylbenzene	2.4	1.3	0.85	1.4	0.17	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
ethylene dibromide (EDB)	2.2	<0.19	<0.19	<0.19	<0.19	**Yes**	**Yes**			**Yes**		**Likely No[d]**
hexachlorobutadiene	<0.25	<0.25	<0.25	<0.25	<0.25		**Yes**					
isopropanol	<2.5	5.9	5.2	58	39	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
isopropylbenzene	0.25	<0.98	<0.98	<0.98	<0.98	**Yes**	**Yes**			**Yes**		**Likely No[d]**
m- & p-xylene	11	5.2	3.3	5.5	0.66	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
methyl tert-butyl ether (MTBE)	<0.72	<0.72	<0.72	<0.72	<0.72		**Yes**					
methylene chloride	<0.28	<0.25	<0.17	<0.21	<0.69		**Yes**					
naphthalene	1.1	0.3	0.19	0.31	0.14	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
n-butylbenzene	0.9	0.33	0.53	0.3	<1.1	**Yes**	**Yes**			**Yes**		**Likely No[d]**
n-heptane	2.3	1.3	0.67	1.2	<4.1	**Yes**		**Yes**		**Yes**		**No[b]**
n-hexane	3.4	2.2	1.5	2.6	0.47	**Yes**		**Yes**		**Yes**		**No[b]**
o-xylene	3.5	1.8	1.1	1.8	0.22	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
p-isopropyltoluene	3.8	3.4	0.29	1.1	0.24	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[g]**
propene	<1.7	<1.7	<1.7	<1.7	<1.7							
sec-butylbenzene	<1.1	<1.1	<1.1	<1.1	<1.1		**Yes**					
styrene	2	0.2	0.12	0.16	<0.85	**Yes**		**Yes**		**Yes**		**No[b]**
tetrachloroethene (PCE)	<1.4	<1.4	<1.4	<1.4	<1.4		**Yes**					
tetrahydrofuran	<2.9	2.3	3.4	11	0.52	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
toluene	10	5.9	3.5	5.9	1	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
trans-1,2-dichloroethene	<0.79	<0.79	<0.79	<0.79	<0.79		**Yes**					
trans-1,3-dichloropropene	0.31	<0.17	<0.17	<0.17	<0.17	**Yes**				**Yes**		**No[b]**
trichloroethene (TCE)	<1.1	<1.1	<1.1	<1.1	<1.1		**Yes**					
trichlorofluoromethane	1.3	1.4	1.3	1.4	1.2	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
vinyl chloride	<0.17	<0.17	<0.17	<0.17	<0.17		**Yes**					

Notes:

[a]Duplicate sample.

[b]Not vapor intrusion pathway related. The analyte was (1) detected only in indoor air (not in groundwater or outdoor air or sub-slab-vapor) or (2) detected in indoor air and outdoor air, but not in groundwater or sub-slab vapor.

[c]Not likely vapor intrusion pathway related. The analyte was detected in indoor air and sub-slab vapor but not in groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[d]Not likely vapor intrusion pathway related. The analyte was detected in indoor air and groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations, and the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[e]Not likely vapor intrusion pathway related. The analyte was detected in indoor air, groundwater, and sub-slab vapor. However, the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[f]Likely vapor intrusion pathway related. Although the analyte is not a groundwater contaminant of concern, it was detected in indoor air and sub-slab vapor. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were at least 10 times higher than those detected in the indoor air.

[g]Vapor intrusion pathway related. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were 10 times higher than those detected in the indoor air.

APPENDIX G

RESPONSES TO REGULATORY COMMENTS

RESPONSES TO COMMENTS

Environmental Restoration Program
Vapor Intrusion Investigation Report
Operable Unit 6
Edwards Air Force Base, California
Draft, April 2014

Reviewer	Comment #	Comment	Response
Bruce Lewis (DTSC)	General Comment 1	Stewardship of Subsurface Contamination. DTSC's Geological Services Unit (GSU) concurs with the "no further action" recommendation for Building 4810. Buildings 4806 and 4807, however, while currently exhibiting minimal risk, warrant future monitoring due to the temporal and spatial variability of contaminants. A long-term monitoring plan should be prepared by the Air Force to demonstrate that benzene soil gas conditions remain unchanged at these buildings. **DTSC RESPONSE:** DTSC does not concur with the establishment of 2,250 µg/L of benzene in groundwater from monitoring well N3-MW20 as being the trigger point to perform additional indoor air sampling in Buildings 4806 and 4807 for the following reasons: 1. Establishment of a trigger level that may indicate that a potential indoor air cancer risk of 1 x 10^{-4} (upper end of the risk management range) already exists within the building is not being proactive in protecting the health of workers in Buildings 4806 and 4807. To be protective, the benzene concentration in groundwater used as a trigger for additional indoor air monitoring would more appropriately be based on a potential indoor air cancer risk of 1 x 10^{-6}. 2. Establishment of a trigger level for additional indoor air monitoring based solely on benzene concentrations in groundwater assumes that the	Because the purpose of the document is to present the results of the assessment of potential VIP risk, long-term monitoring determinations are more appropriately made under the Five-Year Review process. However, the following text has been added to Recommendation 3 in Section 4.2: "Groundwater sampling of well N3-MW20 as part of the ongoing remedial action is recommended until Buildings 4806 and 4807 are removed. Well N3-MW20 groundwater sampling results can be used as an indicator for when indoor air sampling may be needed if building demolition is delayed. For example, the most recent benzene concentration detected in well N3-MW20 (approximately 12 feet upgradient of Buildings 4806 and 4807) was 450 μg/L in May 2012, and the highest associated indoor air cancer risk based upon the indoor air samples collected at Buildings 4806 and 4807 was 2 x 10^{-5}, and the highest indoor HI was 0.6. The cancer risk appears to be the driver for indoor air risk, and a simple extrapolation of the benzene concentration to a hypothetical trigger of 2,250 μg/L may indicate a potential indoor air cancer risk of 1 x 10^{-4}. If the future benzene concentration in well N3-MW20 were ever to increase and exceed 2,250 μg/L and if Buildings 4806 and 4807 still exist, indoor air sampling in the form of personal air sampling equipment may be warranted to ensure that the indoor air risk is still in the protective range for the site workers under the industrial land use scenario. However, the current data (450 μg/L in May 2012) and propensity for benzene in groundwater to continue to decline due to biodegradation/natural attenuation processes makes this hypothetical scenario unlikely."

Reviewer	Comment #	Comment	Response
		source of sub-slab contamination is due exclusively to groundwater. Characterization performed at the site to date cannot rule out the possibility that contaminant sources exist in the vadose zone beneath the buildings. Therefore, a benzene groundwater trigger may not be conservative enough for understanding risk exposure. 3. DTSC's 2011 Vapor Intrusion Guidance states that the closer the sampled media is to the receptor, the more relevant the data are for estimating exposure and the greater its weight of evidence. Accordingly, soil vapor or sub-slab vapor samples would yield data of greater significant than the groundwater for evaluating changes in indoor air exposure. While DTSC concurs with the recommendation that monitoring the potential intrusion of vapor into indoor air in Buildings 4806 and 4807 and the potential risk to workers is warranted, an alternative monitoring approach other than just groundwater should be considered until the buildings are demolished. DTSC recommends that indoor air and subslab sampling be performed on a quarterly basis.	**FOLLOW-UP RESPONSE:** Demolition of Buildings 4806 and 4807 has been delayed until Fiscal Year 2018, therefore NASA and the Air Force are planning an additional Winter VIP investigation in 2016. Investigation results and recommendations will be presented in the Second Five-Year Review Report. The recommendation to monitor well N3-MW20 has been removed and replaced with the proposed and planned Winter VIP investigation to include indoor and outdoor air and subslab vapor sampling.
Bruce Lewis (DTSC)	General Comment 2	Presentation of Data. Tables presenting subslab and outdoor data should be generated along with figures displaying the data. **DTSC RESPONSE:** DTSC agrees that the generation of figures presenting the results of the sub-slab, indoor air, and outdoor	It would not be feasible to generate reasonably-sized legible figures to accommodate the quantity of outdoor air and sub-slab vapor data generated during the investigation. Extracting the tables from the main report and reviewing them next to the figures would provide a similar presentation to that requested.

Reviewer	Comment #	Comment	Response
		ambient air sampling for all detected VOCs during each sampling event is unwarranted. However, it seems that it would have been a simple task to add that data for TCE and benzene, the "indicator chemicals", in data boxes on the 11x17 inch figures (Figures 8 and 9). DTSC does not agree that extracting the tables from the main report and reviewing them next to the figures provides a similar presentation. Particularly since the results of the sub-slab, indoor air, and ambient outdoor samples are not presented together in one table. The indoor air results are presented in tables, but the sub-slab and outdoor ambient air results are only presented in the text. A good report is one that presents the data in a manner that allows the reader to easily process it and formulate a conclusion instead of requiring the reader to search for relevant information.	**FOLLOW-UP RESPONSE:** As DTSC's review of the subject document and data analysis appears to be complete no further refinements to the figures are proposed, however, DTSC's request for more data presentation on figures will be considered in future investigation summary documents. The Vapor Intrusion Investigation Report Addendum reporting on the February 2016 sampling event will include a figure indicating indoor and outdoor air and sub-slab vapor benzene sampling results.
Kimberly Gettmann (DTSC)	Specific Comment 1	Section 1.8.1 - Toxicology Values for Carcinogens. The text states that, "IURs [inhalation unit risks] are developed using a mathematical model that uses data from the results of human epidemiological studies or laboratory animal studies to estimate the dose corresponding to a 1 in a 1,000,000 probability of developing cancer." Please note, according to the Integrated Risk Information System (IRIS) the IUR is "the upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration of 1 microgram per cubic meter (1 $\mu g/m^3$) in air" (USEPA, 2008). The IUR is not the probability of developing cancer. Please revise for accuracy. **DTSC RESPONSE:**	The text describes the development of the IUR, not the definition, and the text does not define IUR as "the probability of developing cancer" as the comment seems to infer. For clarity the following sentence will be added to the paragraph: "The IUR is the upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration of 1 $\mu g/L$ in water, or 1 $\mu g/m^3$ in air (USEPA 2014)."

Reviewer	Comment #	Comment	Response
		Concur. HERO reviewed the Final Report and the text was incorporated. No additional response is necessary.	
Kimberly Gettmann (DTSC)	General Comment 2	Section 3.3.2.1 - Building 4807 Indoor Air Results. Under the subheading "August 2013," the text states that the benzene concentration is the only "concentration in the sample collected at N3-4807IA3 [that] exceeded the IASL [indoor air screening level]." The concentration of benzene in sample N3-4807IA1 was detected at the IASL and this should be included in the sentence quoted. **DTSC RESPONSE:** Please note, in HERO's original comment we stated that the concentration of benzene in sample N3-4807IA1 was detected at the IASL, not that it exceed the IASL. HERO recommended that this sample be called out and discussed in the text. HERO does not concur with the Air Force's response and recommends that this sample be called out and discussed in the text.	The comment is inaccurate. The concentration detected in the sample collected from N3-4807IA1 was 1.6 $\mu g/m^3$, which equals (does not exceed) the 1.6-$\mu g/m^3$. No change was made to the document. **FOLLOW-UP RESPONSE:** The referenced paragraph has been modified as follows (see red font): "The benzene concentrations detected in indoor air samples were 1.6 $\mu g/m^3$ (N3-4807IA1), 1.2 $\mu g/m^3$ (N3-4807IA2), 7.4 $\mu g/m^3$ (N3-4807IA3), and 0.93 $\mu g/m^3$ (N3-4807IA4). Although all of these concentrations exceeded the CA-IASL (0.42 $\mu g/m^3$), only the concentration in the sample collected at N3-4807IA3 exceeded the IASL (1.6 $\mu g/m^3$). The sample collected at N3-4807IA1 equaled the 1.6 $\mu g/m^3$ – IASL."
Kimberly Gettmann (DTSC)	General Comment 3	Section 3.3.3.2 - Building 4810 Indoor Air Results - Other Chemicals Detected. Under the subheading "March 2013" the text states that "only benzene and naphthalene were detected above respective IASLs in indoor air during the March 2013 event at Building 4810." According to Table 12, naphthalene was detected at two sampling locations, N7-4810IA1 and N7-4810IA2, at concentrations greater than the IASL. However, naphthalene is not listed under Section 3.3.3.2 on page 3-22. Please correct the discrepancy. **DTSC RESPONSE:** Concur.	The following bullet item was added to the list: naphthalene concentrations ranged from 0.51 $\mu g/m^3$ (N7-4810IA2) to 0.74 $\mu g/m^3$ (N7-4810IA1);

Reviewer	Comment #	Comment	Response
Kimberly Gettmann (DTSC)	General Comment 4	Building 4807. HERO disagrees that benzene is not a vapor intrusion (VI) related COC at Building 4807. Benzene was detected in the indoor air at concentrations ranging from 1.7 $\mu g/m^3$ to 8.3 $\mu g/m^3$ during the March 2013 sampling event and 1.2 $\mu g/m^3$ to 7.4 $\mu g/m^3$ during the August 2013 sampling event. A majority of the benzene concentrations detected in indoor air are greater than the IASL (USAF-preferred screening level) and CA-IASL (DTSC-preferred screening level). HERO acknowledges that benzene was detected at low levels in the sub-slab soil vapor during both sampling events. However, benzene was detected at concentrations up to 4-times greater than the USAF-preferred IASL and up to 19-times greater than the DTSC-preferred IASL, and is a COC in groundwater. Furthermore, Building 4807 is next to Building 4806 where benzene was identified as a VI COC and the groundwater is predicted to continue to migrate beneath these buildings. HERO recommends including benzene as a VI related COC for Building 4807 and to update the text accordingly and Tables 8, 9, 10, 11, 20, 21, F-3,and F-4. **DTSC RESPONSE:** HERO appreciates the Air Force's (AF's) response to include benzene as a VIP-related analyte at Building 4807 based on the August results. However, we do not concur with the response in its entirety. The only indoor air benzene sample in Building 4807 that was considered VIP-related was from location N3-4807IA2 (1.2 $\mu g/m^3$). The concentration of benzene in the adjacent sub-slab sample location was 14 $\mu g/m^3$ (NS-4807SS2).	The Appendix F tables have been revised to retain contaminants as VIP-related where: either the main sample or the field duplicate sample met the criteria for a VIP-related compound, any of the individual samples met the criteria for a VIP-related compound, regardless if the compound is a groundwater COPC, and (in addition to meeting other criteria) sub-slab contaminant concentrations equaled (as well as exceeded) ten times indoor air contaminant concentrations. All samples meeting the criteria for each analyte have been retained and presented in VIP-Related Indoor Air Risk Calculation Tables (Tables 16 through 25 in the draft version of the report, now Tables 17 through 28 with new table additions based on RPM comments). The text related to the tables has been revised accordingly. The VIP-Related Indoor Air Risk Calculation Tables have been revised to include color coding to differentiate samples that met the VIP-related criteria from those that did not. Benzene is included as a VIP-related analyte at Building 4807 based on August results. Where applicable, the DTSC-preferred approach tables were revised to include the benzene IASL based on the latest non-cancer reference exposure level noted in General Comment 6 below. **FOLLOW-UP RESPONSE:** The following text has been added to Section 3.5.3: Additional uncertainty related to the assessment procedure described in Section 3.5.2 includes the application of the 10-time ratio. One of the lines of evidence in determining

Reviewer	Comment #	Comment	Response
		The benzene detected in samples N3-4807IA1, N3-4807IA3, and N3-4807IA4 were not considered VIP-related detections mainly because sub-slab detections were not 10-times higher than indoor air, as was the case at N3-4807IA2/NS-4807SS2. The indoor air concentrations of benzene at those three locations were 1.6 $\mu g/m^3$, 7.4 $\mu g/m^3$, and 0.93 $\mu g/m^3$, respectively and sub-slab concentrations were 8.4 $\mu g/m^3$ (N3-4807SS1), 11 $\mu g/m^3$ (N3-4807SS3), and 8.2 $\mu g/m^3$ (N3-4807SS4). Benzene is considered VIP-related at one indoor air sample but when it is detected in the indoor air at other sampling locations in the same building, those detections are considered not likely VI-related. Benzene is not the only analyte this occurs with according to Tables 17 through 28. HERO considers this an uncertainty and should be discussed in the uncertainty section of the report including the potential for under and or over estimating cancer risks and noncancer hazards.	if a VOC is VIP-related is whether the sub-slab vapor concentrations compared to those in indoor air are 10 times higher. The 10-time ratio is equivalent to an attenuation factor of 0.1, which is 2 times the attenuation factor of 0.05 recommended by DTSC. Therefore, combined with other lines of evidence, it is reasonable to consider that the indoor air VOCs are not VIP-related if the sub-slab vapor concentrations are not 10 times higher than those detected in the indoor air. Application of 2 times the DTSC-recommended attenuation factor may overestimate the cancer risks and noncancer hazards. However, because the evaluation is applied on a point by point basis, it is possible that a VOC could be determined to be VIP-related at one sampling point within a building but not at another sampling point within the same building, potentially resulting in an underestimate of cancer risks and noncancer hazards.
Kimberly Gettmann (DTSC)	General Comment 5	Section 4.2 - Recommendations for Buildings 4806 and 4807. For Building 4806, when using the DTSC-preferred toxicity criteria, the potential cancer risks from VI related COCs ranged from 3E-06 to 4E-06 and from 2E-06 to 3E-06 during the March and August 2013 sampling events, respectively. For Building 4807, the potential cancer risks from VI related COCs ranged from 4E-06 to 2E-05 and from 2E-06 to 2E-05 during the March and August 2013 sampling events, respectively. The risks for both buildings are within the risk management range of 1E-06 to 1E-04. The recommendation for these two buildings is that a VIP	a. and b. The following text has been added to Recommendation 3 in Section 4.2: "Groundwater sampling of well N3-MW20 as part of the ongoing remedial action is recommended until Buildings 4806 and 4807 are removed. Well N3-MW20 groundwater sampling results can be used as an indicator for when indoor air sampling may be needed if building demolition is delayed. For example, the most recent benzene concentration detected in well N3-MW20 (approximately 12 feet upgradient of Buildings 4806 and 4807) was 450 $\mu g/L$ in May 2012, and the highest associated indoor air cancer risk based upon the indoor air samples collected at Buildings 4806 and 4807 was 2 x 10^{-5},

Reviewer	Comment #	Comment	Response
		monitoring program is not necessary for several reasons: 1) the estimated cancer risks and noncancer hazards are within the risk management range and less than 1, respectively, and 2) both buildings are slated for demolition as early as Fiscal Year 2016 and no replacement structures are planned. HERO has several comments regarding the recommendations for Buildings 4806 and 4807. a. The cancer risk from VI related COCs using DTSC-preferred toxicity criteria was within the risk management range. The estimated cancer risk at Building 4807, mainly due to benzene at one sampling location, was 2E-05 during both sampling events. Please address the need to protect current workers in the building until the buildings are demolished. HERO defers to the DTSC Project Manager for all risk management decisions. b. While Buildings 4806 and 4807 are slated for demolition, what contingency is in place if these buildings are not demolished and continued to be occupied? Especially given that the benzene plume is projected to continue to migrate beneath the buildings. c. Furthermore, while no replacement structures are planned, HERO recommends a written statement be included in the Base Master Plan to ensure that if a new structure is built on the site, the vapor	and the highest indoor HI was 0.6. The cancer risk appears to be the driver for indoor air risk, and a simple extrapolation of the benzene concentration to a hypothetical trigger of 2,250 μg/L may indicate a potential indoor air cancer risk of 1 x 10^{-4}. If the future benzene concentration in well N3-MW20 were ever to increase and exceed 2,250 μg/L and if Buildings 4806 and 4807 still exist, indoor air sampling in the form of personal air sampling equipment may be warranted to ensure that the indoor air risk is still in the protective range for the site workers under the industrial land use scenario. However, the current data (450 μg/L in May 2012) and propensity for benzene in groundwater to continue to decline due to biodegradation/natural attenuation processes makes this hypothetical scenario unlikely." Worker protection, especially in light of the fact that most of the indoor risks are likely associated with chemical usage within the buildings, are more appropriately addressed through occupational safety channels thus the recommendation of indoor air monitoring in the form of personal air sampling equipment. The following text has also been added to Recommendation 3 in Section 4.2: "Unlike Buildings 4806 and 4807, a replacement building is planned for Building 4810. As presented in Section 3.2, in order to evaluate whether sub-slab vapor sources have the potential to pose unacceptable health risks due to vapor intrusion in the future if site conditions were to change such as new building construction, the sub-slab vapor sampling results were compared on a sample-by-sample basis to the respective

Reviewer	Comment #	Comment	Response
		intrusion pathway is re-evaluated prior to construction to account for the site conditions at that time. **DTSC RESPONSE:** HERO concurs and appreciates the recommendation to include groundwater monitoring well N3-MW20 as part of the ongoing remedial action until Buildings 4806 and 4807 are demolished. However, HERO does not concur with the benzene groundwater trigger level of 2,250 µg/L for Buildings 4806 and 4807. This trigger level may indicate a potential indoor air cancer risk of 1×10^{-4}. The benzene groundwater trigger level is discussed in the following sections of the VI report: Executive Summary (page xii) and Section 4.2 (pages 4-2 and 4-3). HERO does not concur with setting a trigger level for groundwater at a 1×10^{-4} risk level. This is at the upper end of the risk management range. Please refer to DTSCs response to General Comment #1 related to establishment of a benzene concentration in groundwater trigger level for monitoring. The highest associated indoor air cancer risk based on the indoor air samples collected at the Buildings was 2×10^{-5}. The cancer risk is in the middle of the risk management range of 1×10^{-6} to 1×10^{-4}. Please refer to DTSCs response to General Comment #1 related to protection of workers associated with vapor intrusion. HERO does not concur with the method described in the new text added in the Executive Summary and Section	SVSLs. As no VOCs detected in the sub-slab vapor samples collected during either season from Building 4810 exceeded the respective SVSLs or California-SVSLs, no changes to construction specifications such as the inclusion of vapor barriers are warranted for the Building 4810 replacement." c. The following has been added as Recommendation 5 in Section 4.2: "Although the purpose of this report is to assess risk to workers under current conditions assuming the industrial exposure scenario, indoor air risks should be re-assessed in a manner similar to that described in Recommendation 3, if site conditions change. Such changes may include new building construction or alteration of existing building foundations." Discussions regarding revising NASA's Master Plan to include this recommendation are in progress. **FOLLOW-UP RESPONSE:** Please see response to Bruce Lewis' General Comment #1 regarding the planned Winter VIP investigation event. Additionally, NASA is currently in the process of updating their Master Plan to include a vapor barrier requirement for new construction. A vapor barrier has been included in the construction specifications for the replacement building to be constructed near the footprint of Building 4810 (demolished in September 2014).

Reviewer	Comment #	Comment	Response
		3.2 that "in order to evaluate whether sub-slab vapor sources have the potential to pose unacceptable health risks due to vapor intrusion in the future if site conditions were to change such as new building construction, the sub-slab vapor sampling results were compared on a sample-by-sample basis to the respective SVSLs." For several reasons listed below, HERO does not concur with comparing the sub-slab samples to the SVSLs which are based on an attenuation factor of 0.001. 1. Any new construction may add utility trenches (water, sewer, electrical, communication) that could create new preferential vapor pathways that are not accounted for by using the sub-slab samples collected under the current building conditions. 2. Building size/area may be different than the current building. 3. The sub-slab samples are specific for the conditions of the current buildings, including but not limited to HVAC and whether the building is under negative or positive pressure, and are not appropriate samples to use to base whether future sampling is warranted. 4. The attenuation factor of 0.001 is not an appropriate attenuation factor to use for sub-slab samples as DTSC has previously stated in past correspondence. 5. Soil gas data would be more appropriate for	

Reviewer	Comment #	Comment	Response
		determining the soil vadose zone and future conditions.	
Kimberly Gettmann (DTSC)	General Comment 6	Benzene Noncancer Toxicity Criteria. HERO recommends using the recently revised CalEPA Office of Environmental Health Hazard Assessment (OEHHA) reference exposure level (REL) for benzene of 3 $\mu g/m^3$. For additional information please see the recently revised Johnson and Ettinger Models with the HERO recommended toxicity criteria and rationale. It can be located at: https://dtsc.ca.gov/assessingrisklhumanrisk2.cfm. Please update the toxicity criteria listed in Table 2, and the noncancer indoor air screening level and hazard listed in Tables 5, 7, 9, 11, 13, 15, 17, and 19. The noncancer DTSC-preferred IASL for benzene will now be 13.1 $\mu g/m^3$ instead of 131 $\mu g/m^3$. Please resubmit the Tables for HERO's review. **DTSC RESPONSE:** Concur.	Tables 2, 5, 7, 9, 11, 13, 15, 17, 19, and new Table 25 were revised and sums re-calculated where appropriate using the new benzene values.
Kimberly Gettmann (DTSC)	Specific Comment 1	Appendix D - Tables D-7, D-8, D-9, D-10, D-11,D-12, D-13, D-14, D-15, and D-17. Please include an explanation as to what the shading represents under "Notes", e.g., detected chemical concentrations that are shaded are greater than the screening level. **DTSC RESPONSE:** Concur. However, HERO was not able to review the addition to Table D-7 since these tables were not provided on the CD for review.	The comment is partially inaccurate. Tables D-8, D-9, D-10, D-11, D-12, D-13, D-14 and D-15 already include the following note on the final page of each table: "Shaded cell indicates sample concentration exceeds IASL or CA-IASL." This note has been added to Table D-7. There is no Table D-17 in the draft version document. **FOLLOW-UP RESPONSE:** Table D-7 is included in the Final Report.

Reviewer	Comment #	Comment	Response
Kimberly Gettmann (DTSC)	Specific Comment 2	Appendix F - Tables F-1, F-3, F-4, and F-6. Under "Notes", the text is incomplete for Notes "c", "e", and "f" with portion of the statements missing. Please revise to include the entire text statement for those "Notes." **DTSC RESPONSE:** Concur.	The final version hard copy will be printed to show all notes. In the interim, the electronic copy of the draft version of the document may be reviewed, all notes are visible on that medium.
Kimberly Gettmann (DTSC)	Specific Comment 3	Appendix F - Table F-4. The title of Table F-4 is "Building 4810 Vapor Intrusion Pathway Determination-August 2013." The results presented in Table F-4 are actually for Building 4807 and not Building 4810. Please correct for accuracy. **DTSC RESPONSE:** Concur, however Table F-4 on the CD still says "Building 4810". Please make sure this correction is done.	The title of Table F-4 has been revised to: "Building 4807 Vapor Intrusion Pathway Determination - August 2013". **FOLLOW-UP RESPONSE:** Table F-4 has been corrected and is included in the Final Report.
		NEW HERO COMMENTS ON FINAL REPORT	
Kimberly Gettmann (DTSC)	New Comment 1	Please note that the comments submitted were from Kimberly Gettmann (DTSC) and not Michael Wade. No response is needed for this comment.	
	New Comment 2, Section 3.3.1	The text in Section 3.3.1 states the results from the indoor air samples from Building 4806 are listed in Tables 4 through 7. The Tables should be 5 through 8. Please revise the text for accuracy.	The referenced text has been revised to indicate Tables 5 through 8.
	New Comment 3, Section 3.3.2	The text in Section 3.3.2 states the results from the indoor air samples from Building 4807 are listed in Tables 8 through 11. The Tables should be 9 through 12. Please revise the text for accuracy.	The referenced text has been revised to indicate Tables 9 through 12.

Reviewer	Comment #	Comment	Response
	New Comment 4, Section 3.3.3	The text in Section 3.3.2 states the results from the indoor air samples from Building 4810 are listed in Tables 12 through 15. The Tables should be 13 through 16. Please revise the text for accuracy.	The referenced text has been revised to indicate Tables 13 through 16.
Dan Gallagher (DTSC)	Specific Comment 1	Detection Limits. An explanation should be provided for the elevated indoor air detection limits for trichloroethene (TCE) and tetrachloroethene (PCE). **DTSC RESPONSE:** The AF's response and revisions to the document are acceptable.	Since the reporting limits for PCE and TCE in indoor and outdoor air samples under method TO-15 (low level) match those proposed in Worksheet 15 of the work plan (AECOM 2013) this response assumes that the comment refers to sub-slab sample results analyzed in accordance with standard level TO-15 (Air Technology Laboratories, Inc. Method TO15-SC-U). For the sub-slab samples, although the Method TO15-SC-U reporting limits (RLs) and method detection limits (MDLs) are approximately two-times those presented in the work plan, the non-detected (ND) results for PCE and TCE are significantly lower than the proposed soil vapor screening levels. Additionally, the ND results are considered ND at less than the MDLs, which are approximately one order of magnitude lower than the RLs. Therefore, the data meet the project objectives for PCE and TCE as reported. The difference between the RLs/MDLS proposed in the work plan and the RLs/MDLs reported by the laboratory are a result of the dilution caused by the pressurization of the canister with laboratory grade nitrogen to facilitate analysis. Section E.2.15 of the QASR has been amended to include the following text: "For the sub-slab samples, the Method TO15-SC-U RLs and MDLs are approximately two-times those presented in

Reviewer	Comment #	Comment	Response
			the work plan due to dilution caused by the pressurization of the canister with laboratory grade nitrogen to facilitate analysis. The ND results are considered ND at less than the MDLs, which are approximately one order of magnitude lower than the RLs. Therefore, the data meet the project objectives for PCE and TCE as reported."
Dan Gallagher (DTSC)	Specific Comment 2	Screening of Contaminant Data. A determination was made on whether indoor air sampling results exceeded outdoor air concentrations. The statistical or non-statistical methodology used for this determination should be discussed in the report. **DTSC RESPONSE:** The AF's response and revision to the document are acceptable.	No statistical methodology was applied to ascertain whether indoor air results exceeded those in outdoor air and the non-statistical methodology has been clarified in Section 3.5.2. The first sentence of Section 3.5.2 has been revised to read: "The VOCs detected in the indoor air samples were assessed using database queries to determine the likelihood of originating from the subsurface via the VIP based upon the interpretation of several lines of evidence (Appendix F), including:"… [see bullet 2] detection in the outdoor air, and the outdoor air concentrations compared to those in the indoor air at one order of magnitude higher.
Dan Gallagher (DTSC)	Specific Comment 3	Attenuation Factors. Where the occurrence of a contaminant in indoor appears to be attributable to vapor intrusion, an estimation of the chemical's attenuation factor should be provided and discussed in the report. **DTSC RESPONSE:** The AF's response is acceptable.	Many of the chemicals detected in indoor air are used in the building and the source may be those activities. To make such an assessment of attenuation factors, data differentiating the amount of a chemical originating from the sub-slab vapor versus building activities would be required and no such data were collected during the investigation.

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Review of the Responses to Environmental Protection Agency Comments For Draft Vapor Intrusion Investigation Report, Operable Unit 6, Edwards Air Force Base, California, April 2014

Responses to comments are shown below in blue text. Where excerpts from the text of the report are included in the response, the text is shown in purple.

GENERAL COMMENTS

1. Based on review of the Draft Vapor Intrusion Investigation Report; Operable Unit (OU) 6, National Aeronautics and Space Administration Armstrong Flight Research Center, Edwards Air Force Base, California (VI Report), it is unclear whether investigation of buildings in addition to the three selected (i.e., Buildings 4806, 4807, and 4810) is warranted. According to Section 1.3.2, Potential VIP Risks at Operable Unit 6 and Buildings 4806, 4807, and 4810, "the selection of buildings for further VIP [vapor intrusion pathway] investigation was based on a screening procedure...[which] identified areas of groundwater where the concentration of chemicals was above a level that corresponded to an acceptable risk in indoor air. The next step was to identify whether there were any buildings that were within this area, and then to determine if these buildings were occupied on a routine basis." Several issues were identified in review of this screening process which warrant further discussion or clarification:

a. Section 1.3.2 states that as part of the above-mentioned screening effort, two groundwater volatile organic compounds (VOCs) [i.e., trichloroethene (TCE) and benzene] were selected as indicator chemicals based on "their high degree of carcinogenic potential and on their representativeness of the groundwater impact beneath the site." However, no data or figures are presented to demonstrate that TCE and benzene are representative of the groundwater impact beneath the site. As such, it is unclear whether the extents of all contaminants are within the boundaries of the TCE and benzene plumes and if any buildings were excluded from investigation that are, in fact, within 100 feet from a contaminant source or plume. Please revise the VI Report to provide data and figures to demonstrate that TCE and benzene are representative of the groundwater impact beneath the site and that no buildings were inappropriately excluded from the VI assessment.

b. Numerous buildings are present in the vicinity of Buildings 4806, 4807, and 4810 which appear to be located within 100 feet of the groundwater contaminant plumes (e.g., 4800, T-20, 4827, etc.); however, the VI Report does not explain why these buildings were not investigated. Please revise the VI Report to provide rationale for the exclusion of each of the buildings within 100 feet of the groundwater contaminant plumes as depicted on Figure 3 from the investigation.

c. The first paragraph on page 3-37 (Section 3.5.3, Uncertainties) indicates that the results of the indoor air sampling at Buildings 4806 and 4807 may be biased by the presence of large, open roll-up doors. It is noted that according to Section 1.3.2, Potential VIP Risks at Operable Unit 6 and Buildings 4806, 4807, and 4810, Building 4802 was not selected for sampling for this very reason (i.e., "due to the large size and open nature

of this building"). As such, it is unclear whether exposures to workers were properly estimated, and if an additional building located over or near the foot-print of the plume that does not have large roll-up doors should be sampled. Please revise the VI Report to discuss how the sampling of Buildings 4806 and 4807 provides an appropriate estimation of the risk to indoor workers who occupy OU 6 buildings. If lines of evidence do not demonstrate that risks have been accurately assessed, it appears that sampling of an additional building located over or adjacent to the foot-print of the plume should be considered.

Please revise the VI Report to address these concerns such that it is clear that all appropriate building were investigated as part of the VI assessment or to recommend investigation of one or more additional buildings.

Response: The buildings included in the investigation are presented in the approved *Vapor Intrusion Sampling Plan and Risk Assessment Work Plan* (AECOM 2013) and were selected with extensive consultation and agreement with RPMs. Since the decisions have already been made and planning document approved, additional discussion would not provide any information that has not already been considered. Building selection is extensively discussed in Appendix A of the *Vapor Intrusion Sampling Plan and Risk Assessment Work Plan.* The referenced appendix includes an explanation for the selection of benzene and TCE as indicator chemicals. Additionally a multi-page table is included in the referenced appendix which presents details for buildings within 100 ft of the RBSLs and building-specific selection determination statements. Buildings 4800, 4802, and 4827 and temporary building T-20 (which are referenced in the comment) are included in the table.

2. Numerous VOCs were detected in sub-slab soil gas samples collected at Buildings 4806, 4807, and 4810; however, the significance of the detections (or lack thereof) is not discussed. In addition, it does not appear that the results of the sub-slab soil gas sampling were considered in the recommendations for the buildings. Section 3.2, Sub-Slab Analytical Results, states that "sub-slab vapor laboratory analytical results were used as a line of evidence to determine if chemicals detected in indoor air are attributable to the VIP [vapor intrusion pathway] by comparing sub-slab vapor concentrations to indoor air concentrations rather than SVSLs [soil vapor screening levels]." However, the Final Guidance For Assessing And Mitigating The Vapor Intrusion Pathway From Subsurface Sources To Indoor Air, USEPA, 2013, (VI Guidance), "recommends that site managers also evaluate whether subsurface vapor sources that remain have the potential to pose unacceptable health risks due to vapor intrusion in the future if site conditions were to change. For example, potentially unpredictable changes in the transitory soil characteristics (e.g., soil moisture) and subsurface vapor concentrations may occur as a result of constructing a new building or supporting infrastructure. Either type of change could result in the potential for unacceptable health risks due to vapor intrusion in the future." Please revise the VI Report to discuss the significance of the results of the sub-slab soil gas sampling in terms of the potential to pose unacceptable health risks due to VI in the future if site conditions were to change.

Response: The results for sub-slab contaminant concentrations are presented in Appendix D and the significance as they relate to their potential impact to indoor air, and thus building

occupants, is presented in Appendix F. Tables D-1 through D-6 have been revised to include SVSLs. The following has been added as the third sentence in Section 3.2: However, in order to evaluate whether sub-slab vapor sources have the potential to pose unacceptable health risks due to vapor intrusion in the future if site conditions were to change such as new building construction, the sub-slab vapor sampling results were compared on a sample-by-sample basis to the respective SVSLs. The SVSLs were derived by dividing the IASLs by a soil vapor-to-indoor air attenuation factor (alpha) of 0.001, which was presented in the Basewide VIP Protocol (AECOM 2012b) for the industrial land use scenario. As indicated in Appendix D (Appendices D-1 through D-6) no VOCs detected in the sub-slab vapor samples collected during either season from Buildings 4806, 4807, or 4810 exceeded the respective SVSLs or California-SVSLs.

Section 4.2 has been revised to include the following as Recommendation 5: Although the purpose of this report is to assess risk to workers under current conditions assuming the industrial exposure scenario, indoor air risks should be re-assessed in a manner similar to that described in Recommendation 3, if site conditions change. Such changes may include new building construction or alteration of existing building foundations.

3. The VI Report does not discuss the stability of the groundwater contaminant plumes beneath and adjacent to the buildings being assessed in the VI Report; as such, it is unclear whether the potential exists for increases in VI contaminant concentrations to be observed in the future. Trends in groundwater contaminant concentrations and plume stability should be monitored in terms of their potential to impact VI conclusions; plume stability should be discussed in the VI Report as an additional line of evidence to support no further investigation at the buildings. It is noted that the total cancer risk associated with sample location N7-4810IA1 at Building 4810 during the August 2013 sampling event was 1E-04, and while Building 4810 is scheduled for demolition, a new building is scheduled for construction in 2017 (according to Section 1.3.2). Based on this, it appears that assessment of plume stability in the vicinity of Building 4810 is particularly pertinent. If significant increases in groundwater contaminant concentrations near these buildings are observed during future groundwater monitoring events, please recommend evaluation of whether additional vapor intrusion investigation is necessary.

Response: Although benzene and naphthalene exhibited the highest estimated risks of the potentially VIP-related compounds detected in Buildings 4806/4807 indoor air, cumulative risks were within the acceptable range. Benzene was detected in the groundwater sample from well N3-MW20 (approximately 12 feet north of Building 4806) collected during the 2012 event at a concentration of 450 μg/L. The historically high benzene concentration in groundwater samples from well N3-MW20 was 2,200 μg/L in 2006. Naphthalene was detected in the groundwater sample from well N3-MW20 collected during the 2012 event at a concentration of 58 μg/L. The historically high naphthalene concentration in groundwater samples from well N3-MW20 was 300 μg/L in 2011. The potentially VIP-related compounds detected in Building 4810 indoor air that exhibited the highest estimated risks were benzene, ethylbenzene, and naphthalene. None of these compounds were detected in groundwater samples from well N7-MW10 (approximately 95 feet east of Building 4810) collected during the 2012 event.

Recommendation 3 in Section 4.2 has been revised to include: Groundwater sampling of well N3-MW20 as part of the ongoing remedial action is recommended until Buildings 4806 and 4807 are removed. Well N3-MW20 groundwater sampling results can be used as an indicator for when indoor air sampling may be needed if building demolition is delayed. For example, the most recent benzene concentration detected in well N3-MW20 (approximately 12 feet upgradient of Buildings 4806 and 4807) was 450 μg/L in May 2012, and the highest associated indoor air cancer risk based upon the indoor air samples collected at Buildings 4806 and 4807 was 2×10^{-5}, and the highest indoor HI was 0.6. The cancer risk appears to be the driver for indoor air risk, and a simple extrapolation of the benzene concentration to a hypothetical trigger of 2,250 μg/L may indicate a potential indoor air cancer risk of 1×10^{-4}. If the future benzene concentration in well N3-MW20 were ever to increase and exceed the hypothetical trigger of 2,250 μg/L and if Buildings 4806 and 4807 still exist, indoor air sampling in the form of personal air sampling equipment may be warranted to ensure that the indoor air risk is still in the protective range for the site workers under the industrial land use scenario. However, the current data (450 μg/L in May 2012) and propensity for benzene in groundwater to continue to decline due to biodegradation/natural attenuation processes makes this hypothetical scenario unlikely.

And

Unlike Buildings 4806 and 4807, a replacement building is planned for Building 4810. As presented in Section 3.2, in order to evaluate whether sub-slab vapor sources have the potential to pose unacceptable health risks due to vapor intrusion in the future if site conditions were to change such as new building construction, the sub-slab vapor sampling results were compared on a sample-by-sample basis to the respective SVSLs. As no VOCs detected in the sub-slab vapor samples collected during either season from Building 4810 exceeded the respective SVSLs or California-SVSLs, no changes to construction specifications such as the inclusion of vapor barriers are warranted for the Building 4810 replacement.

4. It is unclear whether several VOCs were overlooked in the classification of VOCs as VIP-related or potentially VIP-related chemicals of concern. For example, according to Section 3.5.2, VIP-related Indoor Air Risk Calculation, in August 2013, only benzene was identified as a VIP-related VOC at Building 4806; however, based on review of the indoor air and sub-slab soil gas sampling results for Building 4806 presented in Appendix D, the concentrations of 2-butanone and carbon disulfide detected in sub-slab soil gas samples in August 2013 were on the order of 10 times greater than the concentrations detected in indoor air samples (see Appendices D-2 and D-8). These VOCs were also detected in groundwater. As such, it appears that these two VOCs may be VIP-related. It is noted that Appendix F-2, Building 4806 Vapor Intrusion Pathway Determination – August 2013, does not indicate that the sub-slab soil gas concentrations of 2-butanone and carbon disulfide were 10 times greater than the indoor air concentrations. The reviewer found that more than one VOC identified at each building was potentially misclassified. Please revise Section 3.5.2 and Appendix F to ensure that all VOCs which are VIP-related or potentially VIP-related are classified as such.

Response: The Appendix F tables have been revised to retain contaminants as VIP-related where: either the main sample or the field duplicate sample met the criteria for a VIP-related

compound, any of the individual samples met the criteria for a VIP-related compound, regardless if the compound is a groundwater COPC, and (in addition to meeting other criteria) sub-slab contaminant concentrations equaled (as well as exceeded) ten times indoor air contaminant concentrations. All samples meeting the criteria for an analyte have been retained and presented in VIP-Related Indoor Air Risk Calculation Tables (Tables 16 through 25 in the draft version of the report, now Tables 17 through 28 with new table additions based on RPM comments). The text related to the tables has been revised accordingly.

The VIP-Related Indoor Air Risk Calculation Tables have been revised to include color coding to differentiate samples that met the VIP-related criteria from those that did not. The tables also now present two different line items for cancer risks and hazard indices, one line item for all cumulative risks and hazards per sample (if a chemical detected in indoor air met the criteria for determination of Likely VIP-related or VIP-related in at least one location in the building, then the chemical was determined to be Likely VIP-related or VIP-related for the entire building) and one line item for VIP-related cumulative risks and hazards per sample (cumulative risks per sample includes only chemicals that met the criteria for a VIP-related compound at the specific sampling location). Where applicable, the DTSC-preferred approach tables were revised to include the benzene IASL based on the latest non-cancer reference exposure level noted in Kimberly Ghettmann's (DTSC) General Comment 6.

SPECIFIC COMMENTS

1. **Section 1.7, Procedure Used for Derivation of Screening Levels, Page 1-13:** Based on the availability of indoor air data to characterize breathing zone exposures, the Air Force has neglected to effectively screen sub-slab soil gas (SSSG) concentrations reflective of the vapor pooling phenomenon and provide a characterization of VOC concentrations at the interface with a subject building. The existing assessment is limited to an examination of the relativity of SSSG and indoor air (IA) data. Indoor air concentrations are significantly more dynamic than subslab soil gas and are subject to myriad confounding influences (e.g., intermittent operation of heating, ventilating, and air conditioning [HVAC] systems) and these data represent a snapshot in time. SSSG data are, generally, more stable and consistent and provide an understanding of the potential to adversely impact indoor air breathing zones. The relationship between these two datasets is critical in understanding building-specific attenuation factors and comparison of health-based screening criteria to empirical SSSG data is fundamental in supporting a defensible vapor intrusion potential assessment. Please revise the VI investigation report to discuss SSSG data in comparison to the most relevant health-based screening criteria and the uncertainties related to synoptically-paired indoor air sample results.

   Response: The results for sub-slab contaminant concentrations are presented in Appendix D and the significance as they relate to their potential impact to indoor air, and thus building occupants, is presented in Appendix F. Tables D-1 through D-6 have been revised to include SVSLs. The following has been added as the third sentence in Section 3.2: However, in order to evaluate whether sub-slab vapor sources have the potential to pose unacceptable health risks due to vapor intrusion in the future if site conditions were to change such as new building construction, the sub-slab vapor sampling results were compared on a sample-by-sample basis to the respective SVSLs. The SVSLs were derived by dividing the IASLs by a soil vapor-to-

indoor air attenuation factor (alpha) of 0.001, which was presented in the Basewide VIP Protocol (AECOM 2012b) for the industrial land use scenario. As indicated in Appendix D (Appendices D-1 through D-6) no VOCs detected in the sub-slab vapor samples collected during either season from Buildings 4806, 4807, or 4810 exceeded the respective SVSLs or California-SVSLs.

2. **Section 3.1.3, Photoionization Detector Readings, Pages 3-4 and 3-5:** The first paragraph in this section states, "[B]ecause VOCs detected in indoor air may be an indication of VI, total VOC concentrations were measured using a PID [photoionization detector] throughout the investigation." While subsections 3.1.3.1 through 3.1.3.3 provide the results of the PID screening, the significance (or lack thereof) of the results and/or conclusions that can be drawn based on the results is unclear, as they are not discussed. Please revise Section 3.1.3 to explain the significance (or lack thereof) of the results of the PID screening and discuss the conclusions that can be drawn based on the results.

   Response: The following has been added as the fourth and fifth sentences of Section 3.1.3: PID readings indicated the presence of VOCs in all three buildings during both events. However, since VOCs are used regularly in the buildings, this was expected and their presence was not deemed significant.

3. **Section 3.3, Indoor Air Analytical Results, Pages 3-13 through 3-24:** Several statements in various subsections of Section 3.3 indicate that one or more chemicals were detected at concentrations that exceeded applicable indoor air screening levels (IASLs); however, the text does not specify which chemicals exceeded the IASLs. For example, Section 3.3.1.2, Other Chemicals Detected in Indoor Air, states that "one compound in addition to benzene was detected above the IASL in indoor air during the March 2013 event at Building 4806." However, the compound that was detected is not specified. Similar statements were identified in Sections 3.3.2.2 and 3.3.3.2. For clarity, please revise all applicable subsections of Section 3.3 to ensure that all chemicals that exceeded the IASLs are specified.

   Response: The last sentence of Section 3.3 has been revised to read: The complete laboratory analytical results, including IASL exceedances, qualifiers, and reporting limits, are presented in Appendix D. Although the information is already included in Appendix D, the last paragraph of the following sections were revised to specify which analytes exceeded respective IASLs: Section 3.3.1.2 - March 2013, Section 3.3.1.2 - August 2013, Section 3.3.2.2 - March 2013, Section 3.3.2.2 - August 2013, and Section 3.3.3.2 - August 2013.

4. **Section 3.3.3.2, Other Chemicals Detected in Indoor Air, Pages 3-21 to 3-23:** It is unclear in how many samples naphthalene was detected at Building 4810. Line 1 on page 3-23 indicates naphthalene was detected above its IASL during the March 2013 sampling event at Building 4810; however, this section does not specify the number of samples in which naphthalene was detected. For clarity, please revise Section 3.3.3.2 to specify the number of samples in which naphthalene was detected.

   Response: As noted in the introductory sentence for Section 3.3.3.2, the bullet list is comprised of analytes which were detected in all indoor air sample locations at Building 4810.

Naphthalene was only detected in two indoor air samples collected at Building 4810; so, it was not included in the list. The results for naphthalene in March 2013 at Building 4810 are presented Appendix D-11 on page 2 of 3. No change was made to the document based on this comment.

5. **Appendix F-4, Building 4810 Vapor Intrusion Pathway Determination – August 2013:** The table in Appendix F-4 is identified as the Building 4810 Vapor Intrusion Pathway Determination – August 2013; however, it appears that this table should be identified as the Building 4807 Vapor Intrusion Pathway Determination – August 2013. Appendix F-6 is the Building 4810 Vapor Intrusion Pathway Determination – August 2013. Please revise Appendix F-4 to address this error.

   Response: The Appendix F-4 title on both pages has been revised to read: **Building 4807 Vapor Intrusion Pathway Determination – August 2013**.

GENERAL COMMENT (Daniel Stralka)

1. Based upon reviewing this report and the data, there appears to be a completed indoor air pathway. It should be noted that the absence of a chemical being detected in groundwater ignores the potential of a vadose zone source. Consequently, I disagree with the VI Report's derivation of "VIP-related risks. This possibility is not addressed as a salient potential counter-factual in all the modeling. However, total risks are presented in the VI Report and the indoor air results do not reveal a large threat of exposure. This finding notwithstanding, additional monitoring would be warranted to address the seasonal uncertainty and building changes. A confounding factor is the statement that buildings 4806/4807 and 4810 are slated for demolition in FY 2016 and 2014, respectively. If true, no further monitoring would be necessary. Nonetheless, LUCs would be appropriate to address redevelopment and engineering controls, e.g. radon type systems, in the new structures since the contaminants will be present over a long time. Monitoring would also need to be included into those new buildings.

   Response: Demolition is planned for the subject buildings. The absence of a chemical as a groundwater COPC was not a deciding factor in determining whether a chemical was removed from consideration as VIP-related and the approach does not ignore the potential of vadose zone sources. An example is cyclohexane at Building 4810 in March 2013, which is not a groundwater COPC but was considered likely to be VIP-related for the purposes of this assessment.

   LUC determinations are more appropriately made in conjunction with the future Five-Year Review cycles corresponding to Question B (Are the exposure assumptions still valid?) as the demolition process will result in less exposure (no planned reuse) at Buildings 4806/4807. When Building 4810 is demolished and future structures are envisioned, if data (collected as part of the five-year review) suggest subsurface conditions have become worse (and concentrations have increased), then LUCs or engineering controls might be warranted. But, at this time, the Building 4810 location remains industrial and all subsurface screening levels for each sampling point in the Building 4810 footprint over two seasons do not pose an actionable

risk. Additionally, see responses to USEPA General Comments 2 and 3 regarding recommendations for additional monitoring.

SPECIFIC COMMENTS (Daniel Stralka)

1. **Section 3.1.2 Temperature Measurements**. Please also add the external temperatures at the time of survey and sampling.

   Response: A table of interior and exterior temperature measurements has been added and a reference to the table included in Section 3.1.2.

2. **Section 3.5.2 VIP-Related Indoor Air Risk Calculations**. Bullet 2 is too restrictive and ignores the potential for a vadose source. If the same contaminant is detected in the indoor air and sub-slab soil gas, it may likely be VI. Please add this to the discussion and the uncertainty.

   Response: The comment is inaccurate. The main deciding factor in Item 2 of Section 3.5.2 is the difference between indoor air concentrations and sub-slab concentrations, not whether the analyte is a groundwater COPC. As indicated in Item 3 of Section 3.5.2 analytes that are not groundwater COPCs may still be considered VIP-related, an example is cyclohexane detected at Building 4810 during the March event.

3. **Section 4.2 Recommendations**. Please add the need for LUCs for future development.

   Response: No change is recommended in response to this comment. See responses to Dan Stralka's General Comment 1 and USEPA General Comments 2 and 3 regarding recommendations for additional monitoring.

GENERAL COMMENTS (Joe Healy)

1. The VI Report needs to mention the new short-term TCE exposure risk to a developing fetus, a concern for women within the child-bearing age range, who might be in their first trimester of pregnancy. Even though the report results did not discern significant amounts of TCE in the indoor air sampling, it will be important to remind the reader and future users of the subject VI Report that the Air Force is aware of this pathway and the potential need to consult the latest levels of concern that could apply to this pathway. Two key situations for such comparisons are: a) when conducting further monitoring; and b) upon formal presentation of the risk assessment with the OU 6 Five Year Review Addendum that is due later summer 2014.

   Response: The following bullet has been added to the Section 4.1 list: TCE was not detected above the 1.1-$\mu g/m^3$ reporting limit in indoor air, which is below the 8.8-$\mu g/m^3$ concentration estimated to represent an HQ of 1 for any exposure over an 8-hour day. The (USEPA-calculated) industrial worker May 2014 RSL for TCE in air uses the USEPA IRIS RfC to calculate a scenario-specific (industrial worker) concentration that is protective of both genders (and an unborn fetus) as 8.8 $\mu g/m^3$.

2. The VI Report should add to the discussion of this new receptor pathway for short-term exposure to TCE, the current level of uncertainty among experts as to the exact duration of

exposure (which is often described as less than a few days to less than a few weeks). This topic should also mention the different hours per day assumptions affecting the residential versus site worker scenarios.

Response: The following bullet has been added to the Section 4.2 list: If, during future investigations, TCE is detected in indoor air, the receptor pathway for short-term exposure of developing fetuses and related uncertainty regarding residential and industrial exposure durations should be addressed.

3. Furthermore, regarding the new short-term TCE exposure risk to a developing fetus, the VI Report needs to mention the numerical value of, and provide a reference for, a currently available and reasonable screening level to use for comparison purposes. I have previously forwarded the following three documents to the Edwards FFA parties and, again, highly recommend that the Air Force consider using one or more of them to bolster its case for the screening level that will be chosen to use in the analysis.

a. *USEPA. December 13, 2012. EPA Region 10 Office of Environmental Assessment (OEA) Recommendations Regarding Trichloroethylene Toxicity in Human Health Risk Assessments*. Memorandum from Joyce C. Kelly (Region 10 Director, Office of Environmental Assessment).

b. *USEPA. December 3, 2013. EPA Region 9 Guidelines and Supplemental Information Needed for Vapor Intrusion Evaluations at the South Bay National Priorities List (NPL) Sites*. Letter from Kathleen Salyer (Region 9 Assistant Director, Superfund Division) to Stephen Hill (California Regional Water Quality Control Board, Toxics Cleanup Division).

c. *Massachusetts Department of Environmental Protection. March 27, 2014. TCE Toxicity Information: Implications for Chronic and Shorter-term Exposure. Fact Sheet.*

Until either the State of California or national US EPA publish formal screening levels guidance for this new short-term exposure risk, the above three references provide a tight range of values and assumptions that provide the current best available focus on a reasonable level of concern.

Response: See response to Joe Healy's General Comment 1.

4. A key objective of the Air Force's investigation was to assess potential current vapor intrusion risks for industrial workers. The EPA screening levels that referenced in the VI Report are for the generic scenarios for long-term cancer and long-term non-cancer exposures. The Air Force point out that the screening level that will likely be chosen to use (see Comment B above) for the new short-term TCE exposure risk is very close to the current generic long-term non-cancer screening level of 8.8 $\mu g/m^3$. However, the VI Report should point out that the relative uncertainties about the short-term screening level and the exposure duration merit special consideration for continued prudent monitoring of the situation, as recommended in the Air Force's *February 2013 VIP Communication Plan*. A place in the current report to do this would be at the end of the section *"Uncertainties about Exposure Assumptions,"* on page 3-37.

Response: See response to Joe Healy's General Comments 1 and 2. Additional discussion (beyond the bullet items added under General Comments 1 and 2) regarding a contaminant that has not been detected in indoor air is not warranted within this document.

U.S. Environmental Protection Agency
Technical Review Comments
of the
Attachment B, Response to Comments on the Draft Vapor Intrusion Investigation Repot, Operable Unit 6, Edwards Air Force Base, California, and the Redlined Final Vapor Intrusion Investigation Report, Operable Unit 6, Edwards Air Force Base, California, September 2014

Responses to General Comment 2 and Specific Comment 1: The responses partially address the comments. The responses state that Appendix D was revised to include tables which present the results of screening of sub-slab soil gas concentrations against soil vapor screening levels; however, a revised version of Appendix D was not provided. As such, the response cannot be fully reviewed and the appropriateness of the revisions cannot be verified. Please provide a revised version of Appendix D so that the responses to General Comment 2 and Specific Comment 1 can be reviewed.

Response: Revised version of Appendix D is provided in the Final Report.

Response to General Comment 3: The response partially addresses the comment. The comment requested that the VI Report discuss the stability of the groundwater contaminant plumes beneath and adjacent to the buildings that were assessed in the VI Report. While the response provides concentrations of contaminants detected in two monitoring wells near the buildings in 2012 (N3-MW20 and N7-MW10), no discussion of contaminant trends and plume stability is provided to support the discussion. In addition, the response recommends that the results of ongoing groundwater monitoring at well N3-MW20 be used as an indicator of the need to collect additional indoor air samples at Buildings 4806 and 4807 should their demolition be delayed; however, the response does not explain why the results of sampling at this well location are an appropriate indictor. Please revise the VI Report to discuss the stability of the groundwater contaminant plumes beneath and adjacent to the buildings. In addition, explain why the results of groundwater sampling at well N3-MW20 are an appropriate indictor of the need for additional indoor air sampling at Buildings 4806 and 4807.

It is noted that the response also states that no concentrations of contaminants detected in sub-slab soil gas samples at Building 4810 exceeded applicable soil vapor screening levels (SVSLs), and that, as such, "no changes to construction specifications such as the inclusion of vapor barriers are warranted for the Building 4810 replacement;" however, as a revised version of Appendix D was not provided, this portion of the response cannot be assessed. Please provide the tables from Appendix D that were revised to include the SVSLs.

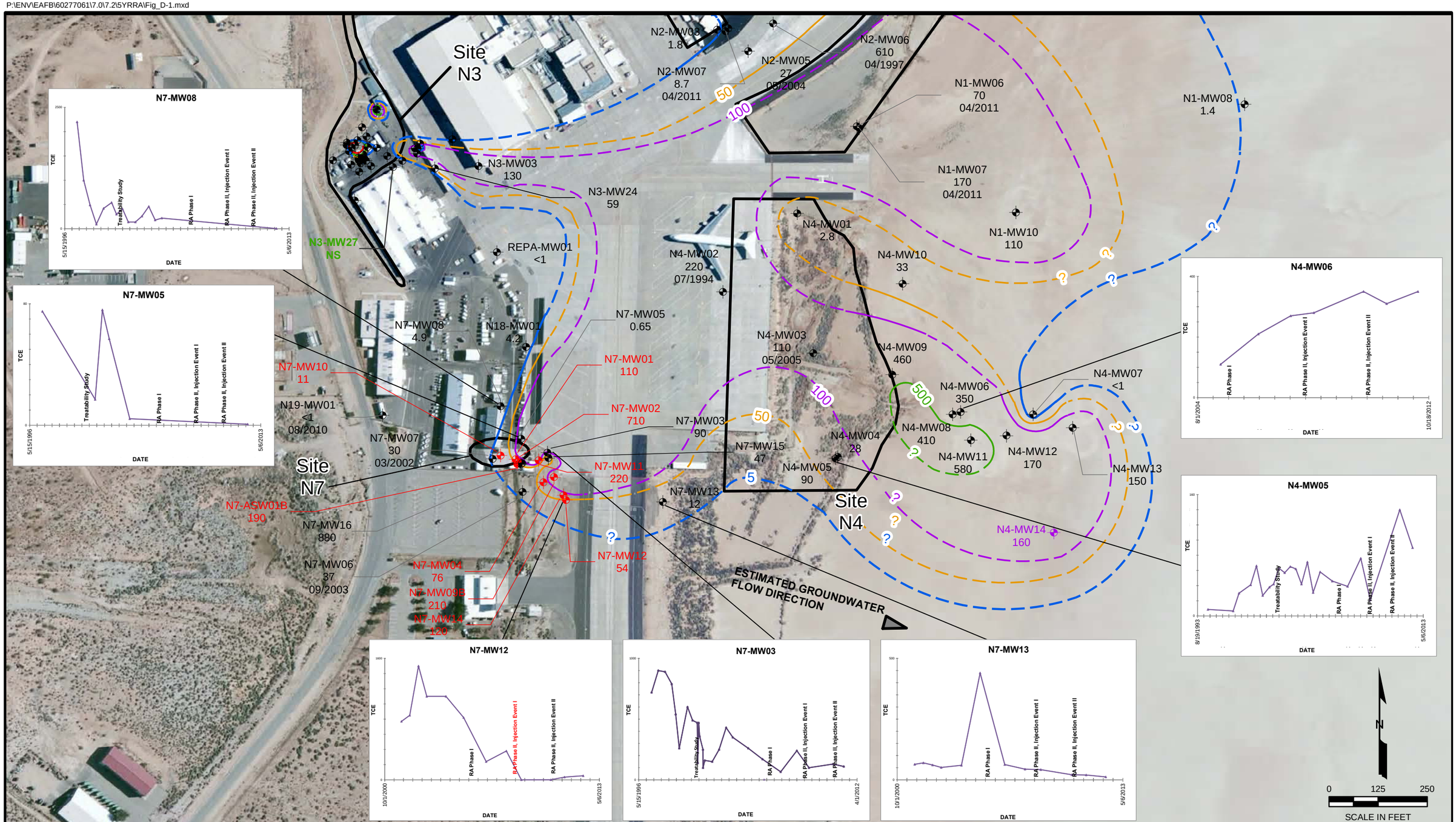
Response: Revised version of Appendix D is provided in the Final Report.

Responses to Dan Stralka General Comment 1 and Specific Comment 1: The responses address the comments and new Table 4, Indoor and Outdoor Temperatures was provided, but this table indicates that the lowest external temperature was 54 degrees Fahrenheit. As a result, it appears that none of the OU 6 sampling events were representative of winter conditions (e.g., when winter heating is at a maximum). If these buildings continue to be occupied, indoor air and subslab sampling during true winter conditions (e.g., in January or February when temperatures are at or below 32 degrees Fahrenheit) is recommended. Please clarify whether Buildings 4806/4807 and 4810 are still occupied, and if so, whether conducting indoor air and subslab sampling during true winter conditions when external temperatures are low will occur.

Response: Building 4810 was demolished in September 2014. At Buildings 4806 and 4807, the Air Force and NASA are planning a Winter Sampling Event in the January/February 2016 timeframe to include indoor and outdoor air and subslab vapor sampling.

APPENDIX D
SITE N7 TREND GRAPHS

P:\ENV\EAFB\60277061\7.0\7.2\5YRRA\Fig_D-1.mxd



EXPLANATION

N7-MW04 76 — MONITORING WELL AND 2012 TCE CONCENTRATION

N4-MW14 160 — MONITORING WELL SAMPLED IN MARCH 2014 AND TCE CONCENTRATION

N3-MW27 NS — MONITORING WELL INSTALLED IN AUGUST 2012 - NOT SAMPLED

N7-MW04 76 — SITE N7 WELL, USED AS INJECTION POINT IN 2000, 2005, 2008, AND/OR 2010, AND 2012 TCE CONCENTRATION

"<" INDICATES THAT TRICHLOROETHENE (TCE) WAS BELOW THE REPORTING LIMIT SHOWN.

MOST RECENT SAMPLING DATES ARE PRESENTED FOR WELLS NOT SAMPLED DURING THE 2012 EVENT. COMPREHENSIVE 2012 DATA, INCLUDING THOSE FOR SITE N3, ARE PRESENTED IN THE REMEDY PERFORMANCE AND GROUNDWATER MONITORING REPORT (AECOM 2012).

— 50 — GROUNDWATER TCE CONCENTRATION CONTOUR (INTERVALS = 5, 50, 100, 500) ALL CONCENTRATIONS PRESENTED IN MICROGRAMS PER LITER. THE ESTIMATED CONTOURS ARE BASED ON 2012 MONITORING RESULTS, DASHES INDICATE CONTOUR IS INFERRED.

TCE Groundwater Concentration Contours, May – June 2013 and Historic Site N7 Injection Wells

Date 04-2015	Addendum to First Five-Year Review Report	Figure
Project No. 60318504	Operable Unit 6 Edwards AFB	D-1

APPENDIX E
RESPONSES TO REGULATORY COMMENTS ON THE SUBJECT DOCUMENT

RESPONSES TO COMMENTS

Environmental Restoration Program
Addendum to First Five-Year Review Report
Operable Unit 6
Edwards Air Force Base, California
Draft, September 2014

Reviewer	Comment #	Comment	Response
Kimberly C. Gettmann, Ph.D (HERO, DTSC)	General Comment 1	Risk Management Range (1×10^{-6} to 1×10^{-4}). HERO disagrees with the use of the language "generally acceptable" when referring to the risk range of 1×10^{-6} to 1×10^{-4} and recommends removing the language from the Report. Please note that the risk range is not intended to imply that any risk within this range is acceptable. The actual level of acceptable risk is a site-specific risk management decision, with 1×10^{-6} as the point of departure for making such decisions. Clear justification must be provided for risk management decisions which result in residual risk levels greater than 1×10^{-6}. HERO defers to the project manager for risk management decisions.	The Human Health Risk Assessment Addendum (Appendix C) was prepared in support of a Five-Year Review and in the context of a Five-Year Review, guidance (USEPA 2001), indicates that the new estimated risk should be evaluated to determine if it is acceptable. The guidance defines acceptable risk as "within or below the generally acceptable risk range of 10^{-4} to 10^{-6} for carcinogenic risk and the hazard index is below 1 for non-carcinogenic effects." Reference cited: United States Environmental Protection Agency. 2001. *Comprehensive Five-Year Review Guidance*. Office of Emergency and Remedial Response. EPA540-R-01-007. June. To resolve this comment, a risk management discussion among the RPMs is recommended. Clarification language such as "The target risk range (also known as the risk management range) is between 10^{-4} to 10^{-6}. Depending on site-specific factors, cleanup is considered when risks are greater than 10^{-6} but is generally required when risks are greater than 10^{-4}" would be added to appropriate sections of the document followed by a summary of the risk management discussion. This approach is consistent with that taken in the 2006 Operable Unit 6 ROD (Section 2.7.1) which states "…from 10^{-4} to 10^{-6} is considered generally acceptable when site-specific circumstances allow…". The 2006 ROD also provided site-specific justification for no action for soil even though risk levels were within the risk management range

Reviewer	Comment #	Comment	Response
			(e.g., PAHs in soil due to low frequency of detection and nearby asphalt).
Kimberly C. Gettmann, Ph.D (HERO, DTSC)	General Comment 2	Section 2.1.2.1 (page 2-8). Cleanup levels to protect receptors (industrial workers) from potential vapor intrusion into occupied buildings were not established in the ROD because the estimated cancer risks were less than 1×10^{-4}. The re-evaluation of the vapor intrusion risks indicate that the cancer risks range from 7×10^{-7} to 5×10^{-6} using the Air Force preferred toxicity criteria and 9×10^{-7} to 2×10^{-5} using DTSC preferred toxicity	The Human Health Risk Assessment Addendum (Appendix C) was prepared in support of a Five-Year Review and in the context of a Five-Year Review, guidance (USEPA 2001), indicates that the new estimated risk should be compared to the baseline risk and that "If the estimated risk has increased, then you should determine whether the new estimated risk is acceptable. In most cases, you should base this determination on whether the risk is within or below the generally acceptable risk range of 10^{-4} to 10^{-6} for carcinogenic risk and the hazard index is below 1 for non-

Reviewer	Comment #	Comment	Response
		criteria. HERO acknowledges that the estimated industrial vapor intrusion cancer risks are within the risk management range, however, the decision to derive cleanup values should not be based on risks being less than 1×10^{-4}, the upper risk management range, but based on whether the risks are greater than the point of departure and site specific conditions. The Report is lacking this justification and having risks less than 1×10^{-4} is not adequate justification for not deriving cleanup values.	carcinogenic effects. If the estimated risk is not protective, you should determine what actions need to be taken to achieve an acceptable level of risk." The paragraph preceding the text cited in the comment clearly refers to the EPA Five-Year Review guidance: "The USEPA has provided Five-Year Review guidance for interpreting these risk results within the CERCLA framework (USEPA 2001): > Generally, your human health determination should be based on whether the cancer risk could now be greater than 10^{-4} and/or the hazard index could be greater than 1 for non-carcinogenic effects. " Reference cited: United States Environmental Protection Agency. 2001. *Comprehensive Five-Year Review Guidance*. Office of Emergency and Remedial Response. EPA540-R-01-007. June. See also response to HERO's General Comment 1 regarding recommendation to conduct an RPM risk management discussion.
Kimberly C. Gettmann, Ph.D (HERO, DTSC)	General Comment 3	<u>Groundwater Monitoring of Well N3-MW20 and Building 4806/4807</u>. The Final Vapor Intrusion Investigation Report for OU6 recommended "groundwater sampling of well N3-MW20 [for benzene] as part of the ongoing remedial action until Buildings 4806 and 4807 are removed." The concentration of benzene in groundwater would be used as an indicator for when indoor air sampling is	The referenced comment to the Final Vapor Intrusion Investigation Report has been overcome by events. A delay in the demolition of Buildings 4806 and 4807 and the need to confirm seasonal variances to ensure that the indoor air risk is still in the protective range for the site workers under the industrial land use scenario warranted an additional winter sampling event. The additional VIP investigation was conducted in February 2016 and will be

Reviewer	Comment #	Comment	Response
		necessary. While HERO does not concur with the groundwater trigger level for benzene, as discussed in our response to Air Force Comments regarding HERO's June 23, 2014 memorandum for the Draft Vapor Intrusion Investigation Report, the Addendum Report lacks any discussion on this recommendation.	documented in the Second FYRR. The following paragraph has been added as the last paragraph of Section 3.2.3 Additional Remedial Action Implementation: "A delay in the demolition of two OU 6 buildings and the need to confirm seasonal variances to ensure that the indoor air risk is still in the protective range for the site workers under the industrial land use scenario warranted an additional winter sampling event. The additional VIP investigation was conducted in February 2016 and will be documented in the Second FYRR."
Kimberly C. Gettmann, Ph.D (HERO, DTSC)	General Comment 4	<u>HERO has the following comments on Appendix C.</u> a. Section 2.0 (page 2-3). The text states that "The DTSC has developed toxicity values through OEHHA [Office of Environmental Health Hazard Assessment]." Please note that DTSC does not develop toxicity criteria through OEHHA. Both DTSC and OEHHA are separate agencies under the Cal EPA. Under the umbrella of Cal EPA, OEHHA is responsible for establishing toxicity criteria for the State's regulatory programs. DTSC uses the toxicity criteria established by OEHHA. Please revise the text for accuracy. b. Section 2.2 – Uncertainty Analysis. Please include a discussion on any uncertainty associated the lack of plume stability at the	a. The referenced text has been revised to read: "The DTSC uses the toxicity values developed by OEHHA." b. The following text has been added as the first paragraph of the referenced section: "This section discusses major uncertainties as they relate to risk assessment. Although the groundwater plume is not fully delineated at the leading edge and it is not yet known if the plume is migrating, the undelineated portion is not expected to yield higher concentrations or new COCs than those already captured in the Sites N1 and N4 risk assessments (Site N1 and N4 are along the leading edge of the plume)." c. Section 3.1 – Vapor Intrusion Investigation- 2013 (page 3-3). c.i. Please see responses to HERO's General

Reviewer	Comment #	Comment	Response
		leading edge. c. Section 3.1 – Vapor Intrusion Investigation- 2013 (page 3-3). i. The text on page 3-3, lines 6 through 20, discuss the potential VIP-related cancer risk for the buildings sampled during March and August 2013, and whether the risk is less than 1×10^{-4}, the upper end of the risk management range. The discussion should be focused on whether the estimated cancer risk from Buildings 4806, 4807, and 4810 are greater than the point of departure (1×10^{-6}) and not focused on the upper end of the risk management range. The actual level of acceptable risk is a site-specific risk management decision, with 1×10^{-6} as the point of departure for making such decisions. Clear justification must be provided for risk management decisions which result in residual risk levels greater than 1×10^{-6}. See HERO's Comments 1 and 2 above. Please revise the text. ii. The text on page 3-3, lines 27-29, states ".VIP results for the current industrial and hypothetical future residential exposure	Comments 1 and 2. c.ii. This risk assessment was performed in support of and in the context of a Five-Year Review. Therefore, application of USEPA's Five-Year Review guidance is appropriate. The guidance states: "Generally, your human health determination should be based on whether the cancer risk could now be greater than 10^{-4} and/or the hazard index could be greater than 1 for non-carcinogenic effects." See also response to HERO's General Comment 1 regarding recommendation to conduct an RPM risk management discussion. d. The recommendation is included in Appendix C as it is included in an attachment to the appendix (Attachment B). Additionally in response to HERO's General Comment 3, the recommendation has been added to Section 3.2.3 Additional Remedial Action Implementation Recommendations of the main document text. e. The Air Force has responded to HERO's responses to the Air Forces' responses to HERO's comments on the Draft Vapor Intrusion Investigation Report under separate cover.

Reviewer	Comment #	Comment	Response
		scenarios are within the acceptable ranges cited in USEPA's Five-Year Review guidance, no further actions beyond the selected remedy need to be taken to achieve an acceptable risk level…" HERO disagrees with the interpretation that risks within the risk management range are acceptable and no action is needed. The actual level of acceptable risk is a site-specific risk management decision, with 1×10^{-6} as the point of departure for making such decisions. Clear justification must be provided for risk management decisions which result in residual risk levels greater than 1×10^{-6} HERO reiterates our Comments 1, 2, and 4.c.i. d. The Final Vapor Intrusion Investigation Report for OU6 recommended "groundwater sampling .of well N3-MW20 [for benzene] as part of the ongoing remedial action until Building 4806 and 4807 are removed." The concentration of benzene in groundwater would be used as an indicator for when indoor air sampling is necessary. While HERO does not concur with the groundwater trigger level for benzene, as discussed in our response to Air Force Comments regarding HERO's June 23, 2014 memorandum for the Draft Vapor Intrusion Investigation Report, there is no discussion of this recommendation in Appendix C. Please include a discussion of the proposed monitoring	

Reviewer	Comment #	Comment	Response
		for vapor intrusion at Buildings 4806 and 4807. e. Appendix C – Attachment B – Draft Final Vapor Intrusion Investigation Report. HERO reviewed the Draft Final Vapor Intrusion Investigation Report along with the Air Force's responses to HERO's June 23, 2014 memorandum. HERO has several new comments on the revised and new text added to the Draft Final VI Report, along with our responses to the Air Force's responses. These comments and responses are being submitted under separate cover. HERO's concerns with the VI report need to be addressed and incorporated as appropriate into the text of Appendix C.	
Kimberly C. Gettmann, Ph.D (HERO, DTSC)	Specific Comment 1	Appendix C List of Abbreviations and Acronyms. a. The acronym for HERO should be reported as Human and Ecological Risk Office. b. The acronym listed for COC is chemical of concern and for COPC is contaminant of potential concern. For consistency please use either chemical or contaminant for both COC and COPC.	a. The acronym for HERO has been corrected as Human and Ecological Risk Office throughout the document. b. The acronym for COPC has been revised as chemical of potential concern throughout the document.
Bruce Lewis (DTSC)	General Comment 1	DTSC appreciates the effort put forth by the Air Force in evaluating the vapor intrusion pathway and the potential risks to workers in Buildings 4806, 4807, and 4810. However, DTSC is disappointed that work completed over the past three years since the First Five-Year Review in 2011 has not been insufficient to address the data gaps identified by the regulatory agencies that would facilitate a protectiveness determination for OU6.	The primary focus of the Addendum to the First Five-Year Review Report is Risk Assessment (specifically VIP), however the Addendum includes a discussion of plume delineation based on the most recent data available as specified in Section 2.0 of the First Five-Year Review Addendum: "Though the Plume Characterization Key Action Items are dynamic and the status update will be included the Second FYRR in September 2016, this

Reviewer	Comment #	Comment	Response
		The data gaps identified by the regulatory agencies in 2011 on the First Five Year Review that were not achieved include the lateral and vertical characterization of trichloroethene (TCE), benzene, and carbon tetrachloride in groundwater needed to evaluate plume stability and a determine that the In-Situ Chemical Oxidation (ISCO) injections performed as part of the remedy is functioning as intended. Additionally, DTSC is concerned that proposed investigation work does not appear to be proceeding at a pace to provide sufficient data to close the identified data gaps in time for the Second Five-Year Review Report scheduled for 2016.	Addendum includes a discussion of the plume delineation based on the most recent data available (up through 2012) (Section 2.1.1.3)." This approach was documented as follows in the Remedial Action Work Plan Addendum: "due to budgetary constraints and based on the agreements at the 5 December 2011 RPM meeting that the assessment of the VIP is a higher priority than the Plume Characterization key action item" and "The Plume Characterization key action will be fully addressed in the Second FYRR and therefore, with concurrence of the RPMs, the actions necessary to address plume characterization will not be completed within the two years specified in the non-concurrence letter." Wells installed as part of the Site 25 lakebed investigation effort have provided additional lateral and vertical characterization data at the leading edge of the plume. Ten monitoring wells are scheduled for installation in Spring 2015 to further delineate the lateral extent of the TCE, benzene, and carbon tetrachloride plumes. In regards to whether or not the ISCO injections are functioning as intended, please note that although areas of increasing concentrations and possible plume instability were not necessarily anticipated, they are not unusual occurrences when plume delineation is ongoing. Contaminant mass estimates will be updated as new wells are installed, data are compiled, and plume extent estimates are updated. Treatment areas will be selected on the latest available data to ensure efficient RA progress. Areas of possible plume instability and expansion were identified at the downgradient edge of the commingled plume after initial RA design and implementation. Therefore, possible plume expansion and instability is an indication of incomplete

Reviewer	Comment #	Comment	Response
			contamination delineation as opposed to failure or shortcoming of the ISCO component. The Site 25 lakebed investigation results were unexpected and have significantly impacted the schedule proposed in the Remedial Action Work Plan Addendum. The Site 25 data indicates that the OU 6 plume may extend over 500 feet further downgradient than the 2012 groundwater sampling results indicated. Well installations specified in the Final Groundwater Investigation Work Plan were delayed and locations reassessed based on the Site 25 lakebed investigation data. Though the Air Force and NASA are planning on installing 8 wells on the lakebed (2 additional wells will be installed in the upgradient plume areas near Site N3) in Spring 2015, given the large areal extent to be investigated, additional wells may be necessary to delineate the downgradient edge of the plume and to determine the connectivity between the plume in the Sites N1, N4, and N7 areas and the elevated concentration areas identified by the Site 25 well installations.
Bruce Lewis (DTSC)	General Comment 2	In the *Draft Final Vapor Intrusion Report for OU6* (Appendix C, Attachment B), the Air Force recommended "groundwater sampling of well N3-MW20 [for benzene) as part of the ongoing remedial action…until Buildings 4806 and 4807 are removed." As stated in comments on the *Draft Final Vapor Intrusion Report*, DTSC does not concur with the concentration of benzene being proposed as the trigger level for additional indoor air sampling at Buildings 4806	The referenced comment to the Final Vapor Intrusion Investigation Report has been overcome by events. A delay in the demolition of Buildings 4806 and 4807 and the need to confirm seasonal variances to ensure that the indoor air risk is still in the protective range for the site workers under the industrial land use scenario warranted an additional winter sampling event. The additional VIP investigation was conducted in February 2016 and will be documented in the Second FYRR.

Reviewer	Comment #	Comment	Response
		and 4807 or that such sampling is an appropriate indicator for determining the need for additional sampling Nevertheless, there is no discussion of this recommendation in this document. Please include a discussion of the proposed monitoring for vapor intrusion in this report.	The following paragraph has been added as the last paragraph of Section 3.2.3 Additional Remedial Action Implementation Recommendations: "A delay in the demolition of two OU 6 buildings and the need to confirm seasonal variances to ensure that the indoor air risk is still in the protective range for the site workers under the industrial land use scenario warranted an additional winter sampling event. The additional VIP investigation was conducted in February 2016 and will be documented in the Second FYRR."
Bruce Lewis (DTSC)	Specific Comment 1	Figure 2. Not all the proposed wells are shown on the figure and the location of the wells does not reflect changes agreed upon by the Air Force and regulatory agencies during a teleconference on November 25, 2014. Please revise the figure to show the location of all proposed wells at the agreed upon locations. Additionally, revise the TCE iso-concentration contours using data from all wells in the OU6 area, including those installed as part of the groundwater investigation of Site 25 (OU8).	All applicable report figures (including Figure 2) have been revised to show the revised well locations agreed to by the Air Force, NASA, and regulatory agencies during the 25 November 2014 teleconference. Additionally, on applicable figures, the TCE and carbon tetrachloride figures have been extended around monitoring well N4-MW14. The contours have not been extended to include the Site 25 lakebed wells as sampling points are not currently available to determine the relationship between the downgradient Sites N1, N4, and N7 wells and the Site 25 lakebed wells. Proposed monitoring wells N4-MW15 and N4-MW16 will further the understanding of the connection between the concentrations detected at downgradient Sites N1, N4, and N7 monitoring wells and VOC concentrations detected at Site 25 lakebed wells. Although TCE concentrations were detected at the same order of magnitude at downgradient Sites N1, N4, and N7 wells as Site 25 lakebed wells, carbon tetrachloride (present in Site N4 wells) was not detected in any of the Site 25 lakebed wells which lends some uncertainty to the relationship of the OU 6 plume in the area of Site N4 to the

Reviewer	Comment #	Comment	Response
			Site 25 lakebed wells.
Bruce Lewis (DTSC)	Specific Comment 2	Section 2.1.1.3, Page 2-4, Line 18. Show the location of proposed well N3-MW29 on associated Figure 3.	Figure 3 has been revised to show proposed monitoring well N3-MW29.
Bruce Lewis (DTSC)	Specific Comment 3	Section 2.1.2.1, Page 2-7, Line 19. Discussion of risk should be focused on whether the estimated cancer risks are greater than the point of departure (1×10^{-6}) and not the upper end of the risk management range (1×10^{-4}). This comment also applies to Line 23 where it states "…all cancer risks were still below 1×10^{-4}. The Air Force should note that in their letter *"EPA Non-Concurrence on the Edwards AFB Draft Final First Five-Year Review Report, NASA Dryden Flight Research Center, Operable Unit 6, Edwards Air Force Base, California"* dated September 30, 2011, the USEPA stated the following under Major Issue Item 1, Vapor Intrusion Pathway (VIP) Risk: *"In addition, when performing the VIP risk assessment, the Air Force must use 10^{-6} as the point of departure for evaluating risk in terms of the area of risk for both the industrial scenario and for a future residential scenario, as the trigger for developing action levels within the risk management range."* The USEPA's statement also supports Dr. Kimberly Gettmann's General Comment 2 in the attached letter which states "…the decision to derive cleanup values should not be based on risks being less than 1×10^{-4}, the upper risk management range, but based on whether the risks are greater than the point of departure and site	Please see responses to HERO's General Comments 1, 2, and 4.c.ii.

Reviewer	Comment #	Comment	Response
		specific conditions.	
Lahontan Regional Water Quality Control Board	General Comment 1	In September 2011, EPA issued a Non-Concurrence letter on the Draft Final FYR, stating that a protectiveness determination could not be made until further information was obtained. The Remedial Action Work Plan Addendum [RAWPA (April 2013)] was prepared to provide a documented path forward for the remedial action through the next FYR. Additional plume characterization was identified as an investigation priority. The additional plume investigations were to consist of delineation of VOC plumes at the leading edge of the TCE plumes, vertical and lateral extent delineation; and annual remedy performance and groundwater monitoring. The OU 6 Groundwater Investigation Work Plan Uniform Federal Policy- Quality Assurance Project Plan (Work Plan) was finalized in January 2014. The Work Plan proposed installing, developing, and sampling ten groundwater monitoring wells to evaluate contaminant lateral and vertical extent of the contaminant plumes. April through September 2013, eighteen monitoring wells were installed on the lakebed east and southeast of OU 6 associated with a separate work plan for Site 25. Results from the Site 25 groundwater investigations identified contaminants at a further lateral downgradient extent. The extent of the plume remains undefined both laterally and vertically. The Work Plan is being revised to focus on delineating the lateral	The comment indicates that additional tasks are needed to delineate the vertical extent of the plume. This no longer appears to be the case based on vertical delineation data obtained from the Site 25 investigation. For clarity, the third paragraph of Section 2.1.1.3 has been modified to read: "Since the review period, 18 groundwater monitoring wells (RL-25-MW01 to RL-25-MW18) associated with Site 25 (OU 8) were installed in April through September 2013 on the lakebed east and southeast of OU 6 and groundwater samples were collected from those wells and well N4-MW14. Figure 2 presents the locations of these wells and an updated plume configuration estimate based on data collected since those data shown on Figure 6-4 of the *First FYRR*. The laboratory analytical results for those groundwater samples indicated the presence of TCE at 12 of the 18 wells and at well N4-MW14. The horizontal extent of the plume remains unclear to the east, southeast, and south of Site N4 and additional wells will be installed in Spring 2015 to close these data gaps. The rationale for the additional well locations is provided in the Revised Final *Groundwater Investigation Work Plan* (AECOM 2015). Site 25 lakebed results (Figure 2) agree with the results of previous investigations regarding vertical contaminant gradient and extent. Site 25 lakebed results indicate that the highest TCE concentrations occur at the water table. This finding is consistent with previous investigations conducted in upgradient areas. As further discussed and illustrated in the Revised Final *Groundwater Investigation Work Plan* (AECOM 2015), packer testing performed at Site N1

Reviewer	Comment #	Comment	Response
		extent of the plume. Additional tasks are needed to delineate the vertical extent of the plume. Please provide a schedule for installing additional wells to meet the initial objectives of the Work Plan. Review of information from the site shows groundwater monitoring has not been conducted as required by the ROD and described in RAWPA. Water Board staff are concerned that the information needed to make a protectiveness determination will not be available for the Second FYR, scheduled for completion in September 2016. To address our concerns we ask that the Air Force implement the actions identified in the RAWPA.	indicated a vertical concentration gradient with the highest TCE concentrations present at the water table. Plume characterization extent findings will be updated during the second five-year review period and in future five-year review periods." A detailed schedule for installing the additional wells will be included in the Revised Final *Groundwater Investigation Work Plan* (AECOM 2015) which is planned for release in March 2015. Additionally, Table 2 has been revised to identify a date of "4/2015" for installation of the 10 monitoring wells. Groundwater sampling data from the 2011 (not available for the First FYR), 2012, 2014 (Site 25 investigation), 2015, and 2016 monitoring events are anticipated to be available for the Second FYR. The schedule forecasted in the Remedial Action Work Plan Addendum was developed prior to the Site 25 lakebed investigation. The results of which were unexpected and have significantly impacted the schedule proposed in the Remedial Action Work Plan Addendum. The Site 25 data indicates that the OU 6 plume may extend over 500 feet further downgradient than the 2012 groundwater sampling results indicated. Well installations specified in the Final Groundwater Investigation Work Plan were delayed and locations reassessed based on the Site 25 lakebed investigation data. Though the Air Force and NASA are planning on installing 8 wells on the lakebed (2 additional wells will be installed in the upgradient plume areas near Site N3) in Spring 2015, given the large areal extent to be investigated, additional

Reviewer	Comment #	Comment	Response
			wells may be necessary to delineate the downgradient edge of the plume and to determine the connectivity between the plume in the Sites N1, N4, and N7 areas and the elevated concentration areas identified by the Site 25 well installations. NASA has allocated funding to additional well installations *in lieu* of performing an injection event in 2015. To further understand whether or not the plume is migrating, several years of groundwater data from the new wells is needed and that evaluation would be complicated by manipulation of the plume through ISCO treatment. Additionally, recommendations to assess and evaluate different oxidants and plume mobilization potential from injection prior to the next injection event is proposed in the Addendum to the First-Five Year Review Report.
Lahontan Regional Water Quality Control Board	Specific Comment 2 (no Specific Comment 1 indicated)	P. 2-3, Section 2.1.1.1, Plume Boundaries and In Situ Chemical Oxidation Implementation- The First FYR provided supportive analytical data that the In Situ Chemical Oxidation (ISCO) remedy in the source areas appeared to be working successfully where applied. Further, the FYR Addendum states that the possible plume expansion and instability is an indication of incomplete contamination delineation as opposed to failure or shortcoming of the ISCO component of the remedy. While work is being completed to define the extent of the plume Water Board staff request that the ISCO injection event for Calendar Year 2015 be implemented as scheduled.	Please see response to Lahontan Regional Water Quality Control General Comment 1.
Lahontan Regional	Specific Comment 3	P. 2-3, Section 2.1.1.3, Groundwater Monitoring Data Review - A key action item identified for Plume	As indicated on Table 2, the 2015 Groundwater Monitoring Event is scheduled for June/July 2015. Please also see

Reviewer	Comment #	Comment	Response
Water Quality Control Board		Characterization in the RAWPA is annual groundwater monitoring to assess plume movement and stability. Deviations from the RAWPA have resulted in two missed annual groundwater monitoring events (2013 and 2014). The groundwater monitoring component of the Remedial Action was established to evaluate the performance of the ISCO remedy and monitor the changes in plume characteristics. For ongoing compliance with the ROD, it is important to continue annual groundwater monitoring. Water Board staff request that the 2015 Annual Groundwater Monitoring be performed.	response to Lahontan Regional Water Quality Control General Comment 1.
Lahontan Regional Water Quality Control Board	Specific Comment 4	P. 2-3, Section 2.1.1.3, Groundwater Monitoring Data Review - The section discusses the latest groundwater data for Chemical of Concern (COC) TCE, Benzene, and CT in regard to the lateral distribution of contaminants. The Addendum does not discuss the vertical distribution of COCs, however, Figure 2, depicts proposed deep wells and the Site 25 multiple depth wells. Please revise the Addendum to also discuss the lateral distribution of Potential Chemical of Concern (PCOC). Also revise the Addendum to discuss the vertical distribution of COCs and PCOCs and associated potential data gaps.	Please see response to Lahontan Regional Water Quality Control General Comment 1.
Lahontan Regional Water Quality Control Board	Specific Comment 5	P. 2-3, Section 2.1.1.3, Groundwater Monitoring Data Review - The section states that Figure 2 shows groundwater TCE plume extents based on data collected since the First FYR, including preliminary data. However, Figure 2 does not incorporate the Site 25 monitoring well data in the estimated plume extent. Please revise Figure 2 to incorporate the Site 25	All applicable report figures (including Figure 2) have been revised to show the revised well locations agreed to by the Air Force, NASA, and regulatory agencies during the 25 November 2014 teleconference. Additionally, on applicable figures, the TCE and carbon tetrachloride figures have been extended around monitoring well N4-MW14. The contours have not been extended to include the Site 25 lakebed wells

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		groundwater data in the estimated plume extent (e.g. revised contaminant concentration contours).	as sampling points are not currently available to determine the relationship between the downgradient Sites N1, N4, and N7 wells and the Site 25 lakebed wells. Proposed monitoring wells N4-MW15 and N4-MW16 will further the understanding of the connection between the concentrations detected at downgradient Sites N1, N4, and N7 monitoring wells and VOC concentrations detected at Site 25 lakebed wells. Although TCE concentrations were detected at the same order of magnitude at downgradient Sites N1, N4, and N7 wells as Site 25 lakebed wells, carbon tetrachloride (present at Site N4) was not detected in any of the Site 25 lakebed wells which lends some uncertainty to the relationship of the OU 6 plume in the area of Site N4 to the Site 25 lakebed wells.
Lahontan Regional Water Quality Control Board	Specific Comment 6	P. 3-1, Section 3.1.1, Leading Edge Data Gap – The section states that "to address apparent data gaps in the groundwater plume data, additional well installations are proposed in the area of Site N4 and on Rogers Dry Lake as presented in the Groundwater Investigation Work Plan (January 2014)." It is further stated that "data generated during the Site 25 investigation may warrant a revision of the proposed well locations." The agencies agreed verbally that the results of the Site 25 investigation warranted a revision of the proposed well locations. Please revise the Addendum globally to discuss the revision of the proposed well locations with rationale for each location.	All applicable report figures have been revised to show the revised well locations agreed to by the Air Force, NASA, and regulatory agencies during the 25 November 2014 teleconference. Change-out pages constituting the Revised Final Groundwater Investigation Work Plan and documenting the revised monitoring well locations is planned for release in March 2015 in anticipation of well installations in April 2015. Worksheet 17 of the Revised Final Groundwater Investigation Work Plan has been extensively revised to provide the objective and rationale for each of the 10 proposed monitoring well locations. The following sentence has been added to Section 2.1.1.3 of the Addendum to First Five-Year Review Report: "The rationale for the additional well locations is provided in the Revised Final *Groundwater Investigation Work Plan* (AECOM 2015)."
Lahontan	Specific	P. 3-3, Section 3.2.3, Additional Remedial Action	Please see response to Lahontan Regional Water Quality

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Regional Water Quality Control Board	Comment 7	Implementation Recommendations- Further evaluation and recommendations for ISCO of Fenton's reagent or persulfate treatment at Site N4 is stated to be needed in the AFYR. It is also stated that the results of the evaluations and recommendations will be included in the Remedy Performance and Groundwater Monitoring Reports and the Second FYR. The needed evaluation and recommendations should be identified now to ensure sufficient implementation time is available for it to be addressed prior to the Second FYR. We request that the need for further ISCO evaluation and recommendations be identified as an Issue Warranting Follow-Up Actions. Please provide a timetable for the evaluation and include it in the data gaps schedule. Please revise the Addendum accordingly to reflect the changes.	Control General Comment 1 regarding the delay of the next ISCO injection event. As the next ISCO injection event will likely occur after the next five-year review and Tables 1 and 2 provide action items to be completed prior to the next five-year review, the current location of recommendations regarding ISCO implementation in Section 3.2.3 is appropriate.
Lahontan Regional Water Quality Control Board	Specific Comment 8	Table 1, Recommendations and Follow-Up Actions - The Table does not reflect updated relative dates for the Specific Issues. Please revise the Anticipated Completion Date for the Specific Issues to reflect updated relative dates. Specify the anticipated completion dates for Groundwater Monitoring Events 2015 and 2016. Update the Initial Investigation completion date. Please revise the Addendum discussions accordingly for consistency.	Tables 1 and/or 2 have been updated with current forecasted dates for the 2015 and 2016 Groundwater Monitoring Events and the Initial Groundwater Investigation. The ISCO event originally planned for 2015 has been removed from Table 2 as the table provides dates for remedial action activities completed or planned up to the next five-year review and for reasons discussed in the response to Lahontan Regional Water Quality Control General Comment 1, the next ISCO event will not occur prior to the next five-year review in 2016.
Lahontan Regional Water Quality Control	Specific Comment 9	Table 2, Summary of Anticipated Remedial Action Activities in the Next Five Years - Please revise the table to include the Groundwater Monitoring events for 2013 and 2016. Additionally, please revise the table to provide rationale for actions that were not conducted.	Table 2 has been updated with current forecasted dates for the 2015 and 2016 Groundwater Monitoring Events. An explanation for actions that were not or will not be conducted is provided in the response to Lahontan Regional Water Quality Control General Comment 1. The responses

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Board			to comments will be documented by inclusion as an appendix to the final document. The addition of rationale for actions not conducted to Table 2 would result in a complicated and unwieldy table resulting in the focus of the table (activities to be completed prior to the next five-year review) being lost.
Lahontan Regional Water Quality Control Board	Specific Comment 10	Figure 1, Approximate Extent of TCE in Groundwater - Please revise the figure to depict the estimated extent of the TCE plume based on the 2014 Site 25 groundwater investigation data.	Please see response to Lahontan Regional Water Quality Control Board Specific Comment 5.
USEPA	General Comment 1	The Addendum does not provide adequate information to support the data gap investigation proposed as Specific Issue 2 in Section 3.2.1, Issues Warranting Follow-up Actions. For example, Section 3.2.1 states, "Step-out monitoring wells should include locations south of existing monitoring wells N4 MW04, N4 MW05, N4 MW11, N4-MW12, N4 MW13, and N7 MW13. Other recommended monitoring well locations include east of N1-MW08, N1-MW10, N1 MW11, and N4 MW13;" however, only three locations with 6 proposed wells are shown on Figure 2, TCE Groundwater Concentration Contours May - June 2012 and Proposed Well Locations. As such, it is not clear if these locations are appropriate. Also, the rationale for these wells is not discussed in the Addendum. Further, as acknowledged in the text, these wells need to be relocated because of the elevated detections found in well N4-MW14 and the Site 25 lakebed well clusters. Please revise the Addendum to provide additional or revised proposed	All applicable report figures (including Figure 2) have been revised to show the revised well locations agreed to by the Air Force, NASA, and regulatory agencies during the 25 November 2014 teleconference. Change-out pages constituting the Revised Final Groundwater Investigation Work Plan and documenting the revised monitoring well locations is planned for release in March 2015 in anticipation of well installations in April 2015. Worksheet 17 of the Revised Final Groundwater Investigation Work Plan has been extensively revised to provide the objective and rationale for each of the 10 proposed monitoring well locations. The following sentence has been added to Section 2.1.1.3 of the Addendum to First Five-Year Review Report: "The rationale for the additional well locations is provided in the Revised Final *Groundwater Investigation Work Plan* (AECOM 2015)."

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		well locations, along with a rationale for each location. In addition, ensure that Figure 2 is consistent with the text of the Addendum.	
USEPA	General Comment 2	The Addendum does not include adequate information to assess whether the data collected after previous In-situ Chemical Oxidation (ISCO) injections performed as part of the remedy indicate that the remedy is functioning as intended. For example, Section 2.1.1.1, Plume Boundaries and In Situ Chemical Oxidation Implementation, indicates plume expansion and instability is an indication of incomplete contamination delineation as opposed to failure or a shortcoming of the ISCO component of the remedy for plumes identified in the Record of Decision (ROD); however, information to support this assertion is not provided in the Addendum. Further, Figure 2, TCE Groundwater Concentration Contours May - June 2012 and Proposed Well Locations, shows uncertainty in the extent of the plume downgradient of two sites which received ISCO injections (Sites N4 and N7), which indicates that plume expansion may be occurring due to plume displacement resulting from the ISCO injections. For example, at Site N7, the injections occur in fractured bedrock, which has a limited volume, making displacement likely. At Site N4, injection into fractured bedrock as well as into alluvium may be occurring. However, the Addendum does not acknowledge this potential or provide calculations that demonstrate how much displacement would occur. Please revise the Addendum to provide additional information to assess whether the ISCO remedy is functioning as intended or include this as a	The following text has been inserted as the third paragraph of Section 2.1.1.1: "Localized effects of pressurized injections in the form of groundwater mounding and surfacing have been observed up to 30 feet away from injection points during field implementation. Based on this observation the recommendation that ISCO injections be conducted only at wells greater than 100 feet from occupied buildings to avoid displacing/mobilizing the plumes under buildings and possibly completing the VIP has been made in Section 3.2.3. To evaluate if ISCO injections have affected plume stability at the downgradient edge, concentration trends in downgradient wells in relation to Site N7 injection events were evaluated. Site N7 injection events in relation to downgradient monitoring wells were evaluated due to the proximity of the site to downgradient areas and the availability of long-term data as a result of early ISCO implementation (in 2000) at the site. Trend graphs of TCE concentrations in groundwater were generated for wells in the Site N7 and downgradient edge areas (Appendix D) and notated with the timing of Site N7 injections. The locations of wells for which trend graphs were generated are shown on Figure D-1 provided in Appendix D. As further discussed in Section 2.1.1.2, of the leading edge wells with an adequate number of data points, only monitoring well N4-MW06 demonstrates a clear trend of increasing TCE concentrations indicating possible plume movement. As

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		formal issue in the Addendum.	shown on Figure D-1, monitoring well N4-MW06 is located over 1,000 feet away and cross-gradient of the Site N7 treatment area. Given the distance from the Site N7 treatment area and that permanganate has not been observed in monitoring well N4-MW06, it is unlikely that increasing TCE concentrations at this well are a result of injections at Site N7. A closer evaluation of the trend graph indicates that the TCE concentration trend for well N4-MW06 may be becoming asymptotic or leveling off. If this trend is further defined or confirmed during the 2015 and 2016 groundwater monitoring events then it should be determined if there were any site activities that could have caused the increase in TCE concentrations from 2006 to 2010. For example, was an unusually large volume of surface water discharged to the South Retention Pond (Site N4) during this timeframe? It is also noted, that when the Site N4 TCE high concentration area or hotspot is overlain on an aerial photograph (Figure D-1), the hotspot appears to align with an outflow point from the Retention Pond."
USEPA	General Comment 3	The Addendum does not discuss the vertical distribution of the contaminant of concern (COC) groundwater plumes. For example, while Figure 2, TCE Groundwater Concentration Contours May - June 2012 and Proposed Well Locations, shows several proposed "deep" wells and TCE data is provided for multiple depths for the wells associated with Site 25 (OU 8), the Addendum does not discuss the vertical distribution of COCs. As such, it is not clear if the vertical distribution is a data gap that will be addressed by the proposed additional groundwater well installations and sampling. Please revise the Addendum to discuss the vertical	Figure 2 has been modified to show the revised well locations agreed to by the Air Force, NASA, and regulatory agencies during the 25 November 2014 teleconference. As discussed during the teleconference, deep wells are no longer proposed for installation as the Site 25 investigation wells provided vertical extent data. The third paragraph of Section 2.1.1.3 has been modified to read: "Since the review period, 18 groundwater monitoring wells (RL-25-MW01 to RL-25-MW18) associated with Site 25 (OU 8) were installed in April through September 2013 on the lakebed east and southeast of OU 6 and groundwater samples were collected from those wells and well

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		distribution of COCs and the potential impact in evaluating data gaps and the remedy function.	N4-MW14. Figure 2 presents the locations of these wells and an updated plume configuration estimate based on data collected since those data shown on Figure 6-4 of the *First FYRR*. The laboratory analytical results for those groundwater samples indicated the presence of TCE at 12 of the 18 wells and at well N4-MW14. The horizontal extent of the plume remains unclear to the east, southeast, and south of Site N4 and additional wells will be installed in Spring 2015 to close these data gaps. The rationale for the additional well locations is provided in the Revised Final *Groundwater Investigation Work Plan* (AECOM 2015). Site 25 lakebed results (Figure 2) agree with the results of previous investigations regarding vertical contaminant gradient and extent. Site 25 lakebed results indicate that the highest TCE concentrations occur at the water table. This finding is consistent with previous investigations conducted in upgradient areas. As further discussed and illustrated in the Revised Final *Groundwater Investigation Work Plan* (AECOM 2015), packer testing performed at Site N1 indicated a vertical concentration gradient with the highest TCE concentrations present at the water table. Plume characterization extent findings will be updated during the second five-year review period and in future five-year review periods."
USEPA	General Comment 4	Review of Tables 1 through 5 (Human Health Risk Screening) of the Draft Human Health Risk Assessment Addendum (HHRA Addendum) in Appendix C indicates that numerous analytes were not detected above their applicable reporting limit in 2012; however, the HHRA does not include an evaluation of detection limits, reporting limits or, preferably, sample quantitation limits	The USEPA Five-Year Review guidance indicates that the new estimated risk should be compared to the baseline risk. For a close comparison, the updated risk assessment based on 2012 groundwater sampling results was conducted similarly to the baseline risk assessment (based on 2003 groundwater sampling results) which was conducted in accordance with the Basewide HHRA Work Plan for

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		(SQLs) for constituents in groundwater in comparison to applicable health-based screening criteria. Elevated sample quantitation limits may result in some constituents not being identified as constituents of potential concern (COPCs). Non-detect results associated with SQLs which exceed the most relevant health-based screening criteria should result in additions to the site-specific COPC list. This list of COPCs predicated on non-detect results can be further refined in consideration of a data review of contributing/receiving media, a review of historical land use at the site, or an assessment of potential breakdown/daughter products from known site COPCs, among other phenomena within the context of the data evaluation or uncertainty assessment To ensure that constituents were not overlooked in the risk assessment, please revise the HHRA to include an evaluation of non-detect results as a function of sample quantitation limits in comparison to the most relevant health-based screening criteria.	Edwards Air Force Base (Earth Tech 2001). Since per guidance the new estimated risk is generated for comparison purposes (if the new risk is greater than the baseline risk, action may be required), the following approach in response to the comment was taken. Overall when the updated risk assessment results were compared to the baseline risk assessment, results were lower. To determine if an analyte that was not detected in 2012 had the potential to make the updated risk assessment results higher than the baseline risk assessment results, for each site, the baseline risk assessment risk drivers were identified and evaluated to see if they were detected in 2012. Only 1,2 dichloroethane at Site N7 was a risk driver in the baseline risk assessment and not detected in Site N7 groundwater sampling results. The risk and hazards for 1,2 dichloroethane were calculated using the method detection level of 0.15 μg/L. The addition of the 1,2 dichloroethane risk and hazards calculated using the method detection level did not change the Site N7 cancer risk nor the non-cancer hazard. See attachment "Table 5 Attachment to RTCs.xlsx" to this comment response document.
USEPA	General Comment 5	Section 3.0, Vapor Intrusion Risk Assessment, of the HHRA Addendum, indicates that risks to the hypothetical future resident population were calculated based on a comparison of the concentrations of contaminants detected in indoor air samples to applicable residential indoor air screening levels; however, the assessment does not include a discussion or evaluation of sub-slab soil gas (SSSG) concentrations relative to residential vapor intrusion screening levels. As previously indicated in USEPA comments on the Vapor	The assessment of residential exposure using indoor air samples is consistent with the approach specified for the HHRA Addendum in the Final Remedial Action Work Plan Addendum "Potential risk will be evaluated by a comparison of the indoor air results to concentrations in air calculated to protect receptors under both residential and industrial exposure scenarios." Additionally see response to HERO's General Comment 1 regarding recommendation to conduct an RPM risk

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		Intrusion Investigation Report, dated April 2014, indoor air concentrations are significantly more dynamic than SSSG, are subject to myriad confounding influences (e.g., intermittent operation of HVAC systems), and represent a snapshot in time. SSSG data are, generally, more stable and consistent and provide an understanding of the potential to adversely impact indoor air breathing zones. A comparison of empirical SSSG data to health-based screening criteria is fundamental in supporting a defensible vapor intrusion potential assessment. Please revise the assessment to discuss SSSG data in comparison to the most relevant health-based screening criteria.	management discussion.
USEPA	General Comment 6	As discussed in Section 1.0, Introduction, of the HHRA Addendum, the focus of the document is assessment of risks associated with exposure to groundwater and indoor air via the vapor intrusion pathway. While it is recognized that risks to an industrial worker due to exposure to indoor air were previously assessed in the Vapor Intrusion Investigation Report included as Attachment B of the HHRA Addendum, for clarity and completeness, it is recommended that the results and conclusions of the investigation be summarized in the HHRA Addendum, along with a discussion as to whether any further actions are necessary to preclude exposures, as applicable. Please revise the HHRA Addendum to include a summary of the results of the vapor intrusion investigation, including whether any future action is necessary.	The HHRA Addendum already includes a summary of the results of the vapor intrusion investigation, most significantly in Section 3.1 Vapor Intrusion Investigation – 2013. Additionally Table 6 of the HHRA Addendum summarizes both the Residential and Industrial results for all 3 buildings investigated and both sampling seasons. The second to last paragraph of Section 3.1 includes the following text, "…no further actions beyond the selected remedy need to be taken to achieve an acceptable risk level…"
USEPA	Specific Comment 1	**Section 2.1.1.1, Plume Boundaries and *In Situ* Chemical Oxidation Implementation, Page 2-2 and**	The recommendation appears more appropriate for inclusion in Section 3.2.3 Additional Remedial Action

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		Section 3.2.1, Issues Warranting Follow-up Actions, Page 3-2: This section recommends establishing an artificial plume boundary for Site N4 as part of the next five-year review to initiate removal estimates in that treatment area; however, this is not included as an issue or part of the recommendations in the Addendum For example, Section 3.2.1, Issues Warranting Follow-up Actions, does not include this as specific issue or as a recommendation that is part of one of the existing two issues. As such, it is unclear if this issue will be addressed as part of the next five-year review. Please revise Section 3.2.1 to include establishing an artificial plume boundary for Site N4 as part of an issue for the next five-year review.	Implementation Recommendation. Section 3.2.3 has been revised to include the following: "Artificial plume boundaries were established at Sites N3 and N7 to allow for consistent future contaminant mass estimates. To initiate removal estimates and allow for consistent future contaminant mass estimates an artificial plume boundary for Site N4 is recommended as part of the next five-year review."
USEPA	Specific Comment 2	**Section 2.1.1.3, Groundwater Monitoring Data Review, Page 2-3:** The text states, "Figure 2 includes trend graphs for wells with an adequate number of data points;" however, Section 2.1.1.3 does not provide any analysis of trends or analysis of plume stability based on these trends. As such, the current state of the plume (i.e., whether the plume is expanding, shrinking, or stable) is not clear. Please revise the Addendum to provide information on the COC trends in leading edge wells and an evaluation of the plume stability, based on current data.	The following text has been added to the second paragraph of Section 2.1.1.3: "Trend graphs for wells with an adequate number of data points are included on Figure 2, and indicate that the extent of leading edge plume instability appears to be limited to the southern portion of Site N1 and the northern portion of Site N4 as indicated by increasing TCE concentrations at monitoring well N4-MW06. TCE concentrations in samples collected from monitoring well N4-MW06 have consistently increased since its initial sampling in 2005."
USEPA	Specific Comment 3	**Section 2.1.1.3, Groundwater Monitoring Data Review, Page 2-3:** The description of the plume extent in this section and Figure 1, Approximate Extent of TCE in Groundwater do not appear to be consistent. For example, this section states, "TCE concentrations	Figure 1 has been revised to include contouring based on 2014 monitoring well N4-MW14 data. As explained in the response to DTSC's Specific Comment 1, on applicable figures, the TCE and carbon tetrachloride figures have been extended around monitoring well N4-MW14. The contours

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		detected in samples collected from wells installed at OU 6 since 2009 indicate that the commingled plume extends further downgradient than the plume delineation based on previous monitoring events." While this statement appears to be accurate, the depiction of the TCE plumes from 2010 and 2012 in Figure 1 does not appear show this clearly, apparently because the data from N4-MW-14 and the new Site 25 wells were not used to estimate the plume boundary in this figure. Please revise the Addendum to address the discrepancy in description of the plume extent in Section 2.1.1.3 and Figure 1.	have not been extended to include the Site 25 lakebed wells as sampling points are not currently available to determine the relationship between the downgradient Sites N1, N4, and N7 wells and the Site 25 lakebed wells. Proposed monitoring wells N4-MW15 and N4-MW16 will further the understanding of the connection between the concentrations detected at downgradient Sites N1, N4, and N7 monitoring wells and VOC concentrations detected at Site 25 lakebed wells. Although TCE concentrations were detected at the same order of magnitude at downgradient Sites N1, N4, and N7 wells as Site 25 lakebed wells, carbon tetrachloride (present at Site N4) was not detected in any of the Site 25 lakebed wells which lends some uncertainty to the relationship of the OU 6 plume in the area of Site N4 to the Site 25 lakebed wells.
USEPA	Specific Comment 4	**Section 2.1.1.3, Groundwater Monitoring Data Review, Page 2-4:** This section indicates that Figure 2, TCE Groundwater Concentration Contours May - June 2012 and Proposed Well Locations, presents the locations of recent Site 25 (OU 8) wells and an updated plume configuration estimate based on some of the available data; however, the plume depiction in Figure 2 does not appear to include the Site 25 (OU 8) data or data from well N4-MW14. For example, Figure 2 indicates that wells RL-25-MW07 and RL-25-MW08 have TCE concentrations exceeding 100 micrograms per liter (ug/L); however, the 100 ug/L groundwater TCE concentration contour on Figure 2 has not been extended to include RL-25-MW07 and RL-25-MW08. Since this data was collected more than six months ago, it should have been validated. Please revise Figure 2 to add all	Figure 2 has been revised to include contouring based on 2014 monitoring well N4-MW14 data. As explained in the response to DTSC's Specific Comment 1, on applicable figures, the TCE and carbon tetrachloride figures have been extended around monitoring well N4-MW14. The contours have not been extended to include the Site 25 lakebed wells as sampling points are not currently available to determine the relationship between the downgradient Sites N1, N4, and N7 wells and the Site 25 lakebed wells. Proposed monitoring wells N4-MW15 and N4-MW16 will further the understanding of the connection between the concentrations detected at downgradient Sites N1, N4, and N7 monitoring wells and VOC concentrations detected at Site 25 lakebed wells. Although TCE concentrations were detected at the same order of magnitude at downgradient Sites N1, N4, and N7 wells as Site 25 lakebed wells, carbon tetrachloride

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		relevant data and provide revised contours.	(present at Site N4) was not detected in any of the Site 25 lakebed wells which lends some uncertainty to the relationship of the OU 6 plume in the area of Site N4 to the Site 25 lakebed wells.
USEPA	Specific Comment 5	**Section 2.1.1.3, Groundwater Monitoring Data Review, Page 2-4:** This section states, "Installation of a monitoring well (proposed well N3-MW29, Figure 3) downgradient of well N3-MW24 is planned by December 2014;" however, proposed well N3-MW29 is not shown on Figure 3. Please revise the Addendum figures to show all new proposed wells.	All applicable report figures (including Figure 3) have been revised to show the revised well locations agreed to by the Air Force, NASA, and regulatory agencies during the 25 November 2014 teleconference.
USEPA	Specific Comment 6	**Section 2.1.1.3, Groundwater Monitoring Data Review, Page 2-4 and Figure 4, CT Groundwater Concentration Contours - May-June 2012**: The text under the subheading "Carbon Tetrachloride in Groundwater" does not discuss if carbon tetrachloride (CT) was detected in N4-MW14 or in the new Site 25 wells. For completeness, this should be discussed in the Section 2.1.1.3 and included on Figure 4, CT Groundwater Concentration Contours - May-June 2012. Further, for clarity, Figure 4 should include the drainage ditch and South Retention Pond as they are discussed in the Section 2.1.1.3. Please revise Section 2.1.1.3 and Figure 4 to address these issues.	The fifth paragraph of Section 2.1.1.3 has been revised to include the following text: "This observation was further confirmed by the 2014 sampling data collected as part of the Site 25 investigation effort. CT was detected at a concentration of 60 μg/L at well N4-MW14 and was not detected above the reporting limit at wells RL-25-MW01 to RL-25-MW18 on Rogers Dry Lake (Figure 4)." Figure 4 has been revised to include revised proposed well locations, CT data for monitoring well N4-MW14 and Site 25 investigation wells, contouring around monitoring well N4-MW14, and drainage ditch and Retention Pond identification.
USEPA	Specific Comment 7	**Section 3.1.1, Leading Edge Data Gap, Page 3-1 and Section 3.2.1, Issues Warranting Follow-Up Actions, Page 3-2:** This section does not discuss the proposed method for treatment of CT. Section 2.1.1.3, Groundwater Monitoring Data Review, indicates that permanganate is not effective for CT. As such, it	The second paragraph of Section 3.1.1 has been revised to include the following: "ISCO treatment in the Site N4 area using a strong oxidant such as Fenton's reagent or persulfate will likely be required to reduce CT and TCE concentrations." Section 3.2.3 Additional Remedial Action Implementation Recommendations already includes the

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		appears that Fenton's reagent or persulfate should be considered for areas that have CT. Further, it is not clear why this is not included as a specific issue in Section 3.2.1, Issues Warranting Follow-Up Actions. Please revise Section 3.1.1 and Section 3.2.1 to address these issues.	recommendation to evaluate employing Fenton's reagent or persulfate treatment at Site N4. Section 3.2.3 appears to be a more appropriate location for this recommendation than Section 3.2.1. The Addendum organization is based on the two key action items (Risk Assessment and Plume Characterization) identified during the First Five-Year Review. Of the two action items only Plume Characterization requires further action. In Section 2.0, two components of the Plume Characterization action item are identified: plume delineation and plume stability assessment. Section 3.2.1 is consistent with this organization as it focuses on plume delineation (Specific Issue 1) and plume stability assessment (Specific Issue 2). A myriad of recommendations regarding remedy implementation are identified in the document and are summarized and captured in Section 3.2.3.
USEPA	Specific Comment 8	**Section 3.2.1, Issues Warranting Follow-Up Actions, Page 3-2:** The issues described in this section are not consistent with the issues described in Table 1, Recommendation and Follow-Up Actions. For example, Table 1 includes the statement, "Data from groundwater samples to be collected from proposed monitoring wells (which will be installed in 2014) will be used to optimize remedy performance as necessary. Protectiveness will be reassessed in the Second FYRR [Five-Year Review Report];" however, this information is not included in Section 3.2.1. For clarity, please ensure that issues in both Section 3.2.1 and Table 1 are consistent.	Section 3.2.1 included the following text: "To close the leading edge data gaps, identify potential ISCO injection candidate locations, monitor cleanup progress, and verify future protectiveness, installation of monitoring wells is recommended." The text has been modified as follows (modifications in bold), "To close the leading edge data gaps, **optimize remedy performance by** identify**ing** potential ISCO injection candidate locations, monitor cleanup progress, and verify future protectiveness **(to be reassessed in the *Second FYRR*)**, installation **and sampling** of monitoring wells is recommended.
USEPA	Specific Comment 9	**Section 3.2.3, Anticipated Remedial Action Activities in the Next Five Years, Page 3-3:** This section states that the CT plume is larger than the TCE plume at Site	The first paragraph of Section 3.2.3 has been modified to read: "During the review period, TCE and benzene were used to define the LUC boundary because these two COCs

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		N4 and that this is discussed earlier in the Addendum; however, it does not appear this issue was discussed earlier in the Addendum. Also, it is noted that based on the data from N4-MW14 and the new Site 25 wells, the TCE plume is larger than the CT plume (e.g., unless there is CT data from these wells that is not presented in the Addendum). Please revise the Addendum to clarify the size of the CT plume and any issues associated with this (e.g., a need for an expanded land use control [LUC] boundary).	were believed to be present at concentrations above their respective MCLs over a larger area than the other detected chemicals; however, a comparison of Figures 2 and 4, indicates that the CT plume may be larger northeast of Site N4 than the TCE plume. Data from the proposed monitoring wells (specifically proposed well N4-MW15) in conjunction with the Site 25 investigation data may indicate that the TCE plume extends further to the northeast of Site N4. However, as a precaution, it is recommended that the LUC boundary be modified to include the CT plume as well as the TCE and benzene plumes (AECOM 2012)."
USEPA	Appendix A Evaluation of Response to General Comments 2 and 5 on Draft Final First Five-Year Review Report	**Evaluation of the Follow-on Responses to General Comment (GC) 2 and GC 5:** The responses appear to partially address the comment. The response indicates that Figure 2, TCE Groundwater Concentration Contours May - June 2012 and Proposed Well Locations, presents the locations of recent Site 25 (OU 8) wells and an updated plume configuration estimate based on data collected; however, the plume depiction in Figure 2 does not include the Site 25 (OU 8) data from wells that were installed in the lakebed. For example, Figure 2 shows wells RL-25-MW07 and RL-25-MW08 with TCE concentrations exceeding 100 micrograms per liter (ug/L); however, the 100 ug/L groundwater TCE concentration contour on Figure 2 has not been extended to RL-25-MW07 and RL-25-MW08. Please revise Figure 2 to base the TCE concentration contours on the data from all wells that have been sampled in the OU 6 area.	All applicable report figures (including Figure 2) have been revised to show the revised well locations agreed to by the Air Force, NASA, and regulatory agencies during the 25 November 2014 teleconference. Additionally, on applicable figures, the TCE and carbon tetrachloride figures have been extended around monitoring well N4-MW14. The contours have not been extended to include the Site 25 lakebed wells as sampling points are not currently available to determine the relationship between the downgradient Sites N1, N4, and N7 wells and the Site 25 lakebed wells. Proposed monitoring wells N4-MW15 and N4-MW16 will further the understanding of the connection between the concentrations detected at downgradient Sites N1, N4, and N7 monitoring wells and VOC concentrations detected at Site 25 lakebed wells. Although TCE concentrations were detected at the same order of magnitude at downgradient Sites N1, N4, and N7 wells as Site 25 lakebed wells, carbon tetrachloride (present at Site N4) was not detected in any of the Site 25 lakebed wells which lends some uncertainty to the relationship of the OU 6 plume in the area of Site N4 to the

Reviewer	Comment #	Comment	Response
			Site 25 lakebed wells.
USEPA	Appendix A Evaluation of Response to General Comment 8 on Draft Final First Five-Year Review Report	**Evaluation of the Follow-on Response to GC 8:** The response partially addresses the comment by recommending the establishment of an artificial plume boundary for Site N4 as part of the next five-year review to initiate removal estimates in that treatment area; however, this recommendation is not included as an issue or part of the recommendations in the Draft Addendum to the First Five-Year Review Report, National Aeronautics and Space Administration, Armstrong Flight Research Center, Operable Unit 6, Edwards Air Force Base, California, dated September 2014 (Addendum). For example, Section 3.2.1, Issues Warranting Follow-up Actions, does not include this as a specific issue or as a recommendation that is part of one of the existing two issues. As such, it is not sure if this issue will be addressed as part of the next five-year review. Please revise Section 3.2.1, to include establishing an artificial plume boundary for Site N4 to facilitate removal estimates as part of the next five-year review.	The recommendation appears more appropriate for inclusion in Section 3.2.3 Additional Remedial Action Implementation Recommendation. Section 3.2.3 has been revised to include the following: "Artificial plume boundaries were established at Sites N3 and N7 to allow for consistent future contaminant mass estimates. To initiate removal estimates and allow for consistent future contaminant mass estimates an artificial plume boundary for Site N4 is recommended as part of the next five-year review."
USEPA	Appendix A Evaluation of Response to General Comment 10 on Draft Final First Five-Year Review Report	**Evaluation of the Follow-on Response to GC 10:** The response partially addresses the comment; however, the response does not address the concern that remedial action objectives (RAOs) and LUCs may not be protective with the increasing concentrations of TCE in N3-MW15, which result in the potential for exposure to VOCs in occupied buildings through the vapor intrusion pathway. Please revise the OU 6 Addendum to discuss the protectiveness of the RAOs and LUCs with respect to potential vapor intrusion into buildings located above	The comment references monitoring well N3-MW15 which as shown on Figure 3 is approximately 100 feet away from the nearest occupied buildings (Buildings 4806 and 4807 which are scheduled for demolition in July 2015 and are anticipated to be vacated in May 2015). The comment also references increasing TCE concentrations. TCE was not detected in air samples collected within Buildings 4806 and 4807 during the vapor intrusion investigation. Benzene was detected in air samples collected in Building 4806 and 4807, however the risk related to those detections was assessed

Reviewer	Comment #	Comment	Response
		the groundwater plume.	and found to be in the generally acceptable risk range defined in the guidance (USEPA 2001), "… you should determine whether the new estimated risk is acceptable. In most cases, you should base this determination on whether the risk is within or below the generally acceptable risk range of 10^{-4} to 10^{-6} for carcinogenic risk and the hazard index is below 1 for non-carcinogenic effects. If the estimated risk is not protective, you should determine what actions need to be taken to achieve an acceptable level of risk." Since the calculated risk fell within the acceptable risk range, the remedy was deemed protective for the VIP and no additional action in regards to adjusting the RAOs or LUCs for VIP are needed. A delay in the demolition of Buildings 4806 and 4807 and the need to confirm seasonal variances to ensure that the indoor air risk is still in the protective range for the site workers under the industrial land use scenario warranted an additional winter sampling event. The additional VIP investigation was conducted in February 2016 and will be documented in the Second FYRR. The following paragraph has been added as the last paragraph of Section 3.2.3 Additional Remedial Action Implementation: "A delay in the demolition of two OU 6 buildings and the need to confirm seasonal variances to ensure that the indoor air risk is still in the protective range for the site workers under the industrial land use scenario warranted an additional winter sampling event. The additional VIP investigation was conducted in February 2016 and will be

Reviewer	Comment #	Comment	Response
			documented in the Second FYRR." See also response to HERO's General Comment 1 regarding recommendation to conduct an RPM risk management discussion.
USEPA	Appendix A Evaluation of Response to Specific Comment 17 on Draft Final First Five-Year Review Report	**Evaluation of the Follow-on Response to SC 17:** The response partially addresses the comment; however, proposed well N3-MW29 is not shown on Figure 3, Site N3 Benzene Groundwater Concentration Contours - May-June 2012. Please revise the Addendum figures to show all new proposed wells.	All applicable report figures (including Figure 3) have been revised to show the revised well locations agreed to by the Air Force, NASA, and regulatory agencies during the 25 November 2014 teleconference.

Text in red font indicates changes to the response and/or document text to account for the Air Force's decision to conduct an additional winter VIP sampling event at Buildings 4806 and 4807 in February 2016. Results will be documented in the Second Five-Year Review Report.

TABLE 5. HUMAN HEALTH RISK SCREENING - DIRECT CONTACT (TAPWATER) PATHWAY (HYPOTHETICAL FUTURE RESIDENTIAL)
SITE N7
(Page 1 of 2)

			2003 HHRA Hypothetical Future Residential Risk Results [1]					2012 Hypothetical Future Residential Risk Results [2]	
Analyte	Maximum Detected Concentration (μg/L)	Tapwater PRG (μg/L)	Cancer Risk	Hazard Quotient	2012 Maximum Detected Concentration (μg/L)	Cancer RSL (μg/L)	Non-cancer RSL (μg/L)	Cancer Risk	Hazard Quotient
1,1,2,2-tetrachloroethane	1.10	0.06	2.E-05	NA	---	---	---	---	---
1,1,2-trichloroethane	0.87	0.20	4.E-06	NA	---	---	---	---	---
1,1-dichloroethene	7.90	0.05	2.E-04	NA	---	---	---	---	---
1,2,3-trichlorobenzene	14	194	NA	0.07	---	---	---	---	---
1,2,3-trichloropropane	0.45	0.002	3.E-04	NA	---	---	---	---	---
1,2,4-trichlorobenzene	0.57	194	NA	<0.01	---	---	---	---	---
1,2,4-trimethylbenzene	100	12.3	NA	8.11	---	---	---	---	---
1,2-dibromo-3-chloropropane	1.40	0.005	3.E-04	NA	---	---	---	---	---
1,2-dichlorobenzene	0.24	370	NA	<0.01	---	---	---	---	---
1,2-dichloroethane	130	0.12	1.E-03	NA	0.15	0.17	13	9E-07	0
1,2-dichloropropane	7.60	0.16	5.E-05	NA	---	---	---	---	---
1,3,5-trimethylbenzene	0.38	12.3	NA	0.03	---	---	---	---	---
2-butanone (MEK)	52	1,904	NA	0.03	0.81	NA	5,600	NA	<0.01
4-methyl-2-pentanone (MIBK)	0.79	158	NA	<0.01	---	---	---	---	---
acetone	680	608	NA	1.12	---	---	---	---	---
benzene	2.70	0.35	8.E-06	NA	---	---	---	---	---
bromodichloromethane	4.20	0.18	2.E-05	NA	---	---	---	---	---
bromoform	---	---	---	---	1.1	9.2	380	1E-07	<0.01
carbon disulfide	0.75	1,043	NA	<0.01	---	---	---	---	---
carbon tetrachloride	20	0.17	1.E-04	NA	---	---	---	---	---
chloroform	12	0.16	7.E-05	NA	1.6	0.22	97	7E-06	0.02
cis-1,2-dichloroethene	3,700	60.8	NA	60.82	920	NA	36	NA	26
dibromochloromethane	0.32	0.13	2.E-06	NA	0.5	0.17	380	3E-06	<0.01
dichlorodifluoromethane (Freon 12)	5	395	NA	0.01	---	---	---	---	---
dichloroiodomethane	4	0.18	2.E-05	NA	---	---	---	---	---
ethylbenzene	50	1,340	NA	0.04	---	---	---	---	---
Freon 113	0.33	59,180	NA	<0.01	---	---	---	---	---
methylene chloride	84	4.3	2.E-05	NA	---	---	---	---	---
naphthalene	30	6.2	NA	4.84	---	---	---	---	---
N-nitrosodimethylamine (NDMA)	0.01	0.001	1.E-05	NA	---	---	---	---	---
n-propylbenzene	0.30	60.8	NA	<0.01	---	---	---	---	---
sec-butylbenzene	0.49	60.8	NA	<0.01	---	---	---	---	---

TABLE 5. HUMAN HEALTH RISK SCREENING - DIRECT CONTACT (TAPWATER) PATHWAY (HYPOTHETICAL FUTURE RESIDENTIAL)
SITE N7
(Page 2 of 2)

			2003 HHRA Hypothetical Future Residential Risk Results [1]					2012 Hypothetical Future Residential Risk Results [2]	
Analyte	Maximum Detected Concentration (μg/L)	Tapwater PRG (μg/L)	Cancer Risk	Hazard Quotient	2012 Maximum Detected Concentration (μg/L)	Cancer RSL (μg/L)	Non-cancer RSL (μg/L)	Cancer Risk	Hazard Quotient
tetrachloroethene (PCE)	4.10	1.1	4.E-06	NA	---	---	---	---	---
toluene	460	723	NA	0.64	---	---	---	---	---
trans-1,2-dichloroethene	12	122	NA	0.10	8.2	NA	360	NA	0.02
trichloroethene (TCE)	6,800	1.6	4.E-03	NA	880	0.49	2.8	2E-03	314
vinyl chloride	2.40	0.04	6.E-05	NA	---	---	---	---	---
xylene (m,p)	340	1,400	NA	0.24	---	---	---	---	---
xylene (o)	200	1,400	NA	0.14	---	---	---	---	---
		Total:	6E-03	80			Total :	2E-03	300

Notes:

[1] Calculated as the ratio of the maximum detected concentration to the PRG for noncarcinogens. This ratio is multiplied by 1 x 10^{-6} for carcinogens (Earth Tech 2001).

[2] Calculated as the ratio of the maximum detected concentration to the RSL for noncarcinogens. This ratio is multipied by 1 x 10^{-6} for carcinogens.

--- not detected above reporting limit, therefore RSLs and/or PRGs are not indicated and risk and hazards are not calculated.
μg/L micrograms per liter
HHRA human health risk assessment
NA not applicable/available, toxicity values were not available in 2003 and/or toxicity values are not currently available.
PRG Preliminary Remediation Goal (USEPA 2000)
RSL USEPA Regional Screening Levels for tapwater (May 2014)
USEPA United States Environmental Protection Agency
The PRG for 1,2,4-trichlorobenzene was used for 1,2,3-trichlorobenzene.
The PRG for bromodichloromethane was used for dichloroiodomethane.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 9
75 Hawthorne Street
San Francisco, CA 94105-3901

June 8, 2015

Mr. Ai Duong
Chief, Environmental Restoration
AFCEC/CZO-West
12 Laboratory Road
Edwards AFB, CA 93524

RE: EPA Review of Responses to Comments and Redline Final of the Addendum to the First Five-Year Review Report, Operable Unit 6, Edwards Air Force Base, California, April, 2015

Dear Mr. Duong:

EPA has reviewed the Responses to Comments and Redline Final of the Addendum to the First Five-Year Review Report, Operable Unit 6, received April 2015. Most of EPA's comments were at least partially addressed.

This transmittal is EPA's official comment on the subject document.

Should you have any questions on this correspondence, please feel free to contact me at (415) 972-3176.

Sincerely,

Kevin P. Mayer
NV & Federal Facilities Section 2
(SFD-8-2)

cc: Christina Guerra (RWQCB), electronic copy only
Kevin Depies (DTSC), electronic copy only
Bruce Lewis (DTSC), electronic copy only
Tom Merendini (EAFB), electronic copy only

Review of the Responses to Comments on the Draft Addendum to the First Five-Year Review Report and the Redline Final Addendum to the First Five-Year Review Report, Operable Unit 6, Edwards Air Force Base, California, April 2015

Response to General Comment 1: The response partially addresses the comment. It is understood that the rationale for each step-out location is provided in the Revised Final Groundwater Investigation Work Plan and that the locations have been agreed upon; however, it appears the step-out well locations shown on the revised Figure 2 differ from the step-outs described in Section 3.2.1. For example, Section 3.2.1 recommends a step-out well location south of existing well N7-MW13, but Figure 2 shows no proposed location in this area. The text of Section 3.2.1 should be revised to be consistent with the agreed upon recommendations for step-out locations. In addition, it is unclear what will happen with the unaddressed data gaps (i.e., those recommendations from the draft version that were not addressed by the revised step-out locations). Please revise Section 3.2.1 to describe step-out locations that are consistent with the agreed upon locations displayed on Figure 2. In addition, please revise the Addendum to the First Five-Year Review Report, Operable Unit 6 to discuss the data gaps not addressed by the revised step-out well locations.

Response to General Comment 2: The response addresses the comment; however, the revised text presented in the response could not be located in Section 2.1.1.1. Please revise Section 2.1.1.1 of the Redline FYR Add to include the revised text presented in the response.

Response to General Comment 3: The response addresses the comment; however, the isoconcentration contours on Figure 2 do not appear to have been updated to include the data from the lakebed wells. The response indicates that Figure 2 was updated to include "data collected since those data shown on Figure 6-4 of the First FYRR [Five-Year Review Report]," which should include the data collected from the lakebed wells. The response also indicates that plume boundaries will be updated for the Second FYRR, but it is unclear why it is necessary to wait. Please revise Figure 2 to include the updated isoconcentration contours or review the text to explain why the contours will not be updated until the Second FYRR.

Response to Specific Comments 3 and 4 and Second Response to General Comments 2 and 5: The responses partially address the comments; however, it is unclear why it is necessary to understand the relationships between Sites N1, N4, N7 and the lakebed wells to extend the contours. Further it is possible that the two additional wells listed in the responses may not provide sufficient data to resolve this issue. Also, the responses to these issues and the information from the responses regarding the reason why the trichloroethene (TCE) and carbon tetrachloride (CT) contours on the figures have not been extended to include the Site 25 lakebed wells should be incorporated into the text of the Redline FYR Add. Please revise the Redline FYR Add to explain why it is necessary to understand the relationships between Sites N1, N4, N7 and the lakebed wells to extend the contours and incorporate the information from the responses explaining why the TCE and CT contours have not been extended.

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APPENDIX C

VAPOR INTRUSION INVESTIGATION REPORT ADDENDUM

ENVIRONMENTAL RESTORATION PROGRAM

VAPOR INTRUSION INVESTIGATION REPORT ADDENDUM
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ARMSTRONG FLIGHT RESEARCH CENTER
OPERABLE UNIT 6

EDWARDS AIR FORCE BASE
CALIFORNIA

FINAL

SEPTEMBER 2016

Prepared for:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ARMSTRONG FLIGHT RESEARCH CENTER
SAFETY, HEALTH, AND ENVIRONMENTAL OFFICE
EDWARDS AIR FORCE BASE, CA 93523-0273

and the

UNITED STATES AIR FORCE CIVIL ENGINEER CENTER
ENVIRONMENTAL RESTORATION PROGRAM
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LIST OF ABBREVIATIONS AND ACRONYMS

°F	degrees Fahrenheit
-	minus
+	plus
1×10^{-6}	one in a million
1,2,4-TMB	1,2,4-trimethylbenzene
412 TW/CEV	412th Test Wing/Environmental Management Directorate
μg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
AECOM	AECOM Technical Services, Inc.
AFB	Air Force Base
AFCEC/CZOW	Air Force Civil Engineer Center/Environmental Restoration Program Installation Support Team - West
AFCEC/CZRW	Air Force Civil Engineer Center/ Restoration Program Management Office - West
AFRC	Armstrong Flight Research Center
ASTM	American Society for Testing and Materials
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CA	California
CA-IASL	California Indoor Air Screening Level
Cal EPA	California Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chemical of concern
CT	carbon tetrachloride
DFRC	Dryden Flight Research Center
DoD	Department of Defense
DTSC	Department of Toxic Substances Control
e.g.	for example (*exempli gratia*)
Earth Tech	Earth Tech, Inc.
ERP	Environmental Restoration Program
ft	foot or feet
FY	fiscal year
GC/MS	gas chromatograph/mass spectrometer
HI	Hazard Index
HQ	Hazard Quotient
HVAC	heating, ventilating, and air conditioning
i.e.	that is (*id est*)
IASL	Indoor Air Screening Level
IRIS	Integrated Risk Information System
ISCO	*in situ* chemical oxidation
ITRC	Interstate Technology and Regulatory Council
IUR	inhalation unit risk
LUC	land use control

LIST OF ABBREVIATIONS AND ACRONYMS *(Continued)*

mL/min	milliliters per minute
NASA	National Aeronautics and Space Administration
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
Pa	Pascal
PCE	tetrachloroethene
PID	photoionization detector
ppb	parts per billion
QAPP	Generic Uniform Federal Policy Quality Assurance Project Plan
QASR	quality assurance summary report
RBSL	risk-based screening level
RfC	reference concentration
ROD	Record of Decision
SVSL	Soil Vapor Screening Level
TCE	trichloroethene
TX	Texas
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VI	vapor intrusion
VIIR	Vapor Intrusion Investigation Report
VIP	vapor intrusion pathway
VOC	volatile organic compound

EXECUTIVE SUMMARY

Under the Environmental Restoration Program, the United States Air Force (USAF) and the National Aeronautics and Space Administration conducted a vapor intrusion pathway (VIP) investigation at Buildings 4806, 4807, and 4810 within Operable Unit (OU) 6 in March and August 2013 as reported in the *Vapor Intrusion Investigation Report* (*VIIR*) included as Attachment B to Appendix C (the Final *Human Health Risk Assessment Addendum*) of the *Addendum to First Five-Year Review Report* (Appendix B of the *Second Five-Year Review Report*). These buildings were investigated due to routine occupancy by site workers and because they overlie or are within 100 feet of the OU 6 groundwater contamination plumes. Building 4810 was demolished in September 2014 and a replacement building is planned; however, the demolition of Buildings 4806 and 4807 has been delayed until fiscal year (FY) 2018. Buildings 4806 and 4807 are currently occupied and will be occupied until they are demolished. Due to the demolition delay and to confirm seasonal observations, an additional winter sampling event was performed in February 2016 at Buildings 4806 and 4807. The investigation effort consisted of collecting sub-slab vapor samples and indoor/outdoor air samples at the two buildings. The data collected during this investigation were used to assess whether or not the VIP is complete, and to evaluate the potential risks posed by the VIP in these buildings under the current industrial land use scenario. This *VIIR Addendum*, included as Appendix C in the Second Five-Year Review Report, summarizes the field activities performed in February 2016, field survey results, sample analytical results, risk evaluation, and the conclusions and recommendations of the investigation.

An evaluation of the hypothetical residential scenario was included in the *Addendum to the First Five-Year Review Report* (included in Appendix B in the Second Five-Year Review Report). Based on the evaluation of the hypothetical residential scenario using 2013 indoor air and sub-slab vapor results, the *Addendum to the First Five-Year Review Report* concluded that the OU 6 remedy is protective of vapor intrusion given the continued implementation of land use controls prohibiting residential development for the foreseeable future.

OU 6 is in the remedial action phase of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. No remedial action was determined to be necessary for soil in the *Record of Decision* (ROD). For groundwater, the ROD identified potential exposure pathways requiring prevention or minimization, including groundwater ingestion and dermal contact as well as

inhalation of groundwater vapors. Though the inhalation pathway may include both direct inhalation and inhalation through the VIP into buildings, the selected remedy was designed to be protective of direct inhalation based on available groundwater data evaluated as part of the original human health risk assessment, which, at the time of the ROD signing, indicated no VIP risk that may require mitigation.

The *First Five-Year Review Report* for OU 6 was submitted in 2011. One of the purposes of a five-year review is to determine if changes in site conditions or changes in elements which comprise past risk assessments may have changed to an extent that the previous conclusions supporting the protectiveness of the ROD-selected remedy may no longer be valid. The OU 6 *First Five-Year Review Report* identified changes in toxicity data and risk assessment methodologies that had the potential to adversely affect the calculated VIP risk and the protectiveness of the remedy. Based on the findings of that document, the USAF and the regulatory agencies deferred determination of remedy protectiveness pending additional investigation and assessment of indoor air risk to current site workers (the focus of this *VIIR Addendum*).

The VIP investigation summarized in this *VIIR Addendum* was designed to meet the following objectives:

1. Collect sub-slab vapor samples and evaluate whether indoor workers may be at risk from subsurface volatile organic compounds (VOCs), if detected, in Buildings 4806 and 4807, which overlie or are in close proximity to the OU 6 contamination plumes.

2. Collect indoor/outdoor air samples and use multiple lines of evidence to identify those VOCs with a moderate to high likelihood of intruding into indoor air spaces from the subsurface via the VIP.

3. Quantify the cumulative risk for these VIP-related VOCs and all VOCs detected in the indoor air samples at each sampling location.

4. Based upon the evaluations, provide conclusions regarding the potential VIP risks at Buildings 4806 and 4807 under the current industrial land use scenario.

The February 2016 VIP investigation activities consisted of:

- Supplemental survey as a follow-up to the initial building survey conducted in June 2012 to identify any significant changes to site conditions,

- Sampling event building surveys to confirm the proposed sampling locations,

- Collection of sub-slab vapor samples and indoor and outdoor air samples for laboratory analysis of VOCs,

- Collection of indoor and outdoor air samples for on-site analysis using a portable gas chromatograph/mass spectrometer, and

- Data evaluation of potential VIP risks at both buildings based on the current industrial land use scenario.

Project objectives were met and human health risks were quantified as presented below:

- Met Objective 1 - Sub-slab vapor samples were collected from both buildings in February 2016. Sub-slab vapor sample results served as a line of evidence for comparison to indoor air, and were not used for VIP risk calculations.

- Met Objective 2 - Indoor and outdoor air samples were collected from both buildings in February 2016. Outdoor air sample results served as a line of evidence for comparison to indoor air, and were not used for VIP risk calculations.

- Met Objectives 3 and 4 - The indoor air risks for Buildings 4806 and 4807 were evaluated based on February 2016 sampling data as summarized below. The Hazard Quotients were not expressed on a target organ basis and therefore, the non-cancer risks are likely over-estimated.

  - Using the USAF/CERCLA approach for the selection of toxicity criteria, the total cancer industrial risk for individual samples collected at Building 4806 ranged from 1×10^{-6} to 1×10^{-5}, and the HIs ranged from less than 0.1 to approximately 0.2 for all of the VOCs detected in indoor air.

  - Using the DTSC-preferred approach for the selection of toxicity criteria, the total cancer industrial risk for individual samples collected at Building 4806 ranged from 3×10^{-6} to 1×10^{-5}, and the HIs ranged from less than 0.1 to approximately 0.1 for all of the VOCs detected in indoor air.

  - Using various lines of evidence and the USAF/CERCLA approach for the selection of toxicity criteria, the total cancer industrial risks at Building 4806 ranged from 7×10^{-8} to 3×10^{-7}, and the HIs were less than 0.1 for VOCs considered VIP-related or likely VIP-related.

- Using various lines of evidence and the DTSC-preferred approach for the selection of toxicity criteria, the total cancer industrial risks at Building 4806 ranged from 7×10^{-8} to 1×10^{-6} and the HIs were less than 0.1 for VOCs considered VIP-related or likely VIP-related.

- Results of the indoor air sampling indicated that (1) the potential cancer risks for all VOCs detected in indoor at Building 4806 air were at, or less than, 1×10^{-5}, and no cumulative HI exceeded 1.0; and (2) the potential cancer risks from VIP-related and likely VIP-related indoor air VOCs were at, or less than, 5×10^{-6}, and no cumulative HI exceeded 1.0.

- Using the USAF/CERCLA approach for the selection of toxicity criteria, the total cancer industrial risk for individual samples collected at Building 4807 ranged from 1×10^{-6} to 5×10^{-6}, and the HIs ranged from less than 0.1 to approximately 0.4 for all of the VOCs detected in indoor air.

- Using the DTSC-preferred approach for the selection of toxicity criteria, the total cancer industrial risk for individual samples collected at Building 4807 ranged from 3×10^{-6} to 1×10^{-5}, and the HIs ranged from less than 0.1 to approximately 0.5 for all of the VOCs detected in indoor air.

- Using various lines of evidence and the USAF/CERCLA approach for the selection of toxicity criteria, the total cancer industrial risk at Building 4807 was 4×10^{-7} and the HI was less than 0.1 for the VOC considered to be VIP-related.

- Using various lines of evidence and the DTSC-preferred approach for the selection of toxicity criteria, the total cancer industrial risk at Building 4807 was 2×10^{-6} and the HI was less than 0.1 for the VOC considered VIP-related.

- Results of the indoor air sampling indicated that (1) the potential cancer risks for all VOCs detected in indoor at Building 4807 air were at, or less than, 1×10^{-5}, and no cumulative HI exceeded 1.0; and (2) the potential cancer risks from the VIP-related indoor air VOC were at, or less than, 5×10^{-6}, and no cumulative HI exceeded 1.0.

The following is a summary of the recommendations related to the VIP at Buildings 4806 and 4807:

- Based upon the results of the indoor air sampling and associated human health risk assessment, no further action is necessary.

- The assumption that the heating, ventilating, and air conditioning (HVAC) system is mostly operating in the heating mode during the winter season and tends to induce a negative pressure differential inside the buildings in relation to the outside air, was confirmed with

the February 2016 sampling event, as negative pressure differentials were indicated by most of the measurements. Conversely, the HVAC system is mostly operating in the cooling mode during the summer season, and tends to induce a positive pressure differential inside the buildings in relation to the outside air and tends to impede vapor intrusion. Positive pressure differentials were indicated by most of the measurements during the August 2013 sampling event. Therefore, the results from the previous investigations (March and August 2013) and the February 2016 sampling event appear to be representative of building conditions in the "summer" and "winter" seasons, and no additional confirmatory sampling is necessary to further account for seasonal variations.

- Although a VIP exists in Buildings 4806 and 4807 (particularly in Building 4806 for benzene, a known site contaminant in groundwater), a VIP monitoring program does not appear to be necessary due to the estimated indoor air risks (for VIP-related and likely VIP-related indoor air VOCs) being well within the CERCLA risk management range for cancer risks (1×10^{-6} to 1×10^{-4}) and non-cancer hazards being well below 1. Although the benzene plume is likely under Buildings 4806 and 4807 and is projected to continue to migrate beneath the buildings, Buildings 4806 and 4807 are slated for demolition as early as FY 2018, and no replacement structures are planned. Buildings 4806 and 4807 were selected for this investigation due in part to their proximity to the benzene and trichloroethene (TCE) plumes. No other current or planned occupied buildings are, or will be, closer to the plumes; therefore, Buildings 4806 and 4807 are the most likely buildings to be impacted via the VIP. As this investigation has demonstrated that VIP-related indoor air risks are well within the risk management range and that TCE was not detected in any indoor air samples, an indoor air monitoring program is not recommended at these buildings or any other buildings in the path of the benzene and TCE plumes.

- Remedy performance and groundwater monitoring reports should include discussion of changes in site conditions (as they relate to COC concentrations and plume delineation) that might complete the VIP in occupied buildings. The reports should provide appropriate recommendations as they relate to such conditions.

- Land Use Control reports should include discussion of changes in site conditions (as they relate to new construction or intrusive activities) that might complete the VIP in occupied buildings or otherwise result in exposure of site workers to plume contaminants. The reports should provide appropriate recommendations as they relate to such conditions.

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1.0 INTRODUCTION

Under the Environmental Restoration Program (ERP), the United States Air Force (USAF) and the National Aeronautics and Space Administration (NASA) conducted a vapor intrusion pathway (VIP) investigation at Buildings 4806, 4807, and 4810 within Operable Unit (OU) 6, Edwards Air Force Base (AFB), California (Figure 1) in March and August 2013. The results of the 2013 VIP investigation are presented in the Final *Vapor Intrusion Investigation Report* that is included as Attachment B to Appendix C (the Final *Human Health Risk Assessment Addendum*) of the *Addendum to First Five-Year Review Report* (Appendix B of the *Second Five-Year Review Report*). These buildings were investigated due to routine occupancy by site workers and because they overlie or are within 100 feet (ft) of the OU 6 groundwater contamination plumes. Building 4810 was demolished in September 2014 and a replacement building is planned; however, the demolition of Buildings 4806 and 4807 has been delayed until fiscal year (FY) 2018. Buildings 4806 and 4807 are currently occupied and will be occupied until they are demolished. Due to the demolition delay and to confirm seasonal observations, an additional winter sampling event was performed in February 2016 at Buildings 4806 and 4807. The investigation effort consisted of collecting sub-slab vapor samples and indoor/outdoor air samples at the two buildings. The data collected during this investigation were used to assess whether or not the VIP is complete, and to evaluate the potential risks posed by the VIP in these buildings under the current industrial land use scenario. This *VIIR Addendum*, included as an appendix in the Second Five-Year Review, summarizes the field activities performed in February 2016, sampling results, risk evaluation as well as the conclusions and recommendations.

1.1 OPERABLE UNIT 6 HISTORY

The USAF, due to its primary mission in national defense, has long been engaged in a wide variety of operations that involve the use, storage, and disposal of hazardous substances. In 1980, the Department of Defense (DoD) developed the ERP, formerly known as the Installation Restoration Program, to investigate hazardous substance disposal sites on DoD facilities. The objectives of the ERP are to assess past hazardous substance disposal and release sites at USAF installations and to develop remedial actions consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act, and the National Oil

and Hazardous Substances Contingency Plan for sites that pose a threat to human health and welfare or the environment.

In response to Edwards AFB's listing on the National Priorities List on 30 August 1990, and to facilitate the ERP's investigation of wastes from past military and/or tenant agency use, and implement response actions, the Base was divided into 10 OUs. The OUs are defined by lease boundaries, if applicable, geographical location, similarities in contaminant types and distribution, and/or hydrologic setting. OU 6 is defined by the NASA Armstrong Flight Research Center (AFRC) (formerly Dryden Flight Research Center) lease boundary (Figure 2). Initial NASA AFRC investigations began in 1988 principally at a former gas station (now identified as Site N3 as shown on Figure 3). In 1993, an expanded investigation was conducted at OU 6 in which several sites and areas of concern were identified as documented in the *Base-wide Expanded Source Investigation/Resource Conservation and Recovery Act Facility Assessment* (The Earth Technology Corporation 1993). The OU 6 remedial investigation/feasibility study phase was completed in September 2006 with the signing of the *Record of Decision* (ROD) (USAF 2006). The ROD documented the remedy which consists of:

- Land Use Controls (LUCs): Implement, monitor, maintain, enforce, and report LUCs on groundwater in accordance with the Base General Plan and NASA AFRC Master Plan;
- *In Situ* Chemical Oxidation (ISCO): Treatment of high concentration portions of the chlorinated hydrocarbon (primarily trichloroethene [TCE]) plume via ISCO (Sites N3 and N7 areas);
- Bioremediation: Treatment of high concentration portions of the aromatic hydrocarbon plume (primarily benzene) via enhanced natural attenuation (bioremediation) (Site N3 area);
- Groundwater Monitoring: Demonstrate if natural attenuation in low concentration areas of the groundwater plume (plume containment)through periodic groundwater monitoring (Sites N1 and N4 areas), and document reduction in contaminant levels throughout the plume (Sites N1, N2, N3, N4, and N7 areas); and
- Five-Year Reviews: Conduct five-year reviews to evaluate the effectiveness of the selected remedy and monitor the status of the remedial action objectives.

No further remedial action was determined to be necessary for soil as documented in the ROD. For groundwater, the ROD identified exposure pathways that need to be prevented and/or minimized. The exposure pathways are groundwater ingestion and dermal contact, and inhalation of groundwater vapors. Though the inhalation pathway includes direct inhalation and inhalation through the VIP into buildings, the selected remedy was designed to be protective of direct inhalation based on available

groundwater data evaluated as part of the original human health risk assessment (Earth Tech, Inc. [Earth Tech] 2003), which indicated no unacceptable VIP risk requiring action at the time of the ROD signing. The remedial action selected in the ROD is led by the USAF, and overseen by the United States Environmental Protection Agency (USEPA), Region 9; California Department of Toxic Substances Control (DTSC); and California Regional Water Quality Control Board, Lahontan Region.

The *First Five-Year Review Report* (AECOM 2011) for OU 6 was submitted in 2011. One of the purposes of a five-year review is to determine if changes in site conditions or to the elements making up past risk assessments may have changed in such a way that the previous conclusions supporting the protectiveness of the ROD-selected remedy may no longer be valid. Changes in toxicity data and risk assessment methodologies were identified in the OU 6 *First Five-Year Review Report* (AECOM 2011) as potentially having an adverse effect on the calculated VIP risk, and the protectiveness of the remedy for the VIP. Based on the findings of the *First Five-Year Review Report*, the USAF and the regulatory agencies deferred determination of remedy protectiveness pending additional investigation and assessment of indoor air risk to current site workers (the focus of this investigation).

1.2 ENVIRONMENTAL SETTING

Edwards AFB is located in the Southern California counties of Kern, Los Angeles, and San Bernardino, approximately 2 miles east of the city of Rosamond (Figure 1). NASA AFRC is a tenant organization at Edwards AFB; the 838-acre leased facility is designated as ERP OU 6 and is located in the north-central portion of the Base on the main flightline, wholly within Kern County.

OU 6 is located on the northwestern edge of Rogers Dry Lake in generally flat, but gently sloping terrain. Surface elevations vary by approximately 30 ft between the high points on the western side of OU 6 and the low points along the lakebed. Subsurface materials at OU 6 consist of granitic bedrock (quartz monzonite) overlain by a relatively thin layer of unconsolidated alluvial and lake bed deposits. The alluvial layer consists of sandy deposits that appear to have been derived from granitic bedrock outcrops. The bedrock at OU 6 is generally competent, except for surface weathering and localized fracturing.

Due to the near surface occurrence of bedrock, the saturated zone at OU 6 lies entirely within fractures in the granitic bedrock. Groundwater depth ranges from approximately 30 ft below grade along the

western side of OU 6 to approximately 5 ft below grade along the eastern side of OU 6. Historical groundwater elevations at wells located throughout OU 6 define a water table sloping toward Rogers Dry Lake, indicating that groundwater generally flows from OU 6 to the east.

1.3 OPERABLE UNIT 6 DESCRIPTION AND POTENTIAL VIP RISKS

1.3.1 OPERABLE UNIT 6 DESCRIPTION AND CONCEPTUAL SITE MODEL

Land uses surrounding NASA AFRC are industrial in nature and support aeronautical flight testing. AFRC is NASA's primary flight research center. Elements of NASA AFRC's mission include: performing flight research and technology integration to revolutionize aviation and pioneer aerospace technology, validating space exploration concepts, and conducting airborne remote-sensing and science missions. Mission-critical activities involve the movement of aircraft on taxiways in the vicinity of contamination. As shown on Figure 3, much of the contaminant plume underlies key aircraft ramps and taxiways.

As documented in the ROD (USAF 2006), the locations of former releases to the environment have been designated as Sites N1, N2, N3, N4, and N7 in OU 6. The location and nature of these releases contributed to a commingled groundwater plume that starts in the Site N3 area in the west, extends downgradient to the east to include Sites N1, N2, N4, and N7, and eventually reaches Rogers Dry Lake (Figure 3). The groundwater plume consists of the following chemicals of concern (COCs): chlorinated hydrocarbons (primarily TCE, a solvent used in aeronautical operations) and aromatic hydrocarbons (including benzene, toluene, ethylbenzene and xylenes [BTEX] typically found in petroleum products). N-nitrosodimethylamine is not identified as a COC in the ROD, but is present in groundwater at Site N3.

Sites N2, N3, and N7 are considered to be the primary source areas, with Sites N3 and N7 containing the highest contaminant concentrations. Site N3 formerly consisted of a gas station with underground storage tanks (USTs) and drum dispensing and storage areas, and contributed TCE and BTEX to the commingled groundwater plume. Former drum storage and waste disposal activities at Sites N2 and N7 contributed TCE and other chlorinated solvents to the groundwater plume. The portion of the groundwater plume beneath Site N3 is located within fractured bedrock. As the plume extends east toward Rogers Dry Lake, the groundwater plume enters alluvial lakebed sediments in the areas of

Sites N1 and N4. Sites N1 and N4 consist of a series of topographic depressions along the lakebed boundary, and were used to manage surface water runoff originating from NASA AFRC. Historically, the lowest contaminant concentrations within the OU 6 plume were located beneath Sites N1 and N4, and are likely due to the diluted nature of the Sites N1 and N4 contaminant sources (surface water runoff).

The plume shape is narrower at Sites N3 and N7, where releases occurred within smaller areas. Since contaminated groundwater at Sites N3 and N7 is within bedrock, the plume geometry is controlled by fractures. As the plume reaches Sites N1 and N4, it enters sediments that allow more lateral dispersion. In addition, the Sites N1 and N4 sources are more diffuse, covering larger areas.

Historically, all 30 volatile organic compounds (VOCs) listed in Table 1 have been detected in groundwater samples collected from OU 6 at concentrations exceeding their respective cleanup goals established in the OU 6 ROD (i.e., Maximum Contaminant Levels) or risk-based USEPA Regional Screening Levels. Additionally, the majority of the historical maximum VOC concentrations listed in Table 1 were detected in groundwater samples collected from Site N3 monitoring wells. While chlorinated hydrocarbons attributable to former on-site sources (drum storage and dispensing) contribute to the OU 6 commingled plume (which includes former sources at Sites N1, N2, N4, and N7), aromatic hydrocarbons are specific to the Site N3 area, and are attributable to former on-site sources (i.e., USTs). The aromatic and chlorinated hydrocarbons are commingled in the Site N3 area.

The principal aromatic hydrocarbons detected at Site N3 include BTEX. Due to its presence at high concentrations over a wide area, benzene is used as an indicator for plume delineation and concentration trends in aromatic hydrocarbons at Site N3. The principal chlorinated hydrocarbons detected at Site N3 include carbon tetrachloride (CT), 1,2-dichloroethane, *cis*-1,2,-dichloroethene, and TCE. Due to its presence at high concentrations over a wide area, TCE is used as an indicator for plume delineation and concentration trends in chlorinated hydrocarbons at Site N3.

1.3.2 POTENTIAL VIP RISKS AT OPERABLE UNIT 6 AND BUILDINGS 4806 AND 4807

The human health risk assessment (Earth Tech 2003), which influenced the selection of the remedy documented in the ROD, indicated no unacceptable VIP risk requiring action. However, as previously mentioned, one of the purposes of a five-year review is to determine if changes in site conditions or to

the elements making up past risk assessments may have changed in such a way that the previous conclusions supporting the protectiveness of the ROD-selected remedy may no longer be valid. Due to a change is site conditions (the proximity of the benzene and TCE plumes to occupied buildings) and changes to VIP risk assessment methodologies used in the 2003 human health assessment, the USAF and the regulatory agencies deferred determination of remedy protectiveness pending additional investigation and assessment of indoor air risk to current site workers.

Because the indoor air risks at OU 6 under the current industrial scenario were assumed to be driven by the inhalation of TCE and benzene volatilized from groundwater into indoor air, groundwater risk-based screening levels (RBSLs) were developed for these chemicals. The selection of buildings to be included in this VIP investigation was based on a screening procedure that conservatively calculated a concentration in groundwater that would be protective of indoor air in buildings overlying the commingled plume. The screening process identified areas of groundwater where TCE and benzene concentrations were above those that may result in unacceptable risk in indoor air and whether there were routinely occupied buildings within those areas. Buildings 4800, 4802, 4806, 4807, 4808, 4810, 4823, and T-20 are occupied and within 100 ft of the TCE and/or benzene concentrations exceeding the selected RBSLs. Of those eight buildings, three buildings (Buildings 4806, 4807, and 4810) were included in the current VIP investigation (4810 has since been demolished). The processes of RBSL development and for determining the buildings to be included in the VIP investigation is detailed in Appendix A of the *Vapor Intrusion Sampling Plan and Risk Assessment Work Plan (Work Plan*) (AECOM 2013) and an updated building screening summary table is provided in this document as Table 2.

1.4 CONCEPTUAL SITE MODEL FOR SITE N3 (BUILDINGS 4806 AND 4807)

Buildings 4806 and 4807 are located in the upper plume area near Site N3. Based upon the boring logs for monitoring wells N3-MW20, which is 40.5 ft in depth and located approximately 12 ft north of Building 4806, and N3-MW12, which is 260 ft in depth and located approximately 60 ft northeast of Building 4806 (Figure 4), the geology near Buildings 4806 and 4807 appears to consist of a relatively thin veneer of alluvium (silty sand) (approximately 3 ft) overlying weathered (over 60 ft) and competent granitic bedrock. The bedrock is fractured in this area, and the groundwater level is approximately 12 ft below ground surface (bgs).

The nearest identified potential point sources to Buildings 4806 and 4807 are associated with Site N3, and include former solvent drum storage and dispensers, and former gasoline underground storage tanks associated with a former gas station (Figure 4).

Building 4806 partially overlies the benzene and TCE groundwater plumes. Laboratory analytical results indicated that both benzene and TCE were each detected at a concentration of 18 micrograms per liter (μg/L) in a groundwater sample collected from monitoring well N3-MW27 (the nearest monitoring well to Building 4806) in 2015 (AECOM 2016a). Building 4807 is west and adjacent to Building 4806 and approximately 5 feet west of the estimated extent of the nearest contaminant plume (Figure 4).

Subsurface vapors containing VOCs may volatilize from groundwater and travel upward and pose a risk to workers breathing the indoor air in the buildings overlying or near the groundwater contaminants (Interstate Technology and Regulatory Council [ITRC] 2007a and b). Underground utility lines in areas above the estimated contaminant plume are present, and may provide preferential pathways for VOCs into the buildings. With the exception of the utility tunnel indicated on Figure 4, the majority of the utilities are installed in pea-gravel-lined trenches. Although the concrete-lined utility tunnel appears to be a significant potential preferential pathway based on its size, it is less likely to convey vapors compared to the more permeable pea-gravel-lined utility trenches.

Vapor fate and transport is also affected by the VOC concentrations at the source of the contamination, the separation distance between the source and the base of the building, the effective diffusivity of VOC vapors in the vadose zone, the magnitude and direction of the airflow between the building and the sub-slab fill materials, and the rate of vapor dilution due to air exchange between the building and the atmosphere. For petroleum hydrocarbons and vinyl chloride, aerobic biodegradation in the vadose zone is also an important mechanism (USEPA 2013, Davis et al. 2009, Patterson et al. 2013).

1.5 PROJECT SCOPE AND OBJECTIVES OF THE VAPOR INTRUSION MONITORING PROGRAM

1.5.1 PROJECT SCOPE

The 2016 project scope and activities were performed as a follow-on task to the 2013 VIP investigation (AECOM 2016b), and were conducted in compliance with the *Work Plan* (AECOM 2013) and the

Base-wide Generic Uniform Federal Policy Quality Assurance Project Plan (Base-wide QAPP) (AECOM 2012a) without significant deviation. The *Work Plan* adhered to the guidelines presented in the following:

- *DoD Vapor Intrusion Handbook* (DoD 2009a)
- California Environmental Protection Agency (Cal EPA) *Advisory - Active Soil Gas Investigations* (Cal EPA 2012)
- *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* (DTSC 2011)
- Office of Solid Waste and Emergency Response (OSWER) *Final Guidance for Assessing and Mitigating the Vapor Intrusion to Indoor Air Pathway from Subsurface Sources to Indoor Air (External Review Draft)* (USEPA 2013)
- *Vapor Intrusion Pathway: A Practical Guideline* (ITRC 2007a) and *Vapor Intrusion Pathway: Investigative Approaches for Typical Scenarios* (ITRC 2007b)

The project scope consisted of the following activities:

1. **Sampling Event Building Survey.** Pre- and post-sampling building surveys were performed to document site conditions, and, if possible, to ensure removal of any chemicals identified during the June 2012 initial building survey (AECOM 2016b).
2. **Indoor Air Sampling**. Indoor air samples were collected, where possible, in close proximity to occupied offices, in areas with the highest detections of groundwater VOCs, and/or within the vicinity of the installed sub-slab probes over an 8-hour period for the analysis of VOCs in accordance with USEPA Method TO-15 (low level).
3. **Outdoor (ambient) Air Sampling**. Outdoor air samples were collected 5 to 15 ft upwind of the building where indoor air samples were collected. The samples were collected over an 8-hour period for VOC analysis in accordance with USEPA Method TO-15 (low level).
4. **Indoor and Outdoor Air Sampling and On-Site Analysis**. Air samples were collected at all indoor air sample points and at one outdoor air sample point (N3-4806OA3) for on-site analysis using a portable gas chromatograph/mass spectrometer (GC/MS) to be used for quality control purposes as a comparison to laboratory analytical results.

Section 2.0 details the procedures used to complete the field tasks described above.

1.5.2 PROJECT OBJECTIVES

The vapor intrusion (VI) sampling program was designed to meet the following objectives:

1. Collect sub-slab vapor samples and evaluate whether indoor workers may be at risk from subsurface VOCs in Buildings 4806 and 4807, which overlie or are in close proximity to the OU 6 contamination plumes.

2. Collect indoor/outdoor air samples and use multiple lines of evidence to identify those VOCs with a moderate to high likelihood of intruding into indoor air spaces from the subsurface via the VIP.

3. Quantify the cumulative risk for these VIP-related VOCs and all VOCs detected in the indoor air samples at each sampling location.

4. Based upon the evaluations, provide conclusions regarding the potential VIP risks at Buildings 4806 and 4807 under the current industrial land use scenario.

1.6 PROCEDURE USED FOR DERIVATION OF SCREENING LEVELS

In general, the constituents of potential concern are those chemicals that meet volatility requirements for consideration as a potential VIP risk. The criteria used for volatility are that the chemical must have a Henry's Law Constant greater than 1×10^{-5} atmospheres-cubic meter per mole (USEPA 2015a and DoD 2009a). Indoor Air Screening Levels (IASLs) for the VOCs meeting these criteria are listed in Table 3. Soil Vapor Screening Levels (SVSLs) are usually employed as a screening tool to compare to sub-slab vapor concentrations to determine if indoor air sampling is warranted. The SVSLs were derived by dividing the IASLs by a soil vapor-to-indoor air attenuation factor of 0.05. Sub-slab vapor concentrations were compared to indoor air concentrations as a line of evidence to determine if chemicals detected in indoor air are attributable to the VIP as discussed in Section 3.6.2.

The IASLs were derived using the equations shown on the bottom of Table 3, and are the lower of the concentrations in air that correspond to a carcinogenic risk of 1×10^{-6} or a Hazard Quotient (HQ) of 1. The toxicity criteria (inhalation unit risk [IUR] factors for carcinogens and reference concentrations [RfCs] for non-carcinogens) used in the derivation of the IASLs were selected in accordance with the following hierarchy presented in OSWER Directive 9285.7-53, *Human Health Toxicity Values in*

Superfund Risk Assessments (USEPA 2003), as cited in Enclosure 3 of the DoD Instruction 4715.18, *Emerging Contaminants* (DoD 2009b):

1. Tier 1 - USEPA's Integrated Risk Information System (IRIS) located at http://cfpub.epa.gov/ncea/iris/index.cfm?fuseaction=iris.showSubstanceList.

2. Tier 2 - USEPA's Provisional Peer-Reviewed Toxicity Values accessible through USEPA risk assessors.

3. Tier 3 - Other toxicity values, including USEPA and non-USEPA sources of toxicity information. Priority should be given to sources of information that use sound science and are the most current, peer-reviewed, transparent, and publically available. Example sources for Tier 3 include the Cal EPA toxicity criteria database (located at www.oehha.ca.gov/risk/ChemicalDB/index.asp) and the USEPA's Health Effects Assessment Summary Table.

The source and values used for the toxicity criteria are also provided in Table 3, and the IASLs under the current industrial land use scenario were derived accordingly. The VOCs listed in Table 3 are those reported by USEPA Method TO-15, and include the VOCs detected in OU 6 groundwater monitoring wells from 2006 to 2015 (Table 1). Additionally, the IASLs in Table 3 are generic risk-based screening-level criteria developed for Edwards AFB, and not based on site-specific factors. Because land use will remain industrial for the foreseeable future, IASLs were derived for the default USEPA industrial land use scenario assuming an exposure frequency of 250 days per year, exposure time of 8 hours per day, and exposure duration of 25 years.

The Cal EPA Office of Environmental Health Hazard Assessment (OEHHA) has selected toxicity criteria which, in some cases, are more stringent than the USEPA OSWER hierarchy values. For comparison, California IASLs (CA-IASLs) were derived using the OEHHA toxicity criteria. IASLs and CA-IASLs are listed in Table 3 along with the toxicity values and their sources.

1.7 TOXICITY ASSESSMENT

The objective of the screening level evaluation described in Section 1.6 and the risk assessment presented in Section 3.0 of this *VIIR Addendum* is to assess the relationship between daily intake and toxic response. The toxicity assessment identifies toxicity values for each chemical and the type of effect each chemical is capable of producing. Toxicological effects fall into two categories: those that

could potentially cause cancer (carcinogenic) and those that cause other types of adverse health effects (non-carcinogenic).

The parameter used to describe the toxicity for carcinogenic chemicals via the inhalation route is the IUR, and the parameter used to describe the toxicity for non-carcinogenic effects is the RfC. Chemicals that show a potential for both carcinogenic and non-carcinogenic health effects are assigned both IURs and RfCs.

Use of Cal EPA-OEHHA preferred toxicity values in addition to the USEPA OSWER hierarchy preferred toxicity values results in the creation of a separate set of screening levels and risks incorporating the Cal EPA toxicity values.

1.7.1 TOXICITY VALUES FOR CARCINOGENS

IURs express the relationship between average daily intake and the potential for excess lifetime risk of cancer in people. IURs are developed using a mathematical model that uses data from the results of human epidemiological studies or laboratory animal studies to estimate the dose corresponding to a 1 in 1,000,000 probability of developing cancer.

1.7.2 TOXICITY VALUES FOR NON-CARCINOGENS

Each RfC is associated with a specific adverse health effect (e.g., central nervous system damage). The RfC estimates a concentration the human population (including sensitive subgroups) can be exposed to continuously without an appreciable risk of adverse health effects during a lifetime. RfCs are derived from either human or animal studies and are adjusted using uncertainty factors to account for experimental uncertainties.

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2.0 FIELD PROCEDURES AND ACTIVITIES

This section summarizes the field procedures and activities utilized during this VIP investigation. The field procedures and activities were conducted in accordance with the *Work Plan* (AECOM 2013).

2.1 SAMPLING EVENT BUILDING SURVEY

An initial building survey as well as pre- and post-sampling surveys were conducted during the 2013 VIP investigation for OU 6 as described in the *VIIR* (AECOM 2016b). A follow-up to the initial (June 2012) building survey was performed in 2016 to document (Appendix A) changes in general site conditions since the initial survey in 2012. Building surveys were conducted in February 2016 to provide detailed pre- and post-sampling documentation of the site conditions as presented in Appendix B and discussed in Section 3.

2.1.1 DIFFERENTIAL PRESSURES AND TEMPERATURE MEASUREMENTS

The differential pressure measurements were obtained using ¼-inch tubing. One length of the tubing was connected to the inlet (or reference) port of an Omniguard IV pressure meter. The terminal end of the inlet tubing was placed inside a dry container (with the bottom half of the container cut-off), and this was placed inside a dry bucket outside the building (to prevent any wind from blowing across the tube and artificially decreasing the air pressure). A second length of tubing connected to the outlet port of the meter with the terminal end of that tubing placed in the room to be measured. The differential pressure readings were recorded in Pascals (Pa).

In a building where the differential pressure between the indoor and outdoor air was greater than or equal to 6 Pa, the presumption would be that the positive pressure was sufficient to prevent the intrusion of subsurface vapors. Conversely, in a building under negative pressure where the differential pressure between the indoor and outdoor air was less than or equal to -6 Pa, the presumption would be that a completed VIP is possible. Heating systems, basements, and strong winds promote VI into buildings by reducing the internal air pressure and creating a vacuum effect that enhances advective flow from underlying soil and/or groundwater into buildings ("the stack effect") (ITRC 2007a and b).

The temperatures and barometric pressure measured during the event are presented in Section 3.1 and Appendix B of this *VIIR Addendum*. Building layouts are shown on Figures 4 and 5 of this *VIIR Addendum*.

2.1.2 HVAC SYSTEMS

Specifications regarding each building's heating, ventilating, and air conditioning (HVAC) system were obtained (as available) from the facility manager. This information was supplemented where possible by interviewing other building personnel regarding the typical hours of HVAC operation, whether building doors or windows were open to the outdoor air, and the locations and usage of any space heaters or ventilation fans.

Building 4806 is equipped with ceiling-mounted evaporative cooling units that utilize external air for cooling, and separate internal ceiling-mounted natural gas-fired heaters that recycle interior air for heating. Portable air conditioning units are utilized on hotter days. Although there are no windows, the shop roll-up door is usually left open when vehicle maintenance/repair is performed. The restroom is equipped with a ventilation fan, and shop areas are equipped with roof ventilators.

Building 4807 is equipped with a heat pump unit in the locker room and a ceiling-mounted air conditioning unit (servicing both Buildings 4807 and 4808) for cooling; both units recycle interior air. The restroom is equipped with a ventilation fan, and large rooms are equipped with roof ventilators.

2.2 SUB-SLAB PROBE LOCATIONS AND RATIONALE

During a previous investigation in March 2013, five sub-slab probes were installed inside Building 4806, and four sub-slab probes were installed inside Building 4807 (Figure 5). The sub-slab vapor probes are referred to as "wells" in the remainder of this document, and were installed based on the rationale and procedures presented in the previous *VIIR* (AECOM 2016b) for OU 6.

Dedicated soil gas sampling probes and new tubing were used and therefore, no decontamination was performed.

2.3 SAMPLING PROCEDURES

Sampling procedures were conducted in accordance with the procedures outlined in Appendix B of the *Edwards AFB Base-wide QAPP* (AECOM 2012a) except when additional sampling techniques were utilized, as specified in the *Work Plan* (AECOM 2013); these techniques are discussed below.

2.3.1 LEAK TESTING

The sub-slab vapor sampling points were leak tested during the sampling event. The objective was to verify that each sub-slab vapor sampling point was properly installed, and that indoor air is not drawn into the vapor sampling point. Helium used as a tracer compound was introduced into the atmosphere immediately surrounding the well while a hand-held field helium detector was used to test for the tracer. Prior to leak tests, a shroud was placed over the vapor sampling point and the tracer compound was introduced into the air beneath the shroud. Modeling clay was used to form a seal and contain vapors beneath the shroud. Helium was introduced into the shroud at less than 1 pound per square inch. The shroud was fitted with tubing at the top of the chamber to introduce the tracer gas into the shroud and a valve fitting at the bottom to let ambient air out while introducing the tracer gas. The helium concentration within the shroud was maintained at greater than 30 percent. A vapor sample was collected from the sampling point in a 1-liter Tedlar™ bag for the screening of helium introduced into the isolated area at the well head. Helium concentrations detected within each vapor sampling point are presented in Table 4.

To provide an additional quality control measure, sub-slab vapor samples were analyzed at the laboratory for helium by American Society for Testing and Materials (ASTM) Method D1946. The laboratory analytical results indicated that helium concentrations were below the 5 percent threshold in all of the samples collected. Field sampling forms are presented in Appendix B, and analytical results are included in Appendices C and D.

2.3.2 SOIL GAS SAMPLING

Prior to vapor sampling, the sub-slab vapor sampling points were purged to achieve removal of stagnant or ambient air from the sampling system, and to allow the collection of environmental samples that are representative of subsurface conditions. The dead space volume was estimated as the internal volume

of the well tubing plus the annular space around the vapor tip. In accordance with procedures recommended in the *Cal EPA Advisory – Active Soil Gas Investigations* (Cal EPA 2012), a default of three purge volumes were extracted prior to sub-slab vapor sampling because SUMMA® canisters were to be used to collect these vapor samples at less than 5 ft bgs. Sub-slab vapor samples were collected from 3 inches below the concrete foundation in both buildings during the 2013 and 2016 investigations. The purge flow rates were maintained between 100 and 200 milliliters per minute (mL/min) to minimize the partitioning of vapors from pore water to soil vapor, to prevent ambient air from diluting the sub-slab vapor samples, and to reduce the variability of purge rates if the activities were performed by multiple field technicians.

Immediately after purging, samples from sub-slab vapor sampling points were collected in batch-certified clean 1-liter SUMMA® canisters and submitted to Eurofins Air Toxics, Inc. for laboratory analysis in accordance with USEPA Method TO-15 (standard level) and ASTM Method D1946. A flow controller was used to regulate the collection of the samples at a flow rate not exceeding 100 mL/min. Prior to the collection of a sample, each canister was vacuum tested using a dedicated vacuum gauge to confirm that it had been properly evacuated. The initial pressure inside the canister and the pressure after the completion of sub-slab vapor sampling were recorded on the "Vapor Sampling with Helium Shroud" field forms provided in Appendix B. The initial canister vacuum readings ranged from 27 to 30 inches of mercury.

The air pressure differential measurements between indoor and outdoor air and between indoor air and sub-slab vapor sampling points, indoor air temperatures, and photoionization detector (PID) readings were also collected before and/or after sub-slab vapor sampling.

2.3.3 INDOOR AIR AND OUTDOOR AIR SAMPLING

Six-liter capacity SUMMA® canisters were used for the collection of indoor and outdoor air samples. The canisters were individually-certified clean by the laboratory prior to shipment, and were fitted with a flow regulator for collection of the sample over a typical 8-hour work day or for collection of a grab sample. Prior to sample collection, each canister was vacuum tested to confirm that it had been properly evacuated. If the vacuum pressure was less than 28 inches of mercury, the canister was not used for sampling. The indoor/outdoor air samples were collected a day before sub-slab sample

collection, and were transported to Eurofins Air Toxics, Inc. under chain-of-custody documentation (Appendix B) for VOC analysis in accordance with USEPA Method TO-15 (low level).

2.3.3.1 Indoor Air

Indoor air samples were collected concurrently with the outdoor air samples. Five indoor air locations were sampled in Building 4806 and four indoor air locations were sampled in Building 4807, as shown on Figure 5. Indoor air samples were collected in the vicinity of the sub-slab wells and approximately 3 ft (i.e., desk height) above the floor surface at all sample points during the 2013 and 2016 investigations.

2.3.3.2 Outdoor Air

Outdoor air samples were collected on the same day as the indoor air samples. Three outdoor air locations were sampled outside of the Building 4806/4807/4808 footprint (Figure 6). The outdoor air samples were collected approximately 10 ft from the buildings at 3 to 5 ft above the ground surface.

2.3.4 SAMPLE LABELING AND IDENTIFICATION

The samples were identified and labeled using the following: 1) site number (Site N3), followed by 2) building number (Building 4806 or Building 4807), and then followed by 3) the type of sample (i.e., whether indoor air [IA], outside air [OA], or sub-slab [SS]).

2.4 FIELD SCREENING-LEVEL INDOOR AND OUTDOOR AIR ANALYSIS

As a quality control measure, a HAPSITE™ portable GC/MS was utilized to analyze air samples collected at all indoor air sample points and at one outdoor air sample point (N3-4806OA3). The data were intended to be used to confirm that compounds detected in laboratory samples were present. The absence or presence of 13 target analytes (selected based on the previous concentrations detected in indoor air above screening thresholds during the 2013 investigation) were determined. The target VOCs included 1,2-dichloroethane, acrylonitrile, benzene, bromodichloromethane, chloroform, *cis*-1,2-dichloroethene, carbon tetrachloride, ethylbenzene, naphthalene, tetrachloroethene (PCE), *trans*-1,2-dichloroethene, TCE, and vinyl chloride. The detection limits ranged from 0.44 to 1.4 microgram per cubic meter ($\mu g/m^3$).

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3.0 RESULTS AND DISCUSSION

This section presents the results of the air sampling events conducted in February 2016. Section 3.1 presents the results of the sampling event building surveys. Section 3.2 presents the analytical results for the sub-slab samples collected; Section 3.3 presents the analytical results for the indoor air samples collected, and compares these sample results to the IASLs and CA-IASLs developed for Edwards AFB. Section 3.4 presents the analytical results for the outdoor air samples collected, Section 3.5 presents the field screening-level results, Section 3.6 presents the indoor air sampling results evaluation, and Section 3.7 introduces the Quality Assurance Summary Report (QASR) prepared for the VIP investigation.

3.1 SAMPLE EVENT BUILDING SURVEY RESULTS

Sampling event building surveys included documentation of HVAC status, indoor and outdoor temperatures, indoor/outdoor pressure differentials, weather conditions, evidence of preferential flow pathways, and the presence of chemicals that should be removed prior to sub-slab vapor and indoor air sampling. The surveys identified no major changes in the building occupancy patterns, HVAC system usage, or chemical presence since the June 2012 initial building survey that would influence sampling results. The completed building survey forms are provided in Appendices A and B of this *VIIR Addendum*.

3.1.1 DIFFERENTIAL PRESSURE MEASUREMENTS

Pressure differential data is used to help determine if VI is possible. In a building where the differential pressure between the indoor and outdoor air is greater than or equal to 6 Pa, the presumption is that the positive pressure is sufficient to prevent the intrusion of subsurface vapors via advective flow through building foundation cracks and penetrations. Conversely, in a building under negative pressure where the differential pressure between the indoor and outdoor air is less than or equal to -6 Pa, the presumption is that a completed VIP is possible. Cooler outdoor temperatures during the winter season increase the use of building heaters, which may result in a negative pressure inside the buildings. Pressure differentials and seasonal comparisons for the summer event (August 2013 documented in the *VIIR* [AECOM 2016b]) and the winter event (February 2016

documented in this *VIIR Addendum*) are summarized in Table 5, and are discussed in the following subsections.

3.1.1.1 Building 4806

Conditions conducive to subsurface VI (e.g., negative pressure) were generally present in Building 4806 during the February 2016 event. On the morning of 3 February 2016, when indoor air samples were collected, the outdoor temperatures ranged from a low of 25 degrees Fahrenheit (°F) to a high of 55°F, and the air handling/HVAC equipment was in operation. Pressure differentials were negative in Rooms 1 through 11, and ranged from minus (-) 1.5 to -0.5 Pa. The pressure differential in Room 12 was plus (+) 3.0 Pa. On 4 February 2016, when sub-slab vapor samples were collected, the air handling/HVAC equipment was in operation. Pressure differentials were negative in Rooms 1 through 10, and ranged from -2.5 to -1.0 Pa. The pressure differential was neutral in Rooms 11 and 12.

The air handling/HVAC equipment was in operation during the August 2013 event, and conditions conducive to VI were generally absent. Pressure differentials ranged from neutral to below 3 Pa in Rooms 5 through 12, and differentials were 3 Pa or above in the remaining rooms measured. The majority of the Building 4806 rooms measured during the August 2013 exhibited positive pressure - a condition under which VI is impeded.

3.1.1.2 Building 4807

Conditions conducive to subsurface VI (e.g., negative pressure) were generally present in Building 4807 during the February 2016 event. On the morning of 3 February 2016, when indoor air samples were collected, the outdoor temperatures ranged from a low of 25°F to a high of 55°F, and the air handling/HVAC equipment was in operation. Pressure differentials were negative in Rooms 2 and 4 through 8, and ranged from -1.5 to -1.0 Pa. The pressure differential in Rooms 1 and 3 were neutral. On 4 February 2016, when sub-slab vapor samples were collected, the air handling/HVAC equipment was in operation. Pressure differentials were negative in all rooms, and ranged from -2.5 to -1.0 Pa.

During the August 2013 sampling event, the air handling/HVAC equipment was not in operation. Negative pressure differentials were present in Rooms 1 (-1.5 Pa) and 5 (-6 Pa). Differentials were neutral to 1.5 Pa in the remaining rooms measured.

3.1.2 TEMPERATURE MEASUREMENTS

Temperature data are presented in Table 6 and differentials are discussed in the following subsections.

3.1.2.1 Building 4806

Temperature data were collected in Rooms 1 through 12 during the 20 August 2013 building survey (documented in the *VIIR* [AECOM 2016b]) and during the 1 February 2016 building survey. Temperatures were higher in February 2016 in Rooms 1 through 4, and the differences between the measurements ranged from 2.8°F in Room 4 to 7°F in Room 3. Temperatures were lower in February 2016 in Rooms 5 through 12, and the differences between the two measurements ranged from 9.9°F in Room 9 to 41°F in Room 12. Differences of greater than 5°F were encountered in Rooms 1, 3, and 5 through 12.

3.1.2.2 Building 4807

Temperature data were collected in Rooms 1, 2, and 4 through 8 during the 20 August 2013 building survey (documented in the *VIIR* [AECOM 2016b]) and in Rooms 1 through 4 and 6 through 8 during the 1 February 2016 building survey. Temperatures were higher in August 2013 in all of the rooms measured, and the differences between the two measurements ranged from 12°F in Room 6 to 27.3°F in Room 8.

3.1.3 PHOTOIONIZATION DETECTOR READINGS

Because VOCs detected in indoor air may be an indication of VI, total VOC concentrations were measured using a PID throughout the VIP investigation. However, PID measurements alone cannot differentiate between VOCs originating from the subsurface (VI contribution) and VOCs originating from interior activities. For example, auto/aircraft maintenance activities specific to Building 4806 are likely significant contributors to the building's high PID readings. PID readings indicated the presence of VOCs. However, since VOCs are used regularly in the buildings, this was expected and their presence was not deemed significant. The methodology for determining VI is further discussed in Section 3.6.2. A summary of PID readings with comparisons to the laboratory analytical results are provided in the following sections.

3.1.3.1 Building 4806

Although PID measurements in Rooms 1 through 12 indicated that no VOCs were detected on the morning of 3 February 2016 prior to indoor air sampling, VOCs were detected at concentrations of 14, 455, and 36 parts per billion (ppb) in Rooms 6, 9, and 12, respectively on 4 February 2016 (during sub-slab sampling). Rooms 6 and 9 are adjacent to the area where sample N3-4806IA5 was collected. Sample N3-4806IA1 was collected in Room 12. The laboratory analytical results indicated that the highest total VOC concentrations detected in Building 4806 were at sample location N3-4806IA2, and not at sample locations N3-4806IA1 or N3-4806IA5. The indoor air sample laboratory analytical results are presented in Section 3.3. Portable GC/MS analytical results indicated that the highest total VOC concentrations detected in Building 4806 were at sample location N3-4806IA5.

3.1.3.2 Building 4807

Although the PID measurements in Rooms 1 through 8 indicated that no VOCs were detected on the morning of 3 February 2016 (prior to indoor air sampling), VOCs were detected at a concentration of 14 ppb on 4 February 2016 (during sub-slab sampling) in Room 6 - the room in which sample N3-4807IA01 was collected. The laboratory analytical results indicated that the highest total VOC concentrations detected in Building 4807 were at sample location N3-4807IA01. The indoor air sample laboratory analytical results are presented in Section 3.3. Portable GC/MS analytical results indicated that the highest total VOC concentrations detected in Building 4807 were at sample location N3-4807IA03.

3.2 SUB-SLAB ANALYTICAL RESULTS

Sub-slab vapor samples were collected on 4 February 2016. Sub-slab vapor laboratory analytical results were primarily used as a line of evidence to determine if chemicals detected in indoor air are attributable to the VIP by comparing sub-slab vapor concentrations to indoor air concentrations. However, in order to evaluate whether sub-slab vapor sources have the potential to pose unacceptable health risks due to VI in the future if site conditions were to change (such as new building construction), the sub-slab vapor sampling results were compared on a sample-by-sample basis to the respective SVSLs. The SVSLs were derived by dividing the IASLs by a soil vapor-to-indoor air attenuation factor (alpha) of 0.05 (Appendix C). The laboratory analytical results from the 2016

investigation are discussed in the following subsections and complete laboratory analytical results, reporting limits, and qualifiers are presented in Appendix D. Laboratory analytical results for indoor air, sub-slab vapor, and outdoor air samples generated during the 2013 investigation as well as indoor air risks and hazards are presented in Appendix E.

3.2.1 BUILDING 4806 SUB-SLAB ANALYTICAL RESULTS

TCE was detected in the sub-slab samples collected at concentrations of 2.4 $\mu g/m^3$ (N3-4806SS1), 70 $\mu g/m^3$ (N3-4806SS4), and 65 $\mu g/m^3$ (N3-4806SS5). The TCE concentrations were below the reporting limits (6.4 to 6.8 $\mu g/m^3$) in the samples collected from wells N3-4806SS2 and N3-4806SS3. Benzene was detected in the sub-slab samples collected at concentrations of 3.4 $\mu g/m^3$ (N3-4806SS1), 6.0 $\mu g/m^3$ (N3-4806SS2), 1.1 $\mu g/m^3$ (N3-4806SS3), 4.2 $\mu g/m^3$ (N3-4806SS4), and 2.9 $\mu g/m^3$ (N3-4806SS5). In addition to benzene, the following VOCs were detected at all five sub-slab sample locations: 4-ethyltoluene, cyclohexane, dichlorodifluoromethane, xylenes (m- & p-xylene and o-xylene), PCE, toluene, n-heptane, and trichlorofluoromethane. Based on an attenuation factor of 0.05 and as shown in Appendix C, there was one SVSL exceedance in Building 4806 during the February 2016 sampling event, hexachlorobutadiene was detected at a concentration of 12 $\mu g/m^3$ in the sample collected at N3-4806SS1, slightly exceeding the 11-$\mu g/m^3$ SVSL.

The following VIP-related compounds were detected during the March 2013 investigation: 2-butanone, acetone, benzene, isopropanol, isopropylbenzene, n-heptane, n-hexane, and p-isopropyltoluene. The compounds 1,2,4-trimethylbenzene, 2-butanone, 4-ethyltolune, benzene, carbon disulfide, ethanol, ethylbenzene, naphthalene, o-xylene, and p-isopropyltoluene were determined to be VIP-related compounds detected during the August 2013 investigation (AECOM 2016b). As discussed in Section 3.6.2.1 below, 4-ethyltoluene, cyclohexane, m- & p-xylene, n-heptane, n-hexane, and styrene were determined to be likely VIP-related compounds detected at Building 4806 during the 2016 investigation. Maximum concentrations of VIP-related compounds detected at Building 4806 during each of the three investigations are presented in Table 7.

3.2.2 BUILDING 4807 SUB-SLAB ANALYTICAL RESULTS

TCE was detected in the sub-slab samples collected at concentrations of 25 $\mu g/m^3$ (N3-4807SS2), and 2.3 and 2.2 $\mu g/m^3$ (in the normal and duplicate samples, respectively, at N3-4807SS3). Benzene was

detected in the sub-slab samples collected at concentrations of 7.7 $\mu g/m^3$ (N3-4807SS2), 1.1 and 1.2 $\mu g/m^3$ (in the normal and duplicate samples, respectively, at N3-4807SS3), and 2.4 $\mu g/m^3$ (N3-4807SS4). The following VOCs were detected at all four sub-slab sample locations: dichlorodifluoromethane, ethanol, m- & p-xylene, PCE, toluene, and trichlorofluoromethane. Based on an attenuation factor of 0.05 and as shown in Appendix C, there were no SVSL exceedances in Building 4807 during the February 2016 sampling event.

The compounds 2-butanone, acetone, and tetrahydrofuran were considered to be VIP-related compounds detected during the March 2013 investigation and acetone, benzene, carbon disulfide, and dichlorodifluoromethane were considered to be VIP-related compounds detected during the August 2013 investigation (AECOM 2016b). As discussed in Section 3.6.2.1 below, benzene was considered the only likely VIP-related compound at Building 4807 during the 2016 investigation. Maximum concentrations of VIP-related compounds detected at Building 4807 during each of the three investigations are presented in Table 8.

3.3 INDOOR AIR ANALYTICAL RESULTS

Indoor air samples were collected on 3 February 2016. The laboratory analytical results are discussed in the following subsections. Detected analytes and related risks are summarized in Tables 9 through 12. The complete laboratory analytical results, including IASL exceedances, qualifiers, and reporting limits, are presented in Appendix C.

3.3.1 BUILDING 4806 INDOOR AIR ANALYTICAL RESULTS

TCE was not detected above the reporting limits (0.88 to 1.0 $\mu g/m^3$) in any of the indoor air samples collected in Building 4806. Benzene was detected in the indoor air samples collected at concentrations of 0.44 $\mu g/m^3$ (estimated value, N3-4806IA1), 0.44 $\mu g/m^3$ (estimated value, N3-4806IA2), 0.54 $\mu g/m^3$ (N3-4806IA3), 0.80 $\mu g/m^3$ (N3-4806IA4), and 0.54 $\mu g/m^3$ (estimated value, N3-4806IA5) (Figure 5). Although all of these benzene concentrations exceeded the CA-IASL (0.42 $\mu g/m^3$), none of the concentrations exceeded the IASL (1.56 $\mu g/m^3$). In addition to benzene, the following VOCs were detected at all five indoor air sample locations: 1,1,2-trichlorotrifluoroethane, 1,2,4-trimethylbenzene (1,2,4-TMB), 2-butanone, 4-ethyltoluene, acetone, CT, chloroform, chloromethane, dichlorodifluoromethane, ethanol, isopropanol, m- & p-xylene, n-heptane, n-hexane, toluene, and

trichlorofluoromethane. In addition to benzene, CT and chloroform were also detected above the CA-IASL in indoor air during the February 2016 event at Building 4806. Four of the five CT concentrations detected exceeded the CA-IASL (0.29 $\mu g/m^3$), and none of the concentrations exceeded the IASL (2.0 $\mu g/m^3$). Because the CA-IASL and IASL are the same for chloroform (0.53 $\mu g/m^3$), three of the five chloroform concentrations detected exceeded both the CA-IASL and IASL. Laboratory analytical results for the indoor air samples collected at Building 4806 are presented in Tables 9 and 10.

The VIP-related compounds detected during the March 2013, August 2013, and February 2016 investigations at Building 4806 are listed in Section 3.2.1 above. Maximum concentrations of VIP-related compounds detected in indoor air at Building 4806 during each of the three investigations are presented in Table 7.

3.3.2 BUILDING 4807 INDOOR AIR ANALYTICAL RESULTS

TCE was not detected above the reporting limits (0.78 to 0.94 $\mu g/m^3$) in any of the indoor air samples collected in Building 4807. Benzene was detected in the indoor air samples collected at concentrations of 1.1 $\mu g/m^3$ (N3-4807IA1), 0.69 $\mu g/m^3$ (N3-4807IA2), 2.0 $\mu g/m^3$ (both normal and duplicate samples at N3-4807IA3), and 0.58 $\mu g/m^3$ (N3-4807IA4) (Figure 5). Although all of these benzene concentrations exceeded the CA-IASL (0.42 $\mu g/m^3$), only the concentrations in the samples collected at N3-4807IA3 exceeded the IASL (1.6 $\mu g/m^3$). In addition to benzene, the following VOCs were detected at all four indoor air sample locations: 1,1,2-trichlorotrifluoroethane, 1,2,4-TMB, 2-butanone, 4-ethyltoluene, 4-methyl-2-pentanone, acetone, CT, chloroform, chloromethane, cyclohexane, dichlorodifluoromethane, ethanol, ethylbenzene, isopropanol, xylenes (m- & p-xylene and o-xylene), n-heptane, n-hexane, styrene, toluene, and trichlorofluoromethane. In addition to benzene, 1,2-dichloropropane, CT, and chloroform were detected above the CA-IASL in indoor air during the February 2016 event at Building 4807. The 1,2-dichloropropane concentration detected at one location (N3-4807IA1) exceeded both the CA-IASL and IASL (both 1.22 $\mu g/m^3$). All five CT concentrations detected exceeded the CA-IASL (0.29 $\mu g/m^3$), and none of the concentrations exceeded the IASL (2.0 $\mu g/m^3$). In addition, three of the five chloroform concentrations detected exceeded both the CA-IASL and IASL (both 0.53 $\mu g/m^3$). PCE was detected at a concentration of 2.1 $\mu g/m^3$ in the indoor air sample N3-4807IA1, equal to the CA-IASL. PCE was not detected in indoor air at that

location during the 2013 investigations. Laboratory analytical results for the indoor air samples collected at Building 4807 are presented in Tables 11 and 12.

The VIP-related compounds detected during the March 2013, August 2013, and February 2016 investigations at Building 4807 are listed in Section 3.2.2 above. Maximum concentrations of VIP-related compounds detected in indoor air at Building 4807 during each of the three investigations are presented in Table 8.

3.4 OUTDOOR AIR ANALYTICAL RESULTS

Outdoor air samples were collected on 3 February 2016. The laboratory analytical results are discussed in the following subsections. The complete laboratory analytical results, qualifiers, and reporting limits are presented in Appendix D.

TCE was not detected above the reporting limits (0.88 to 0.96 $\mu g/m^3$) in any of the outdoor air samples collected at Building 4806/4807. Benzene was detected in the outdoor air samples collected at concentrations of 0.49 $\mu g/m^3$ (N3-4806OA1), 0.42 $\mu g/m^3$ (N3-4806OA2), and 0.37 and 0.84 $\mu g/m^3$ (in the normal and duplicate samples, respectively, at N3-4806OA3). In addition to benzene, the following VOCs were detected at all three outdoor air sample locations: 1,1,2-trichlorotrifluoroethane, 2-butanone, acetone, chloromethane, dichlorodifluoromethane, ethanol, isopropanol, m- & p-xylene, n-hexane, toluene, and trichlorofluoromethane. None of these concentrations were detected above their respective CA-IASLs and/or IASLs.

3.5 FIELD SCREENING-LEVEL INDOOR AND OUTDOOR AIR ANALYTICAL RESULTS

The HAPSITE™ portable GC/MS analytical results are included in Appendix F, and indicated that the concentrations of the 13 target VOCs were below detection limits in the field screening-level air samples collected at N3-4806IA2, N3-4806IA3, N3-4807IA1, N3-4807IA2, N3-4807IA4 (normal and duplicate sample), and N3-4806OA3. Four analytes were detected in the field screening-level air samples: benzene (N3-4806IA1 and N3-4807IA3), acrylonitrile (N3-4806IA4), chloroform (N3-4806IA5), and ethylbenzene (N3-4807IA3).

At Building 4806, benzene was detected at a concentration of 0.97 $\mu g/m^3$ in the field screening-level sample collected at N3-4806IA1. Laboratory analytical results for the indoor air sample collected at

N3-4806IA1 indicated a benzene concentration of 0.44 $\mu g/m^3$ (estimated value). Acrylonitrile was detected at a concentration of 0.53 $\mu g/m^3$ in the field screening-level sample collected at N3-4806IA4. Laboratory analytical results for the indoor air sample collected at N3-4806IA4 indicated that acrylonitrile was below the reporting limit of 2.0 $\mu g/m^3$. Chloroform was detected at a concentration of 4.0 $\mu g/m^3$ in the field screening-level sample collected at N3-4806IA5. Laboratory analytical results for the indoor air sample collected at N3-4806IA5 indicated a chloroform concentration of 5.0 $\mu g/m^3$.

At Building 4807, benzene was detected at a concentration of 2.2 $\mu g/m^3$ in the field screening-level sample collected at N3-4807IA3. Laboratory analytical results for the indoor air sample collected at N3-4807IA3 indicated a benzene concentration of 2.0 $\mu g/m^3$. Ethylbenzene was detected at a concentration of 1.3 $\mu g/m^3$ in the field screening-level sample collected at N3-4807IA3. Laboratory analytical results for the indoor air sample collected at N3-4807IA3 indicated an ethylbenzene concentration of 1.8 $\mu g/m^3$.

No clear bias was apparent where analytes were detected in both the field screening-level sample and the corresponding laboratory-analyzed sample. Although the concentration differences between the field and laboratory samples ranged from 9 to 350 percent, the percentages are not necessarily significant given the extremely low concentrations detected. A low or high bias was not evident. Detailed results of the HAPSITE™ analyses are presented in Appendix F.

3.6 EVALUATION OF THE INDOOR AIR SAMPLING RESULTS

3.6.1 INDOOR AIR RISK CALCULATION

The indoor air risk associated with each detected chemical in the indoor air samples as well as the associated cumulative risk under the current industrial land use scenario were calculated on a sample-by-sample basis (Tables 9 through 12). Potential cancer risks were calculated as the ratio of the measured concentration of each detected VOC to its IASL corresponding to a cancer risk of 1×10^{-6}, and were then multiplied by 1×10^{-6}. Non-cancer risks (or HQs) were calculated as the ratio of the measured concentration of each detected VOC to its IASL corresponding to a HQ of 1. Both the USAF/CERCLA and DTSC-preferred IASLs were used for these calculations. The guidance recommends summing the individual HQs (USEPA 1989), with the assumption that if the total Hazard Index (HI) exceeds 1, there may be concern for potential health effects. Because the summation of

HQs resulted in HIs of less than or near 1, HQs were not expressed on a target organ basis, and the non-cancer risks are likely over-estimated.

The assessment using the USAF/CERCLA approach of the laboratory analytical results for the indoor air samples collected at Building 4806 indicated that the total cancer risks ranged from 1×10^{-6} to 1×10^{-5}, and the total non-cancer HIs ranged from less than 0.1 to approximately 0.2 (Table 9). Using the DTSC-preferred approach, the total cancer risks ranged from 3×10^{-6} to 1×10^{-5}, and the total non-cancer HIs ranged from less than 0.1 to approximately 0.1 (Table 10). The maximum total cancer risk for VIP-related compounds detected at Building 4806 during the March 2013 event was 1×10^{-6} using the USAF/CERCLA approach and 4×10^{-6} using the DTSC-preferred approach. The maximum total cancer risk for VIP-related compounds detected at Building 4806 during the August 2013 event was 1×10^{-6} using the USAF/CERCLA approach and 2×10^{-6} using the DTSC-preferred approach (Table 13). The highest total cancer risk for VIP-related compounds detected at Building 4806 during all three events using both approaches was 4×10^{-6} using the DTSC-preferred during the March 2013 event.

The assessment using the USAF/CERCLA approach of the laboratory analytical results for indoor air samples collected at Building 4807 indicated that the total cancer risks ranged from 1×10^{-6} to 5×10^{-6}, and the total non-cancer HIs ranged from less than 0.1 to approximately 0.4 (Table 11). Using the DTSC-preferred approach, the total cancer risks ranged from 3×10^{-6} to 1×10^{-5}, and the total non-cancer HIs ranged from less than 0.1 to approximately 0.5 (Table 12). No risk for VIP-related compounds detected at Building 4807 during the March 2013 event was identified using either the USAF/CERCLA approach or the DTSC-preferred approach. The maximum total cancer risk for VIP-related compounds detected at Building 4807 during the August 2013 event was 8×10^{-7} using the USAF/CERCLA approach and 3×10^{-6} using the DTSC-preferred approach. The highest total cancer risk for VIP-related compounds detected at Building 4807 during all three events using both approaches was 3×10^{-6} using the DTSC-preferred during the August 2013 event (Table 13).

When a HQ is less than or equal to one (where the average daily exposure is less than the RfC), adverse toxic non-carcinogenic effects are unlikely. The sum of all of the chemical- and route-specific HQs is called the HI. A HI of less than or equal to one indicates that non-carcinogenic effects from all of the site contaminants are unlikely.

In Building 4806, only chloroform exhibited cancer risks exceeding 1×10^{-6} employing the USAF/CERCLA risk assessment approach, and benzene and chloroform exhibited cancer risks exceeding 1×10^{-6} employing the DTSC-preferred risk assessment approach. None of the other chemicals detected at Building 4806 exhibited a cancer risk exceeding 1×10^{-6}, and no chemicals exhibited a non-cancer HQ above 1 using either the USAF/CERCLA or DTSC-preferred approaches. The maximum total non-cancer hazard for VIP-related compounds detected at Building 4806 during the March 2013 event was 0.02 using the USAF/CERCLA approach and 0.1 using the DTSC-preferred approach. The maximum total non-cancer hazard for VIP-related compounds detected at Building 4806 during the August 2013 event was 0.04 using the USAF/CERCLA approach and 0.08 using the DTSC-preferred approach (Table 13). The highest total non-cancer hazard for VIP-related compounds detected at Building 4806 during all three events using both approaches was 0.1 using the DTSC-preferred during the March 2013 event.

In Building 4807, 1,2-dichloropropane and chloroform exhibited cancer risks exceeding 1×10^{-6} employing the USAF/CERCLA risk assessment approach, and 1,2-dichloropropane, 1,3-butadiene, benzene, and chloroform exhibited cancer risks exceeding 1×10^{-6} employing the DTSC-preferred risk assessment approach. PCE was detected at a concentration equal to the CA-IASL (2.1 $\mu g/m^3$) in the indoor air sample N3-4807IA1; however, since the concentration was higher in the indoor air sample than in the corresponding sub-slab vapor sample (1.6 $\mu g/m^3$), the source of the PCE is likely inside the building and not VIP-related. None of the other chemicals detected at Building 4807 exhibited a cancer risk exceeding 1×10^{-6}, and no chemicals exhibited a non-cancer HQ above 1 using either the USAF/CERCLA or DTSC-preferred approaches. The maximum total non-cancer hazard for VIP-related compounds detected at Building 4807 during the March 2013 event was less than 0.01 using both the USAF/CERCLA approach and the DTSC-preferred approach. The maximum total non-cancer hazard for VIP-related compounds detected at Building 4807 during the August 2013 event was less than 0.01 using the USAF/CERCLA approach and 0.09 using the DTSC-preferred approach. The highest total non-cancer hazard for VIP-related compounds detected at Building 4807 during all three events using both approaches was 0.09 using the DTSC-preferred during the August 2013 event.

3.6.2 VIP-RELATED INDOOR AIR RISK CALCULATION RATIONALE AND RESULTS

3.6.2.1 VIP-Related Indoor Air Risk Calculation Rationale

The VOCs detected in the indoor air samples were assessed using database queries to determine the likelihood of originating from the subsurface via the VIP based upon the interpretation of several lines of evidence (Appendix G), including:

- Detection in the groundwater;
- Detection in the outdoor air, and the outdoor air concentrations compared to the concentrations in the indoor air detected at one order of magnitude higher; and
- Detection in the sub-slab vapor, and the sub-slab vapor concentrations compared to the concentrations in indoor air detected at 10 times higher (equivalent to a 0.1 attenuation factor from sub-slab into indoor air, this provides a more conservative approach to determining if sub-slab contaminants are VI-related than applying the DTSC-preferred 0.05 attenuation factor).

Based upon the laboratory analytical results, the scenarios derived from the above lines of evidence are:

1. The VOC is considered not VIP-related if:
   - The VOC was detected only in indoor air (i.e., not detected in groundwater, outdoor air, and sub-slab vapor).
   - The VOC was detected in indoor air and outdoor air, but not in groundwater and sub-slab vapor.
2. The VOC is considered likely not VIP-related if:
   - The VOC was detected in indoor air and sub-slab vapor, but not in groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations, and the sub-slab vapor concentrations were not at least 10 times higher than those detected in indoor air.
   - The VOC was detected in indoor air and groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations, and the sub-slab vapor concentrations were not at least 10 times higher than those detected in indoor air.
3. The VOC is considered likely VIP-related if:
   - The VOC was detected in indoor air and sub-slab vapor, but not in groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the

same order of magnitude as, the outdoor air concentrations, and the sub-slab vapor concentrations were at least 10 times higher than those detected in indoor air.

- The VOC was detected in indoor air and groundwater. Additionally, the indoor air concentrations were higher than, or lower than but within the same order of magnitude as, the outdoor air concentrations, and the sub-slab vapor concentrations were at least 10 times higher than those detected in indoor air.

4. The VOC is considered VIP-related if:

   - The VOC is detected in indoor air, groundwater, and sub-slab vapor. In addition, the indoor air concentrations were higher than, or lower than but within the same order of magnitude as, the outdoor air concentrations, and the sub-slab vapor concentrations were 10 times higher than those detected in indoor air.

The assessment of the laboratory analytical results from the February 2016 event indicated that 6 VOCs (1,2,4-TMB, 2-butanone, 4-methyl-2-pentanone, benzene, ethylbenzene, and o-xylene) out of 26 VOCs detected in Building 4806 indoor air were considered VIP-related, and 6 VOCs (4-ethyltoluene, cyclohexane, m- & p-xylene, n-heptane, n-hexane, and styrene) were considered likely VIP-related(Appendix G). However, of the VIP-related and likely VIP-related compounds, only 1,2,4-TMB, benzene, ethylbenzene, and o-xylene were identified as groundwater COCs in the ROD (Table 1).

The assessment of the laboratory analytical results from the February 2016 event indicated that one VOC (benzene) out of 35 VOCs detected in Building 4807 indoor air were considered VIP-related, and no VOCs were considered likely VIP-related (Appendix G). Benzene was identified as a groundwater COC in the ROD (Table 1).

The VOCs that were considered VIP-related and likely VIP-related during both the August 2013 and February 2016 sampling events at Building 4806 include 1,2,4-TMB, 2-butanone, 4-ethyltoluene, benzene, ethylbenzene, and o-xylene, therefore indicating some consistency between the seasonal events. The VOCs that were considered VIP-related and likely VIP-related detected only during the August 2013 event at Building 4806 include carbon disulfide, ethanol, naphthalene, and p-isopropyltoluene. Carbon disulfide and p-isopropyltoluene were not detected in the indoor air at Building 4806 during the February 2016 event, and ethanol and naphthalene concentrations in sub-slab vapor were either below the reporting limits or were detected below ten times the corresponding indoor air concentrations. The VOCs that were considered VIP-related and likely VIP-related detected only

during the February 2016 event at Building 4806 include 4-methyl-2-pentanone, cyclohexane, m- & p-xylene, n-heptane, n-hexane, and styrene. 4-Methyl-2-pentanone was not detected in indoor air at Building 4806 during the August 2013 event, and cyclohexane, m- & p-xylene, n-heptane, n-hexane, and styrene concentrations in sub-slab vapor were either below the reporting limits or were detected below ten times the corresponding indoor air concentrations.

Benzene was the only VIP-related VOC detected during the February 2016 sampling event at Building 4807 and was also determined to be VIP-related during the August 2013 event. The VOCs that were considered VIP-related and likely VIP-related detected only during the August 2013 event at Building 4807 include acetone, carbon disulfide, and dichlorodifluoromethane. Acetone and dichlorodifluoromethane concentrations in sub-slab vapor at Building 4807 during the February 2016 event were either below the reporting limits or were detected below ten times the corresponding indoor air concentrations. Carbon disulfide was not detected in indoor air during the February 2016 event.

3.6.2.2 VIP-Related Indoor Air Risk Calculation Results

The VIP-related indoor air risk calculation results for the February 2016 event are presented in Tables 14 through 17 for both the USAF/CERCLA and DTSC-preferred approaches.

Using the USAF/CERCLA approach, the assessment of the VIP-related and likely VIP-related analytes detected in the individual samples collected from Building 4806 during the February 2016 event indicated that the total cancer risks ranged from 7×10^{-8} to 3×10^{-7}, and the total non-cancer HIs were all less than 0.1 (Table 14). Using the USAF/CERCLA approach for the samples collected during the August 2013 event, the total cancer risks ranged from 5×10^{-7} to 1×10^{-6}, and the total non-cancer HIs were less than 0.1 at Building 4806. Using the DTSC-preferred approach for the samples collected during the February 2016 event, the total cancer risks ranged from 7×10^{-8} to 1×10^{-6}, and the total non-cancer HIs were less than 0.1 (Table 15). Using the DTSC-preferred approach for the samples collected during the August 2013 event, the total cancer risks ranged from 1×10^{-6} to 2×10^{-6}, and the total non-cancer HIs were less than 0.1.

Using the USAF/CERCLA approach, the assessment of VIP-related and likely VIP-related analytes detected in the individual samples collected from Building 4807 during the February 2016 event indicated that the total cancer risks ranged from 4×10^{-7} to 1×10^{-6}, and total non-cancer HIs were less

than 0.1 (Table 16). Using the USAF/CERCLA approach for the samples collected during the August 2013 event, the total cancer risk was 8 x 10^{-7}, and the total non-cancer HIs were less than 0.1. Using the DTSC-preferred approach for the samples collected during the February 2016 event, total cancer risks ranged from 1 x 10^{-6} to 5 x 10^{-6}, and total non-cancer HIs ranged from less than 0.1 to approximately 0.2 (Table 17). Using the DTSC-preferred approach for the samples collected during the August 2013 event, total cancer risks were up to 3 x 10^{-6}, and total non-cancer HIs were less than 0.1.

3.6.3 UNCERTAINTIES

Inherent in the screening level evaluation of the potential indoor air risk included in this *VIIR Addendum* are uncertainties associated with the various processes that contribute to the final risk result. Understanding the major uncertainties assists with the interpretation of the risk characterization results. In general, the risk assessment process operated in a "cascade" fashion, whereby each phase relies on information generated in the previous phase. If an uncertainty is introduced, for example, during the data collection phase, it will be carried through each successive risk assessment phase. When successive uncertainties introduce biases, the final health risk estimates may overestimate or underestimate actual risks and hazards.

3.6.3.1 Uncertainties Introduced by Sampling Design

The assumptions used in this screening-level risk evaluation are intended to approximate actual exposure conditions. However, these conditions are often difficult to represent, and entail uncertainties in some of the choices made in the collection of the samples. These choices include, but are not limited to, the location of the sampling device, how long to collect air samples, and when and how often to collect the samples. For example, indoor air samples were collected over an 8-hour period to represent a "normal" work day; however, in rare cases, the operation hours during missions may be extended. Because these events are rare, it was considered appropriate to design sampling around the more typical 8–hour work day for evaluating long-term exposures.

Access to the area is restricted to assigned personnel and subcontractors, and is secured by NASA. In general, sampling locations were selected to represent occupied spaces within the buildings, and some sampling locations (e.g., in the bathroom near points of potential soil vapor entry [e.g., floor drain and

utility pipelines]) were in areas that are not regularly occupied or are only occasionally or intermittently occupied. Inclusion of these samples in the risk evaluation overestimates the risk to actual receptors potentially exposed to indoor air within these buildings.

Sub-slab and indoor air samples were collected at Building 4806 during daylight hours in all three sampling events. The sub-slab samples were collected between the hours of 1400 and 1900 in March 2013, between 1100 and 1600 in August 2013, and between 0800 and 1500 in February 2016. Indoor air samples were collected at Building 4806 during morning hours in all three sampling events. The indoor air samples were collected between the hours of 0800 and 1000 in March 2013, between 0900 and 0900 in August 2013, and between 0900 and 1000 in February 2016.

Sub-slab and indoor air samples were collected at Building 4807 during daylight hours in all three sampling events. Sub-slab samples were collected over two days during the March 2013 event. On 6 March the samples were collected at 4807SS1 and 4807SS4 at 1357 and 1845, respectively and on 7 March the samples were collected at 4807SS2 and 4807SS3 at 0906 and 0934, respectively. The sub-slab samples were collected between the hours of 0900 and 1700 in August 2013 and between 1000 and 1500 in February 2016. The indoor air samples were collected between the hours of 0800 and 1000 in all three sampling events.

Outdoor air samples were collected at the Building 4806/4807 area between the hours of 0700 and 0900 in all three sampling events.

3.6.3.2 Uncertainties Introduced by Exposure Assumptions

The exposure assumptions (frequency, time, and duration) used to calculate potential intake rates are another source of uncertainty. For example, the estimated indoor air risks for all of the VOCs detected in the indoor air and for the VIP-related and likely VIP-related VOCs were based on a screening risk evaluation using the USEPA default industrial reasonable maximum exposure parameters of 8 hours per day for 250 days per year and for 25 years. For some sampling locations (e.g., in the bathroom near the points of potential soil vapor entry [e.g., floor drain and utility pipelines]) that were in areas that are not regularly occupied or are only occasionally or intermittently occupied, the screening risk evaluation appears to overestimate the actual indoor air risks. Additionally, the assumption of a 25-year exposure period likely overestimates the typical time that personnel work in these buildings.

Thus, while health-protective, this assumption increases uncertainty. However, because the VIP-related indoor air risks (e.g., total cancer risks slightly above, at, or below 1 x 10^{-6} using the DTSC-preferred approach; and the HI below 1) are within the CERCLA risk management criteria (1 x 10^{-6} to 1 x 10^{-4} and a HI below 1), assessing the risks using site-specific central tendency exposure parameters was not pursued.

3.6.3.3 Uncertainties as to Sources of Chemicals Detected in the Indoor Air

Additional uncertainties are introduced when evaluating whether a VOC is VIP-related. Despite the project team's attempt to remove any known indoor sources, the indoor air can still be impacted by a variety of indoor sources (including consumer products, occupant activities, tap water off-gassing, and releases from interior building materials) and outdoor sources (including vehicle exhaust, paint or pesticide applications, and regional and global sources). Specific activities observed during building surveys that may contribute to VOCs in indoor air include auto/aircraft maintenance, maintenance-related chemical and paint storage, and gasoline-powered equipment storage. However, the conservative assessment procedure described in Section 3.6.2 did not consider these potential sources, and the VOCs determined as VIP-related and likely VIP-related may have originated from some of the sources. As a result, the VIP-related risks may be overestimated. Because the VIP-related indoor air risks (e.g., total cancer risks slightly above, at, or below 1 x 10^{-6} using the DTSC-preferred approach; and the HI below 1) are within the CERCLA risk management criteria (1 x 10^{-6} to 1 x 10^{-4} and a HI below 1), the actual sources of these likely VIP-related VOCs were not investigated further.

3.6.3.4 Uncertainties Inherent in Toxicity Values

Uncertainty is also inherent in the toxicity values established to evaluate cancer risks and non-cancer HIs. Such uncertainty is chemical-specific, and is incorporated into the toxicity value during its development. For example, an uncertainty factor is applied for interspecies and intra-human variability, for extrapolation from sub-chronic to chronic exposures, or for epidemiological data limitations. The application of uncertainty factors is expected to overestimate risks.

3.7 QUALITY ASSURANCE/QUALITY CONTROL

Sample collection, laboratory analyses, and data validation were performed according to the procedures in the *Base-wide QAPP* (AECOM 2012a). A QASR prepared by AECOM's quality assurance manager

is included in Appendix D. The QASR indicates that the sampling data included in this *VIIR Addendum* met the quality objectives for precision, accuracy, representativeness, comparability, and completeness.

4.0 CONCLUSIONS AND RECOMMENDATIONS

This project was designed to meet the four objectives outlined in Section 1.5.2. The following sections summarize how each objective was met. The maximum cumulative indoor air risks from VIP-related chemicals detected during both the 2013 and 2016 investigations are summarized in Table 13.

4.1 CONCLUSIONS

Project objectives were met and human health risks were quantified as presented below:

- Met Objective 1 - Sub-slab vapor samples were collected from both buildings in February 2016. Sub-slab vapor sample results served as a line of evidence for comparison to indoor air, and were not used for VIP risk calculations.

- Met Objective 2 - Indoor and outdoor air samples were collected from both buildings in February 2016. Outdoor air sample results served as a line of evidence for comparison to indoor air, and were not used for VIP risk calculations.

- Met Objectives 3 and 4 - The indoor air risks for Buildings 4806 and 4807 were evaluated based on February 2016 sampling data as summarized below. The HQs were not expressed on a target organ basis and therefore, the non-cancer risks are likely over-estimated.

  - Using the USAF/CERCLA approach for the selection of toxicity criteria, the total cancer industrial risk for individual samples collected at Building 4806 ranged from 1×10^{-6} to 1×10^{-5}, and the HIs ranged from less than 0.1 to approximately 0.2 for all of the VOCs detected in indoor air.

  - Using the DTSC-preferred approach for the selection of toxicity criteria, the total cancer industrial risk for individual samples collected at Building 4806 ranged from 3×10^{-6} to 1×10^{-5}, and the HIs ranged from less than 0.1 to approximately 0.1 for all of the VOCs detected in indoor air.

  - Using various lines of evidence and the USAF/CERCLA approach for the selection of toxicity criteria, the total cancer industrial risks at Building 4806 ranged from 7×10^{-8} to 3×10^{-7}, and the HIs were less than 0.1 for VOCs considered VIP-related or likely VIP-related.

  - Using various lines of evidence and the DTSC-preferred approach for the selection of toxicity criteria, the total cancer industrial risks at Building 4806 ranged from 7×10^{-8}

to 1 x 10^{-6} and the HIs were less than 0.1 for VOCs considered VIP-related or likely VIP-related.

- Results of the indoor air sampling indicated that (1) the potential cancer risks for all VOCs detected in indoor at Building 4806 air were at, or less than, 1 x 10^{-5}, and no cumulative HI exceeded 1.0; and (2) the potential cancer risks from VIP-related and likely VIP-related indoor air VOCs were at, or less than, 5 x 10^{-6}, and no cumulative HI exceeded 1.0.

- Using the USAF/CERCLA approach for the selection of toxicity criteria, the total cancer industrial risk for individual samples collected at Building 4807 ranged from 1 x 10^{-6} to 5 x 10^{-6}, and the HIs ranged from less than 0.1 to approximately 0.4 for all of the VOCs detected in indoor air.

- Using the DTSC-preferred approach for the selection of toxicity criteria, the total cancer industrial risk for individual samples collected at Building 4807 ranged from 3 x 10^{-6} to 1 x 10^{-5}, and the HIs ranged from less than 0.1 to approximately 0.5 for all of the VOCs detected in indoor air.

- Using various lines of evidence and the USAF/CERCLA approach for the selection of toxicity criteria, the total cancer industrial risk at Building 4807 was 4 x 10^{-7} and the HI was less than 0.1 for the VOC considered to be VIP-related.

- Using various lines of evidence and the DTSC-preferred approach for the selection of toxicity criteria, the total cancer industrial risk at Building 4807 was 2 x 10^{-6} and the HI was less than 0.1 for the VOC considered VIP-related.

- Results of the indoor air sampling indicated that (1) the potential cancer risks for all VOCs detected in indoor at Building 4807 air were at, or less than, 1 x 10^{-5}, and no cumulative HI exceeded 1.0; and (2) the potential cancer risks from the VIP-related indoor air VOC were at, or less than, 5 x 10^{-6}, and no cumulative HI exceeded 1.0.

4.2 RECOMMENDATIONS

The following is a summary of the recommendations related to the VIP at Buildings 4806 and 4807:

- Based upon the results of the indoor air sampling and associated human health risk assessment, no further action to address the VIP is necessary.

- The assumption that the HVAC system is mostly operating in the heating mode during the winter season and tends to induce a negative pressure differential inside the buildings in relation to the outside air, was confirmed with the February 2016 sampling event, as

negative pressure differentials were indicated by most of the measurements. Conversely, the HVAC system is mostly operating in the cooling mode during the summer season, and tends to induce a positive pressure differential inside the buildings in relation to the outside air and tends to impede VI. Positive pressure differentials were indicated by most of the measurements during the August 2013 sampling event. Therefore, the results from the previous investigations (March and August 2013) and the February 2016 sampling event appear to be representative of building conditions in the "summer" and "winter" seasons, and no additional confirmatory sampling is necessary to further account for seasonal variations.

- Although a VIP exists in Buildings 4806 and 4807 (particularly in Building 4806 for benzene, a known site contaminant in groundwater), a VIP monitoring program does not appear to be necessary due to the estimated indoor air risks (for VIP-related and likely VIP-related indoor air VOCs) being well within the CERCLA risk management range for cancer risks (1×10^{-6} to 1×10^{-4}) and non-cancer hazards being well below 1. Although the benzene plume is likely under Buildings 4806 and 4807 and is projected to continue to migrate beneath the buildings, Buildings 4806 and 4807 are slated for demolition as early as FY 2018, and no replacement structures are planned. Buildings 4806 and 4807 were selected for this investigation due in part to their proximity to the benzene and TCE plumes (Table 2). No other current or planned occupied buildings are, or will be, closer to the plumes; therefore, Buildings 4806 and 4807 are the most likely buildings to be impacted via the VIP. As this investigation has demonstrated that VIP-related indoor air risks are well within the risk management range and that TCE was not detected in any indoor air samples, an indoor air monitoring program is not recommended at these buildings or any other NASA buildings in the path of the benzene and TCE plumes.

- Remedy performance and groundwater monitoring reports should include discussion of changes in site conditions (as they relate to COC concentrations and plume delineation) that might complete the VIP in occupied buildings. The reports should provide appropriate recommendations as they relate to such conditions.

- LUC reports should include discussion of changes in site conditions (as they relate to new construction or intrusive activities) that might complete the VIP in occupied buildings or otherwise result in exposure of site workers to plume contaminants. The reports should provide appropriate recommendations as they relate to such conditions.

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TABLES

- 1 Volatile Organic Compounds Detected Above MCLs or RSLs in Groundwater near Buildings 4806 and 4807 from 2006 to 2015
- 2 Buildings Within 100 Feet of Trichloroethene and Benzene Risk-Based Screening Levels
- 3 Indoor Air Screening Levels – Current Industrial Land Use Scenario
- 4 Helium Concentrations in Sub-Slab Vapor
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- 7 Maximum Concentrations of Vapor Intrusion Pathway-Related Chemicals - Building 4806
- 8 Maximum Concentrations of Vapor Intrusion Pathway-Related Chemicals - Building 4807
- 9 Indoor Air Risk Calculation, Building 4806 (USAF/CERCLA Approach) - February 2016
- 10 Indoor Air Risk Calculation, Building 4806 (DTSC-Preferred Approach) - February 2016
- 11 Indoor Air Risk Calculation, Building 4807 (USAF/CERCLA Approach) - February 2016
- 12 Indoor Air Risk Calculation, Building 4807 (DTSC-Preferred Approach) - February 2016
- 13 Maximum Cumulative Indoor Air Risk Calculation from Vapor Intrusion Pathway-Related Chemicals
- 14 Vapor Intrusion Pathway-Related Indoor Air Risk Calculation, Building 4806 (USAF/CERCLA Approach) - February 2016
- 15 Vapor Intrusion Pathway-Related Indoor Air Risk Calculation, Building 4806 (DTSC-Preferred Approach) - February 2016
- 16 Vapor Intrusion Pathway-Related Indoor Air Risk Calculation, Building 4807 (USAF/CERCLA Approach) - February 2016
- 17 Vapor Intrusion Pathway-Related Indoor Air Risk Calculation, Building 4807 (DTSC-Preferred Approach) - February 2016

TABLE 1. VOLATILE ORGANIC COMPOUNDS DETECTED ABOVE MCLS OR RSLS IN GROUNDWATER NEAR BUILDINGS 4806 AND 4807 FROM 2006 TO 2015
(Page 1 of 2)

Chemical	Highest Concentration through July 2015 (μg/L)	Detected in Well	MCL[a] (μg/L)	Tap Water RSL[b] (μg/L)	Tap Water SL[c] (μg/L)
1,1-dichloroethene	38	N3-MW21	6	280	NE
1,1,2,2-tetrachloroethane	42	N3-MW22	1	0.076	0.07
1,1,2-trichloroethane	3.3	N3-MW15	5	0.28	NE
1,2,3-trichlorobenzene	95	N3-MW22	NE	7.0	NE
1,2,4-trichlorobenzene	58	N3-MW22	5	1.2	NE
1,2,4-trimethylbenzene	2,000	N3-MW21	NE	15	NE
1,2-dichloroethane	130	N3-ASW02B	0.5	0.17	NE
1,2-dichloropropane	0.64	N3-MW23	5	0.44	NE
1,3,5-trimethylbenzene	840	N3-MW13	NE	120	NE
1,4-dichlorobenzene	11	N3-DEW02	5	0.48	NE
2-hexanone	520	N3-MW16	NE	38	NE
benzene	9,800	N3-MW14	1	0.46	0.15
bromodichloromethane	42	N3-NW05	NE	0.13	0.12
bromoform	110	N3-NW05	NE	3.3	2.9
carbon tetrachloride	7,500	N3-MW22	0.5	0.46	0.1
chloroform	3,600	N3-MW22	NE	0.22	NE
cis-1,2-dichloroethene	14,000	N3-MW21	6	36	12
dibromochloromethane	55	N3-NW05	NE	0.87	0.2
ethylbenzene	1,700	N3-MW13	300	1.5	NE
ethylene dibromide (EDB)	19	N3-MW16	0.05	0.0075	NE
hexachlorobutadiene	190	N3-MW22	NE	0.14	NE
methylene chloride	65,000	N3-MW08	5	11	0.93
naphthalene	1,100	N3-MW13	NE	0.015	NE
tetrachloroethene (PCE)	10	N3-MW15	5	11	0.083
trans-1,2-dichloroethene	17	N7-MW16	10	360	110
toluene	6,300	N3-MW21	150	1,100	NE
trichloroethene (TCE)	66,000	N3-MW22	5	0.49	NE
vinyl chloride	0.5	N3-MW07	0.5	0.019	NE
xylenes, total	7,300	N3-MW21	1,750	190	NE
o-xylene	3,500	N3-MW21	NE	190	NE

TABLE 1. VOLATILE ORGANIC COMPOUNDS DETECTED ABOVE MCLS OR RSLS IN GROUNDWATER NEAR BUILDINGS 4806 AND 4807 FROM 2006 TO 2015
(Page 2 of 2)

Notes:

[a] California Environmental Protection Agency (2015).
[b] United States Environmental Protection Agency (2015b).
[c] Department of Toxic Substances Control (2016).

μg/L	micrograms per liter
MCL	Maximum Contaminant Level
NE	not established
RSL	Regional Screening Level
SL	Screening Level

TABLE 2. BUILDINGS WITHIN 100 FEET OF TRICHLOROETHENE AND BENZENE RISK-BASED SCREENING LEVELS
(Page 1 of 3)

Building	Routinely Occupied?	Description	Distance from RBSLs	Enclosed Office Space within 100 ft of RBSLs?	Potential VI Pathways	Building Disposition[(a)]	Determination
4800	Yes	**Armstrong Headquarters** **Size:** 171,599 ft^2, 3 stories **Current Use:** Contains the Center Director's Office and Flight Operations	TCE: 0 ft Benzene: >100 ft DTSC-Preferred Benzene: >100 ft	Yes	Floor drains and utility lines penetrating foundation	To be demolished, and northern facade to be remodeled/constructed (for preservation as a historic structure) FY20 to FY24	As discussed during the RPM systematic scoping meeting held 15 June 2012, this building was of lower priority than smaller buildings that were more likely to pose a VIP risk. Other factors in the determination of investigation priority include the fact that demolition of this building, constructed in 1954, is on the horizon, and will be completed within the next 10 to 12 years and the complexity of evaluating a multi-story building. Any changes in site conditions related to this building and their impact to completing the VIP will be tracked and evaluated in Annual Land Use Control (LUC) Reports and Remedy Performance and Groundwater Monitoring Reports (RPGMRs).
4802	Yes (for aircraft maintenance personnel in active tasks), but no office space	**Main Hangar** **Size:** 56,230 ft^2 High bay hangar (351 ft deep x 152 ft wide x 32.5 ft high) with 2 hangar doors (one on south side and one on north side) **Current Use:** Support and service medium and small aircraft	TCE: 0 ft Benzene: >100 ft DTSC-Preferred Benzene: >100 ft	No	Utility tunnel, Floor drains and utility lines penetrating foundation	No change planned through FY29	This is an aircraft hangar with no office space and not designed for human occupancy. Construction specifications differ vastly from default small-building (900 ft^2 buildings with 6-inch slabs) assumptions used to derive RBSLs. Excluded from second phase of VIP investigation since vapor intrusion risks to indoor air at Buildings 4806, 4807, and 4810 were within the risk management range. Excluded from first phase due to prioritization of smaller foot print buildings located near former source areas. Also excluded from first phase due to complexities involving installing sub-slab vapor sampling points in 18-inch rebar reinforced concrete slab with in-floor coiled hot water heating system. NASA will not permit sub-slab vapor sampling point installation, if investigation is warranted, near slab sampling should be pursued. Indoor air sampling will also be complicated by the presence of VOC sources such as aircraft which cannot be removed during indoor air sampling without impacting mission-critical activities. Although the utility tunnel represents a potential VI pathway, this utility tunnel also connects to Building 4806; therefore indoor air sampling results for Building 4806 (included in the first phase) will provide a good indication of the significance of the utility tunnel as a VI pathway. The special design of hangars that enhances air exchange and maintains pressure to prevent exposure of airmen and civilians to fuel vapors from fully fueled aircraft parked in the hangars is another reason that Building 4802 is not a candidate for the VIP investigation. Any changes in site conditions related to this building and their impact to completing the VIP will be tracked and evaluated in Annual LUC Reports and RPGMRs.
4803	No	NA	NA	NA	NA	NA	Not routinely occupied.
4806	Yes	**AGE Garage and Maintenance Facility** **Size:** 10,030 ft^2 **Current Use:** Repair and routine maintenance of NASA motor and AGE vehicles	TCE: 14 ft Benzene: 0 ft DTSC-Preferred Benzene: 0 ft	Yes	Utility tunnel, Floor drains and utility lines penetrating foundation	To be demolished FY18	Included in first phase for the following reasons: 1.) Building overlies benzene plume and is within 14 ft of TCE RBSL. 2.) Utility tunnel which is a potential VI pathway transects TCE and benzene plumes and connects to building. 3.) Building is located immediately downgradient of Site N3, which is a former source area and historically and currently contains highest TCE and benzene groundwater concentrations. 4.) Building includes enclosed office spaces. Results of the 2013 and 2016 VIP investigations indicated that the maximum vapor intrusion risks were 4E-06 for cancer and 0.1 for non-cancer. Any changes in site conditions related to this building (prior to demolition) and their impact to the VIP will be tracked and evaluated in Annual LUC Reports and RPGMRs.

TABLE 2. BUILDINGS WITHIN 100 FEET OF TRICHLOROETHENE AND BENZENE RISK-BASED SCREENING LEVELS
(Page 2 of 3)

Building	Routinely Occupied?	Description	Distance from RBSLs	Enclosed Office Space within 100 ft of RBSLs?	Potential VI Pathways	Building Disposition[a]	Determination
4807	Yes	**Pilot Training and Aircraft Stock Storage** **Size:** 11,011 ft^2 **Current Use**: Pilot training and aircraft stock storage	TCE: 51 ft Benzene: 25 ft DTSC-Preferred Benzene: 28 ft	No	Floor drains and utility lines penetrating foundation	To be demolished FY18	Included in first phase for the following reasons: 1.) Building is within approximately 50 ft of TCE RBSL and approximately 30 ft of benzene RBSLs. 2.) Building is located immediately downgradient of Site N3, which is a former source area and historically and currently contains highest TCE and benzene groundwater concentrations. 3.) Building is routinely occupied. Results of the 2013 and 2016 VIP investigations indicated that the maximum vapor intrusion risks were 3E-06 for cancer and 0.09 for non-cancer. Any changes in site conditions related to this building (prior to demolition) and their impact to the VIP will be tracked and evaluated in Annual LUC Reports and RPGMRs.
4808	Yes	**Pilot Training** **Size:** 9,620 ft^2 **Current Use**: Pilot training, office equipment storage, aircraft stock storage	TCE: >100 ft Benzene: 78 ft DTSC-Preferred Benzene: 81 ft	No	Floor drains and utility lines penetrating foundation	To be demolished FY18	Excluded from second phase of VIP investigation since vapor intrusion risks to indoor air at Buildings 4806, 4807, and 4810 were within the risk management range. Excluded from first phase due to its more distal location to the TCE and benzene RBSLs compared to Buildings 4806 and 4807. Additionally, Buildings 4807 and 4808 are connected in the aircraft storage areas and are similar in size and occupancy patterns, therefore it is reasonable to conclude that if the risks to indoor workers in Building 4807 are within the risk management range, then risks posed by the VIP at Building 4808 will also be within the same risk range and not warrant separate assessment. Any changes in site conditions related to this building (prior to demolition) and their impact to the VIP will be tracked and evaluated in Annual LUC Reports and RPGMRs.
4811	No	NA	NA	NA	NA	NA	Not routinely occupied.
4812	No	NA	NA	NA	NA	NA	Not routinely occupied.
4813	No	NA	NA	NA	NA	NA	Not routinely occupied.
4814	No	NA	NA	NA	NA	NA	Not routinely occupied.
4823	Yes	**Experimental Fabrication and Repair/Aircraft Servicing Dock** **Size:** 29,800 ft^2 (6,624 ft^2 hangar space) **Current Use:** Aircraft modification and hazardous materials recycling facility, contains machine, sheet metal, hydraulics, and welding/heat treating shops	TCE: 40 ft Benzene: >100 ft DTSC-Preferred Benzene: >100 ft	Yes	Floor drains and utility lines penetrating foundation	To be demolished FY25 to FY29	Excluded from second phase of VIP investigation since vapor intrusion risks to indoor air at Buildings 4806, 4807, and 4810 were within the risk management range. Excluded from first phase due to prioritization of smaller foot print buildings located near former source areas. Any changes in site conditions related to this building (prior to demolition) and their impact to the VIP will be tracked and evaluated in Annual LUC Reports and RPGMRs.
4848	No	NA	NA	NA	NA	NA	Not routinely occupied.
4858	No	NA	NA	NA	NA	NA	Not routinely occupied.
4890	No	NA	NA	NA	NA	NA	Not routinely occupied.

TABLE 2. BUILDINGS WITHIN 100 FEET OF TRICHLOROETHENE AND BENZENE RISK-BASED SCREENING LEVELS
(Page 3 of 3)

Building	Routinely Occupied?	Description	Distance from RBSLs	Enclosed Office Space within 100 ft of RBSLs?	Potential VI Pathways	Building Disposition[a]	Determination
T-20	Yes	**Maintenance Operations Office** **Size:** 1,440 ft^2 Temporary modular/trailer with skirt elevated above concrete pavement **Current Use:** Office space, aircraft maintenance records storage	TCE: 17 ft Benzene: >100 ft DTSC-Preferred Benzene: >100 ft	Yes	Utility lines	To be demolished FY20 to FY24	Given that construction details of this temporary building (which includes a crawlspace created by the skirting beneath the trailer), the default construction assumptions (slab-on-grade) assumed in the derivation of RBSLs do not apply to the elevated trailer construction. Thus, Trailer T-20 was excluded from VIP investigation. To be removed within 12 years, which is less than the 25-year CERCLA reasonable maximum exposure timeframe for industrial users. Modular/trailer likely constructed of VOC-containing materials which would skew indoor air sampling results.
UNK5368	No	NA	NA	NA	NA	NA	Not routinely occupied.
UNK5370	No	NA	NA	NA	NA	NA	Not routinely occupied.

Notes:

Shading indicates building is not routinely occupied and therefore further details are not provided.
[a] Based on NASA Armstrong's Master Plan (Development One, Inc., 2009)

> greater than
AGE aircraft ground equipment
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
DTSC Department of Toxic Substances Control
ft foot
l
ft^2 square feet
FY fiscal year
i.e. *id est*, or that is
LUC land use control
NA not applicable
NASA National Aeronautics and Space Administration
OEHHA Office of Environmental Health Hazard Assessment
RBSL risk-based screening level
RPGMR Remedy Performance and Groundwater Monitoring Report
RPM remedial project manager
TCE trichloroethene
USEPA United States Environmental Protection Agency
VI vapor intrusion
VIP vapor intrusion pathway
VOC volatile organic compound

TABLE 3. INDOOR AIR SCREENING LEVELS - CURRENT INDUSTRIAL LAND USE SCENARIO
(Page 1 of 3)

		USAF/CERCLA Approach[a]					DTSC-Preferred Approach[b]				
Analyte	CAS	IUR ($\mu g/m^3)^{-1}$	Source	RfC (mg/m^3)	Source	IASL[c] ($\mu g/m^3$)	IUR ($\mu g/m^3)^{-1}$	Source	RfC (mg/m^3)	Source	CA-IASL[c] ($\mu g/m^3$)
1,1,1-trichloroethane	71-55-6	---	---	5.0E+00	IRIS	21,900	---	---	1.0E+00	OEHHA	4,380
1,1,1,2-tetrachloroethane	630-20-6	7.40E-06	IRIS	---	---	1.65	---	---	1.2E+02	OEHHA	Same as USAF/CERCLA approach
1,1,2,2-tetrachloroethane	**79-34-5**	**5.8E-05**	**OEHHA**	**---**	**---**	**0.21**	**5.8E-05**	**OEHHA**	**8.0E-02**	**OEHHA**	**Same as USAF/CERCLA approach**
1,1,2-trichloroethane	**79-00-5**	**1.6E-05**	**OEHHA**	**2.0E-04**	**PPRTV**	**0.76**	**---**	**---**	**---**	**---**	**Same as USAF/CERCLA approach**
1,1,2-trichlorotrifluoroethane	76-13-1	---	---	3.0E+01	HEAST	131,400	---	---	---	---	Same as USAF/CERCLA approach
1,1-dichloroethane	75-34-3	1.6E-06	OEHHA	---	---	7.63	---	---	8.0E-01	OEHHA	Same as USAF/CERCLA approach
1,1-dichloroethene	**75-35-4**	**---**	**---**	**2.0E-01**	**IRIS**	**876**	**---**	**---**	**7.0E-02**	**OEHHA**	**307**
1,2,4-trichlorobenzene	**120-82-1**	**---**	**---**	**2.0E-03**	**PPRTV**	**8.76**	**7.3E-06**	**OEHHA**	**2.0E-03**	**PPRTV**	**1.67**
1,2,4-trimethylbenzene	**95-63-6**	**---**	**---**	**7.0E-03**	**PPRTV**	**31**	**---**	**---**	**---**	**---**	**Same as USAF/CERCLA approach**
1,2-dichlorobenzene	95-50-1	---	---	2.0E-01	HEAST	876	---	---	---	---	Same as USAF/CERCLA approach
1,2-dichloroethane	**107-06-2**	**2.6E-05**	**IRIS**	**7.0E-03**	**PPRTV**	**0.47**	**---**	**---**	**7.0E-03**	**PPRTV**	**Same as USAF/CERCLA approach**
1,2-dichloropropane	**78-87-5**	**1.0E-05**	**OEHHA**	**4.0E-03**	**IRIS**	**1.22**	**---**	**---**	**---**	**---**	**Same as USAF/CERCLA approach**
1,2-dichlorotetrafluoroethane	76-14-2	---	---	3.0E+01	HEAST	131,400	---	---	---	---	Same as USAF/CERCLA approach
1,3,5-trimethylbenzene	**108-67-8**	**---**	**---**	**1.0E-01**	**IRIS**	**438**	**---**	**---**	**4.0E-02**	**OEHHA**	**175**
1,3-butadiene	106-99-0	3.0E-05	IRIS	2.0E-03	IRIS	0.41	1.7E-04	OEHHA	2.0E-03	IRIS	0.07
1,3-dichlorobenzene	541-73-1	---	---	2.0E-01	HEAST	876	---	---	1.0E-01	OEHHA	438
1,4-dichlorobenzene	**106-46-7**	**1.1E-05**	**OEHHA**	**8.0E-01**	**OEHHA**	**1.11**	**---**	**---**	**---**	**---**	**Same as USAF/CERCLA approach**
2-butanone (MEK)	78-93-3	---	---	5.0E+00	IRIS	21,900	---	---	---	---	Same as USAF/CERCLA approach
2-hexanone	**591-78-6**	**---**	**---**	**3.0E-02**	**IRIS**	**131**	**---**	**---**	**---**	**---**	**Same as USAF/CERCLA approach**
4-ethyltoluene	622-96-8	---	---	1.0E-01	IRIS	---	---	---	---	---	Same as USAF/CERCLA approach
4-methyl-2-pentanone (MIBK)	108-10-1	---	---	3.0E+00	IRIS	13,140	---	---	---	---	Same as USAF/CERCLA approach
acetone	67-64-1	---	---	3.1E+01	ATSDR	135,780	---	---	---	---	Same as USAF/CERCLA approach
acrylonitrile	1424-48-2	6.8E-05	IRIS	6.0E-03	IRIS	0.18	2.9E-04	OEHHA	2.0E-03	OEHHA	0.040
benzene	**71-43-2**	**7.8E-06**	**IRIS**	**3.0E-02**	**IRIS**	**1.56**	**2.9E-05**	**OEHHA**	**3.0E-03**	**OEHHA**	**0.42**
benzyl chloride	100-44-7	4.9E-05	OEHHA	1.0E-03	PPRTV	0.25	---	---	---	---	Same as USAF/CERCLA approach
bromodichloromethane	**75-27-4**	**3.7E-05**	**OEHHA**	**---**	**---**	**0.33**	**---**	**---**	**---**	**---**	**Same as USAF/CERCLA approach**
bromoform	**75-25-2**	**1.1E-06**	**IRIS**	**---**	**---**	**11.1**	**---**	**---**	**8.0E-02**	**OEHHA**	**Same as USAF/CERCLA approach**
bromomethane	74-83-9	---	---	5.0E-03	OEHHA	21.9	---	---	---	---	Same as USAF/CERCLA approach
carbon disulfide	75-15-0	---	---	7.0E-01	IRIS	3,066	---	---	---	---	Same as USAF/CERCLA approach
carbon tetrachloride	**56-23-5**	**6.0E-06**	**IRIS**	**1.0E-01**	**IRIS**	**2.0**	**4.2E-05**	**OEHHA**	**4.0E-02**	**OEHHA**	**0.29**
chlorobenzene	108-90-7	---	---	5.0E-02	PPRTV	219	---	---	---	---	Same as USAF/CERCLA approach
chloroethane	75-00-3	---	---	1.0E+01	IRIS	43,800	---	---	---	---	Same as USAF/CERCLA approach
chloroform	**67-66-3**	**2.3E-05**	**IRIS**	**9.8E-02**	**ATSDR**	**0.53**	**---**	**---**	**---**	**---**	**Same as USAF/CERCLA approach**
chloromethane	74-87-3	---	---	9.0E-02	IRIS	394	---	---	---	---	Same as USAF/CERCLA approach
cis-1,2-dichloroethene	**540-59-0**	**---**	**---**	**8.0E-03**	**OEHHA**	**35.0**	**---**	**---**	**---**	**---**	**Same as USAF/CERCLA approach**

TABLE 3. INDOOR AIR SCREENING LEVELS - CURRENT INDUSTRIAL LAND USE SCENARIO
(Page 2 of 3)

		USAF/CERCLA Approach[a]					DTSC-Preferred Approach[b]				
Analyte	CAS	IUR ($\mu g/m^3)^{-1}$	Source	RfC (mg/m^3)	Source	IASL[c] ($\mu g/m^3$)	IUR ($\mu g/m^3)^{-1}$	Source	RfC (mg/m^3)	Source	CA-IASL[c] ($\mu g/m^3$)
cis-1,3-dichloropropene	542-75-6	4.0E-06	IRIS	2.0E-02	IRIS	3.05	1.6E-05	OEHHA	2.0E-02	IRIS	0.76
cyclohexane	110-82-7	---	---	6.0E+00	IRIS	26,280	---	---	---	---	Same as USAF/CERCLA approach
dibromochloromethane	**124-48-1**	**2.7E-05**	**OEHHA**	**---**	**---**	**---**	**---**	**---**	**8.0E-02**	**IRIS**	**350**
dichlorodifluoromethane	75-71-8	---	---	1.0E-01	PPRTV	438	---	---	---	---	Same as USAF/CERCLA approach
ethanol	64-17-5	---	---	7.0E+00	OEHHA	876	---	---	---	---	30,660
ethyl acetate	141-78-6	---	---	7.0E-02	PPRTV	307	---	---	---	---	Same as USAF/CERCLA approach
ethylbenzene	**100-41-4**	**2.5E-06**	**OEHHA**	**1.0E+00**	**IRIS**	**4.88**	**---**	**---**	**---**	**---**	**Same as USAF/CERCLA approach**
ethylene dibromide (EDB)	**106-93-4**	**6.0E-04**	**IRIS**	**9.0E-03**	**IRIS**	**0.02**	---	---	8.0E-04	OEHHA	Same as USAF/CERCLA approach
hexachlorobutadiene	**87-68-3**	**2.2E-05**	**IRIS**	**---**	**---**	**0.55**	**2.2E-05**	**IRIS**	**3.5E-03**	**OEHHA**	**Same as USAF/CERCLA approach**
isopropyl alcohol	67-63-0	---	---	2.0E-01	PPRTV	876	---	---	7.0E+00	OEHHA	30,660
isopropyl benzene	98-82-8	---	---	4.0E-01	IRIS	1,752	---	---	---	---	Same as USAF/CERCLA approach
m- & p-xylene	**179601-23-1**	**---**	**---**	**1.0E-01**	**IRIS**	**438**	**---**	**---**	**---**	**---**	**Same as USAF/CERCLA approach**
methyl tert-butyl ether (MTBE)	1634-04-4	2.6E-07	OEHHA	3.0E+00	IRIS	46.9	---	---	---	---	Same as USAF/CERCLA approach
methylene chloride	**75-09-2**	**1.0E-08**	**IRIS**	**6.0E-01**	**IRIS**	**1,220**	**1.0E-06**	**OEHHA**	**4.0E-01**	**OEHHA**	**12.2**
naphthalene	**91-20-3**	**3.4E-05**	**OEHHA**	**3.0E-03**	**IRIS**	**0.36**	**---**	**---**	**---**	**---**	**Same as USAF/CERCLA approach**
n-butylbenzene	104-51-8	---	---	1.0E+00	PPRTV	---	---	---	1.8E-01	OEHHA	767
n-heptane	142-82-5	---	---	7.0E-01	IRIS	---	---	---	7.0E+00	OEHHA	Same as USAF/CERCLA approach
n-hexane	110-54-3	---	---	7.0E-01	IRIS	3,066	---	---	7.0E+00	OEHHA	Same as USAF/CERCLA approach
o-xylene	**95-47-6**	**---**	**---**	**1.0E-01**	**IRIS**	**438**	**---**	**---**	**---**	**---**	**Same as USAF/CERCLA approach**
p-isopropyl toluene	99-87-6	---	---	1.0E+01	PPRTV	---	---	---	4.0E-01	IRIS	Same as USAF/CERCLA approach
propene	115-07-1	---	---	3.0E+00	OEHHA	13,140	---	---	---	---	Same as USAF/CERCLA approach
sec-butyl benzene	135-98-8	---	---	1.0E+01	PPRTV	---	---	---	4.0E-01	OEHHA	1,752
styrene	100-42-5	---	---	1.0E+00	IRIS	4,380	---	---	9.0E-01	OEHHA	3,942
tetrachloroethene (PCE)	**127-18-4**	**2.6E-07**	**IRIS**	**4.0E-02**	**IRIS**	**46.9**	**5.9E-06**	**OEHHA**	**3.5E-02**	**OEHHA**	**2.1**
tetrahydrofuran	109-99-9	---	---	2.0E+00	IRIS	8,760	---	---	---	---	Same as USAF/CERCLA approach
toluene	**108-88-3**	**---**	**---**	**5.0E+00**	**IRIS**	**21,900**	**---**	**---**	**3.0E-01**	**OEHHA**	**1,314**
trans-1,2-dichloroethene	**156-60-5**	**---**	**---**	**2.0E-01**	**IRIS**	**876**	**---**	**---**	**8.0E-02**	**OEHHA**	**350**
trans-1,3-dichloropropene	10061-02-6	4.0E-06	IRIS	2.0E-02	IRIS	3.05	1.6E-05	OEHHA	2.0E-02	IRIS	0.76
trichloroethene (TCE)	**79-01-6**	**4.1E-06**	**IRIS**	**2.0E-03**	**IRIS**	**2.98**	**---**	**---**	**---**	**---**	**Same as USAF/CERCLA approach**
trichlorofluoromethane	75-69-4	---	---	7.0E-01	HEAST	3,066	---	---	---	---	Same as USAF/CERCLA approach
vinyl chloride	**75-01-4**	**4.4E-06**	**IRIS**	**1.0E-01**	**IRIS**	**2.77**	**7.8E-05**	**OEHHA**	**1.0E-01**	**IRIS**	**0.16**

TABLE 3. INDOOR AIR SCREENING LEVELS - CURRENT INDUSTRIAL LAND USE SCENARIO
(Page 3 of 3)

Notes:

Chemicals shown in bold are those detected in groundwater monitoring wells near Buildings 4806, 4807, and 4810 from 2006 to 2016 (see Table 1 for details).

[a] Screening levels based on USAF/CERCLA approach (i.e., OSWER directive 9285.7-53 [USEPA 2003] as cited in DoD Instruction 4715.18 [DoD 2009b]).
[b] Screening levels based on DTSC-preferred approach (i.e., OEHHA toxicity criteria rather than USEPA IRIS or Tier 2 source). However, if OEHHA toxicity criteria are less health protective than those from USEPA IRIS or Tier 2 source, the more health protective toxicity values from the USEPA IRIS or Tier 2 source were used.
[c] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} or a Hazard Quotient of 1 (whichever is smaller) under the current industrial land use scenario.

----	not available
#	number
µg/m³	micrograms per cubic meter
ATSDR	Agency for Toxic Substances and Disease Registry
CA-IASL	California indoor air screening level
CAS	Chemical Abstract Service
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DoD	Department of Defense
DTSC	California Department of Toxic Substances Control
HEAST	Health Effects Assessment Summary Tables
i.e.	that is (*id est*)
IASL	indoor air screening level
IRIS	Integrated Risk Information System
OEHHA	Office of Environmental Health Hazard Assessment
OSWER	Office of Solid Waste and Emergency Response
PPRTV	Provisional Peer-Reviewed Toxicity Values
USAF	United States Air Force
USEPA	United States Environmental Protection Agency

Surrogate List:
1,1-dichloroethene used as a surrogate for trans-1,2-dichloroethene

1,2-dichlorobenzene used as surrogate for 1,3-dichlorobenzene

cis-1,3-dichloropropene used as surrogate for trans-1,3-dichloropropene

isopropyl alcohol used as a surrogate for ethanol

total xylenes used as a surrogate for m, p, and o-xylenes and 1,3,5-trimethylbenzene

Both sets of indoor air screening levels derived using the following equations (USEPA 2015b):

For carcinogens

$$IASL = \frac{TR \times CF1 \times ATc}{ET \times EF \times ED \times IUR}$$

Where:

IASL	=	Indoor air screening level, $\mu g/m^3$
TR	=	Target risk, unitless (1 x 10^{-6})
CF1	=	Conversion factor, hours/day (24)
ATc	=	Averaging time for carcinogens, days (25,550)
ET	=	Exposure time, hours/day (8 for industrial exposure)
EF	=	Exposure frequency, days/year (250 for industrial exposure)
ED	=	Exposure duration, years (25 for industrial exposure)
IUR	=	Inhalation unit risk, $(\mu g/m^3)^{-1}$ (chemical-specific)

For non-carcinogens

$$IASL = \frac{THQ \times RfC \times ATnc \times CF1 \times CF2}{ET \times EF \times ED}$$

Where:

THQ	=	Target Hazard Quotient, unitless (1)
RfC	=	Reference concentration, mg/m^3
ATnc	=	Averaging time for non-carcinogens, days (9,125 for industrial exposure)
CF2	=	Conversion factor, $\mu g/mg$ (1,000)

TABLE 4. HELIUM CONCENTRATIONS IN SUB-SLAB VAPOR

Sample ID	Sample Date	Helium Concentration Field Reading (percent)	Helium Concentration Laboratory Analysis (percent)
N3-4806SS1-VS3	2/4/16	<0.01	0.05
N3-4806SS2-VS3		0.82	1.00
N3-4806SS3-VS3		<0.01	1.00
N3-4806SS4-VS3		<0.01	0.02
N3-4806SS5-VS3		<0.01	<0.13
N3-4807SS1-VS3		0.82	0.44
N3-4807SS2-VS3		0.01	<0.03
N3-4807SS3-VS3		<0.01	<0.14
N3-4807SS3-VS203*		<0.01	<0.13
N3-4807SS4-VS3		<0.01	0.02

Notes:

*Duplicate sample.

< less than the concentration indicated

ID identification

TABLE 5. SEASONAL PRESSURE DIFFERENTIAL COMPARISON - AUGUST AND FEBRUARY

Room Number	August 2013 Indoor/Outdoor Pressure Differential (Pa)	February 2016 Indoor/Outdoor Pressure Differential (Pa)	Difference (Pa)
Building 4806			
1	3.5	-0.5	4.0
2	3.0	-1.0	4.0
3	3.5	-0.5	4.0
4	4.0	-1.0	5.0
5	0.0	-0.5	0.5
6	0.0	-0.5	0.5
7	1.5	-1.5	3.0
8	2.5	-1.0	3.5
9	2.0	-1.0	3.0
10	3.0	-1.0	4.0
11 (Building 4807)	2.0	-1.5	3.5
12	0.0	3.0	-3.0
Building 4807			
1	-1.5	0.0	-1.5
2	0.0	-1.0	1.0
3	NM	0.0	---
4	1.0	-1.0	2.0
5	-6.0	-1.5	-4.5
6	1.5	-1.5	3.0
7	1.0	-1.5	2.5
8	0.5	-1.0	1.5
	August 2013 Outdoor Temperature (ºF)	February 2016 Outdoor Temperature (ºF)	Difference (ºF)
Low	65.0	25.0	40.0
High	99.0	55.0	44.0

Notes:

ºF degrees Fahrenheit
Pa Pascals
NM not measured

TABLE 6. FIELD PARAMETERS
(Page 1 of 3)

Date	Room Number	VOC Concentration (ppb)	Pressure Differential (Pa)	Temperature (ºF)
Building 4806				
2/1/16	1	4	-10.0	71.8
	2	7	-10.5	71.3
	3	46	-17.0	74.0
	4	22	-8.5	70.8
	5	167	-1.5	64.9
	6	48	-1.5	63.5
	7	65	-10.0	62.0
	8	0	+1.0	59.3
	9	82	-2.0	65.1
	10	0	+1.0	64.0
	11 (Building 4807)	60	+1.0	60.0
	12	5	+10.5	46.0
	Outdoor	---	---	39.6 to 50.0
2/3/16 Morning	1	0	-0.5	73.1
	2	0	-1.0	69.9
	3	0	-0.5	70.8
	4	0	-1.0	68.6
	5	0	-0.5	61.8
	6	0	-0.5	62.8
	7	0	-1.5	61.4
	8	0	-1.0	62.9
	9	0	-1.0	64.1
	10	0	-1.0	70.8
	11 (Building 4807)	0	-1.5	58.9
	12	0	3.0	58.0
	Outdoor	---	---	51.6
2/3/16 Afternoon	1	0	-1.5	73.5
	2	0	-1.5	71.6
	3	0	-1.5	70.4
	4	0	-1.5	74.9
	5	0	-1.0	63.5
	6	0	-1.0	63.9
	7	0	-1.5	52.9
	8	0	-1.0	62.0
	9	0	-1.0	63.4
	10	0	-1.0	69.0
	11 (Building 4807)	0	-2.0	57.3
	12	0	-0.5	49.5
	Outdoor	---	---	45.0

TABLE 6. FIELD PARAMETERS
(Page 2 of 3)

Date	Room Number	VOC Concentration (ppb)	Pressure Differential (Pa)	Temperature (°F)
Building 4806 (continued)				
2/4/16	1	0	-1.5	75.2
	2	0	-1.5	73.5
	3	0	-1.5	73.4
	4	0	-1.0	72.1
	5	0	-1.0	67.3
	6	14	-1.0	64.8
	7	0	-2.5	63.8
	8	0	-2.5	76.0
	9	455	-1.0	63.5
	10	0	-2.0	65.9
	11 (Building 4807)	0	0.0	53.2
	12	36	0.0	57.4
	Outdoor	---	---	46.9
Building 4807				
2/1/16	1	95	-50.5	51.0
	2	109	-24.0	51.0
	3	122	-24.0	50.1
	4	125	-52.0	52.3
	5	NA	NA	NA
	6	93	-22.5	60.0
	7	100	-30.0	59.0
	8	15	+2.5	54.7
	Outdoor	---	---	52.0
2/3/16 Morning	1	0	0.0	48.6
	2	0	-1.0	47.1
	3	0	0.0	40.6
	4	0	-1.0	43.4
	5	0	-1.5	58.3
	6	0	-1.5	52.3
	7	0	-1.5	48.8
	8	0	-1.0	47.3
	Outdoor	---	---	43.3
2/3/16 Afternoon	1	0	-0.5	48.8
	2	0	-1.0	48.7
	3	0	-1.0	44.0
	4	0	-1.0	47.2
	5	0	-1.0	53.2
	6	0	-0.5	58.6
	7	0	-1.5	52.4
	8	0	-1.0	59.6
	Outdoor	---	---	48.6

TABLE 6. FIELD PARAMETERS
(Page 3 of 3)

Date	Room Number	VOC Concentration (ppb)	Pressure Differential (Pa)	Temperature (°F)
Building 4807 (continued)				
2/4/16	1	0	-1.5	49.2
	2	0	-1.5	49.8
	3	0	-1.5	47.3
	4	0	-1.0	44.3
	5	0	-1.0	57.9
	6	14	-1.0	54.3
	7	0	-2.5	49.3
	8	0	-2.5	60.1

Notes:

VOC concentrations presented were measured with a photoionization detector.

°F degrees Fahrenheit
NA not available (due to room inaccessibility)
Pa Pascals
ppb parts per billion
VOC volatile organic compound

TABLE 7. MAXIMUM CONCENTRATIONS OF VAPOR INTRUSION PATHWAY-RELATED CHEMICALS - BUILDING 4806

Analyte	Sample Type	Maximum Concentration (micrograms per cubic meter) March 2013 Event	August 2013 Event	February 2016 Event
1,2,4-trimethylbenzene	Sub-slab	20	**4.5**	**4.3**
	Indoor Air	3.9	**2.7**	**0.5**
2-butanone	Sub-slab	**33**	**27**	**46**
	Indoor Air	**6.5**	**6.4**	**4.6**
4-ethyltoluene	Sub-slab	25	**2.9**	**4**
	Indoor Air	3.3	**2.2**	**0.4**
4-methyl-2-pentanone	Sub-slab	24	ND	**9**
	Indoor Air	ND	ND	**0.3**
acetone	Sub-slab	**200**	150	70
	Indoor Air	**19**	110	71
benzene	Sub-slab	**33**	**13**	**6**
	Indoor Air	**1.8**	**1.2**	**0.8**
carbon disulfide	Sub-slab	ND	**240**	3.9
	Indoor Air	2.2	**140**	2.2
cyclohexane	Sub-slab	5	5.2	**6**
	Indoor Air	1.6	1.1	**0.2**
ethanol	Sub-slab	120	**110**	16
	Indoor Air	37	**28**	140
ethylbenzene	Sub-slab	4	**2.6**	**22**
	Indoor Air	2.2	**1.5**	**0.3**
isopropanol	Sub-slab	**32**	16	30
	Indoor Air	**11**	64	9.4
isopropylbenzene	Sub-slab	**2.5**	ND	3.1
	Indoor Air	**0.6**	ND	ND
m- & p-xylene	Sub-slab	18	8.2	**83**
	Indoor Air	9	7.1	**1.1**
n-heptane	Sub-slab	**250**	ND	**9**
	Indoor Air	**2.1**	1.0	**0.5**
n-hexane	Sub-slab	**310**	2.4	**6.2**
	Indoor Air	**10**	220	**0.4**
naphthalene	Sub-slab	ND	**4.7**	0.8
	Indoor Air	1.0	**1.0**	0.1
o-xylene	Sub-slab	6	**3.4**	**24**
	Indoor Air	3.3	**2.4**	**0.4**
p-isopropyltoluene	Sub-slab	**2.5**	**7.6**	ND
	Indoor Air	**1.0**	**3.3**	ND
styrene	Sub-slab	ND	ND	**3.2**
	Indoor Air	ND	ND	**0.5**

Notes:

Concentrations in **bold** indicate that the analyte was determined to be vapor intrusion pathway-related for that event.
ND not detected above the reporting limit
t

TABLE 8. MAXIMUM CONCENTRATIONS OF VAPOR INTRUSION PATHWAY-RELATED CHEMICALS - BUILDING 4807

Analyte	Sample Type	Maximum Concentration (micrograms per cubic meter) March 2013 Event	August 2013 Event	February 2016 Event
2-butanone	Sub-slab	**45**	29	4.3
	Indoor Air	**6.1**	170	14
acetone	Sub-slab	**540**	**210**	ND
	Indoor Air	**30**	**72**	59
benzene	Sub-slab	18	**14**	**7.7**
	Indoor Air	8.3	**7.4**	**2**
carbon disulfide	Sub-slab	ND	**51**	8
	Indoor Air	2.1	**13**	ND
dichlorodifluoromethane	Sub-slab	3.8	**37**	5.9
	Indoor Air	2.9	**16**	4.5
tetrahydrofuran	Sub-slab	**2.5**	4.5	ND
	Indoor Air	**1.7**	1	0.6

Notes:

Concentrations in **bold** indicate that the analyte was determined to be vapor intrusion pathway-related for that event.
ND not detected above the reporting limit

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TABLE 9. INDOOR AIR RISK CALCULATION, BUILDING 4806 (USAF/CERCLA APPROACH) - FEBRUARY 2016

(Page 1 of 2)

	Indoor Air Screening Level ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane	---	21,900															
1,1,1,2-tetrachloroethane	1.65	---															
1,1,2,2-tetrachlorethane	0.21	---															
1,1,2-trichoroethane	0.76	1															
1,1,2-trichloro-1,2,2-trifluoroethane	---	131,400	0.48		<0.01	0.54		<0.01	0.55		<0.01	0.57		<0.01	0.53		<0.01
1,1-dichloroethane	7.63	---															
1,1-dichloroethene	---	876															
1,2,4-trichlorobenzene	---	8.76															
1,2,4-trimethylbenzene	---	31	0.25		<0.01	0.18		<0.01	0.32		0.01	0.24		<0.01	0.47		0.02
1,2-dichlorobenzene	---	876															
1,2-dichloroethane	0.47	31															
1,2-dichloropropane	1.22	18															
1,2-dichloro-1,1,2,2-tetrafluoroethane	---	131,400															
1,3,5-trimethylbenzene	---	438															
1,3-butadiene	0.41	9															
1,3-dichlorobenzene	---	876															
1,4-dichlorobenzene	1.11	3,504															
2-butanone (MEK)	---	21,900	0.88		<0.01	4.6		<0.01	1.2		<0.01	3.3		<0.01	0.81		<0.01
2-hexanone	---	131				0.60		<0.01									
4-ethyltoluene	---	---	0.20			0.18			0.28			0.21			0.39		
4-methyl-2-pentanone	---	13,140				0.25		<0.01				0.29		<0.01			
acetone	---	135,780	18		<0.01	37		<0.01	40		<0.01	71		<0.01	58		<0.01
acrylonitrile	0.18	9															
benzene	1.56	131	0.44	3E-07	<0.01	0.44	3E-07	<0.01	0.54	3E-07	<0.01	0.80	5E-07	<0.01	0.54	3E-07	<0.01
benzyl chloride	0.25	4															
bromodichloromethane	0.33	---															
bromoform	11.1	---															
bromomethane	---	21.9															
carbon disulfide	---	3,066															
carbon tetrachloride	2.0	438	0.38	2E-07	<0.01	0.37	2E-07	<0.01	0.29	1E-07	<0.01	0.36	2E-07	<0.01	0.32	2E-07	<0.01
chlorobenzene	---	219															
chloroethane (ethyl chloride)	---	43,800															
chloroform	0.53	429	0.31	6E-07	<0.01	0.39	7E-07	<0.01	0.65	1E-06	<0.01	1.5	3E-06	<0.01	5.0	9E-06	0.01
chloromethane	---	394	1.1		<0.01	1.30		<0.01	1.2		<0.01	1.2		<0.01	1.2		<0.01
cis -1,2-dichloroethene	---	35.0															
cis -1,3-dichloropropene	3.05	88															
cyclohexane	---	26,280							0.10		<0.01	0.16		<0.01	0.16		<0.01
dibromochloromethane	---	---															
dichlorodifluoromethane	---	438	2.4		<0.01	2.5		<0.01	2.4		<0.01	3.7		<0.01	2.4		<0.01
ethanol	---	1,752	5.0		<0.01	140		0.08	7.5		<0.01	19		0.01	3.9		<0.01
ethyl acetate	---	307				6.7		0.02									
ethylbenzene	4.88	4,380							0.24	5E-08	<0.01	0.34	7E-08	<0.01	0.34	7E-08	<0.01
ethylene dibromide (EDB)	0.02	39															
hexachlorobutadiene	0.55	---															
isopropyl alcohol	---	876	0.63		<0.01	7.8		<0.01	0.90		<0.01	9.4		0.01	1.8		<0.01
isopropyl benzene (cumene)	---	1,752															
m,p-xylenes	---	438	0.38		<0.01	0.50		<0.01	0.66		<0.01	0.85		<0.01	1.1		<0.01

TABLE 9. INDOOR AIR RISK CALCULATION, BUILDING 4806 (USAF/CERCLA APPROACH) - FEBRUARY 2016

(Page 2 of 2)

	Indoor Air Screening Level ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
tert-butyl methyl ether (MTBE)	46.9	13,140															
methylene chloride	1,220	2,628															
naphthalene	0.36	13				0.13	4E-07	<0.01	0.12	3E-07	<0.01						
n-butyl benzene	---	---															
n-heptane	---	---	0.25			0.30			0.35			0.5			0.39		
n-hexane	---	3,066	0.31		<0.01	0.22		<0.01	0.36		<0.01	0.44		<0.01	0.41		<0.01
o-xylene	---	438				0.25		<0.01	0.37		<0.01	0.35		<0.01	0.36		<0.01
p-isopropyl toluene	---	---															
propene	---	13,140															
sec-butyl benzene	---	---															
styrene	---	4,380				0.10		<0.01	0.14		<0.01	0.083		<0.01	0.18		<0.01
tetrachloroethene (PCE)	46.9	175															
tetrahydrofuran (THF)	---	8,760										0.82		<0.01			
toluene	---	21,900	8.0		<0.01	12		<0.01	20		<0.01	26		<0.01	30		<0.01
trans-1,2-dichloroethene	---	876															
trans-1,3-dichloropropene	3.05	88															
trichloroethene (TCE)	2.98	9															
trichlorofluoromethane	---	3,066	2.2		<0.01	1.4		<0.01	1.5		<0.01	1.5		<0.01	1.4		<0.01
vinyl chloride	2.77	438															
Cumulative Risks and Hazard Indices:				1E-06	0.03		2E-06	0.15		2E-06	0.04		4E-06	0.06		1E-05	0.05

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United State Air Force

Surrogate list:

1,1-dichloroethene used as a surrogate for trans-1,2-dichloroethene

1,2-dichlorobenzene used as surrogate for 1,3-dichlorobenzene

cis-1,3-dichloropropene used as a surrogate for trans-1,3-dichloropropene

isopropyl alcohol used as surrogate for ethanol

total xylenes used as a surrogate for m, p, and o-xylenes and 1,3,5-trimethylbenzene

TABLE 10. INDOOR AIR RISK CALCULATION, BUILDING 4806 (DTSC-PREFERRED APPROACH) - FEBRUARY 2016

(Page 1 of 2)

	California Indoor Air Screening Level ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		4,380															
1,1,1,2-tetrachloroethane	1.65	526															
1,1,2,2-tetrachlorethane	0.21	350															
1,1,2-trichoroethane	0.76	0.88															
1,1,2-trichloro-1,2,2-trifluoroethane		131,400	0.48		<0.01	0.54		<0.01	0.55		<0.01	0.57		<0.01	0.53		<0.01
1,1-dichloroethane	7.63	3,504															
1,1-dichloroethene		307															
1,2,4-trichlorobenzene	1.67	8.8															
1,2,4-trimethylbenzene		31	0.25		<0.01	0.18		<0.01	0.32		0.01	0.24		<0.01	0.47		0.02
1,2-dichlorobenzene		876															
1,2-dichloroethane	0.47	31															
1,2-dichloropropane	1.22	18															
1,2-dichloro-1,1,2,2-tetrafluoroethane		131,400															
1,3,5-trimethylbenzene		175															
1,3-butadiene	0.07	8.8															
1,3-dichlorobenzene		438															
1,4-dichlorobenzene	1.11	3,504															
2-butanone (MEK)		21,900	0.88		<0.01	4.6		<0.01	1.2		<0.01	3.3		<0.01	0.81		<0.01
2-hexanone		131				0.60		<0.01									
4-ethyltoluene			0.20			0.18			0.28			0.21			0.39		
4-methyl-2-pentanone		13,140				0.25		<0.01				0.29		<0.01			
acetone		135,780	18		<0.01	37		<0.01	40		<0.01	71		<0.01	58		<0.01
acrylonitrile	0.04	8.8															
benzene	0.42	13	0.44	1E-06	0.03	0.44	1E-06	0.03	0.54	1E-06	0.04	0.80	2E-06	0.06	0.54	1E-06	0.04
benzyl chloride	0.25	4.4															
bromodichloromethane	0.33	350															
bromoform	11.1	350															
bromomethane		21.9															
carbon disulfide		3,066															
carbon tetrachloride	0.29	175	0.38	1E-06	<0.01	0.37	1E-06	<0.01	0.29	1E-06	<0.01	0.36	1E-06	<0.01	0.32	1E-06	<0.01
chlorobenzene		219															
chloroethane (ethyl chloride)		43,800															
chloroform	0.53	429	0.31	6E-07	<0.01	0.39	7E-07	<0.01	0.65	1E-06	<0.01	1.5	3E-06	<0.01	5.0	9E-06	0.01
chloromethane		394	1.1		<0.01	1.30		<0.01	1.2		<0.01	1.2		<0.01	1.2		<0.01
cis -1,2-dichloroethene		35.0															
cis -1,3-dichloropropene	0.76	88															
cyclohexane		26,280							0.10		<0.01	0.16		<0.01	0.16		<0.01
dibromochloromethane		350															
dichlorodifluoromethane		438	2.4		<0.01	2.5		<0.01	2.4		<0.01	3.7		<0.01	2.4		<0.01
ethanol		30,660	5.0		<0.01	140		<0.01	7.5		<0.01	19		<0.01	3.9		<0.01
ethyl acetate		307				6.7		0.02									
ethylbenzene	4.88	4,380							0.24	5E-08	<0.01	0.34	7E-08	<0.01	0.34	7E-08	<0.01
ethylene dibromide (EDB)	0.02	3.5															
hexachlorobutadiene	0.55	18															
isopropyl alcohol		30,660	0.63		<0.01	7.8		<0.01	0.90		<0.01	9.4		<0.01	1.8		<0.01
isopropyl benzene (cumene)		1,752															
m,p-xylenes		438	0.38		<0.01	0.50		<0.01	0.66		<0.01	0.85		<0.01	1.1		<0.01

TABLE 10. INDOOR AIR RISK CALCULATION, BUILDING 4806 (DTSC-PREFERRED APPROACH) - FEBRUARY 2016

(Page 2 of 2)

	California Indoor Air Screening Level ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
tert-butyl methyl ether (MTBE)	46.9	13,140															
methylene chloride	12.2	1,752															
naphthalene	0.36	13				0.13	4E-07	<0.01	0.12	3E-07	<0.01						
n -butyl benzene		767															
n-heptane			0.25			0.30			0.35			0.5			0.39		
n-hexane		3,066	0.31		<0.01	0.22		<0.01	0.36		<0.01	0.44		<0.01	0.41		<0.01
o-xylene		438				0.25		<0.01	0.37		<0.01	0.35		<0.01	0.36		<0.01
p-isopropyl toluene																	
propene		13,140															
sec-butyl benzene		1,752															
styrene		3,942				0.10		<0.01	0.14		<0.01	0.083		<0.01	0.18		<0.01
tetrachloroethene (PCE)	2.1	153															
tetrahydrofuran (THF)		8,760										0.82		<0.01			
toluene		1,314	8.0		<0.01	12		<0.01	20		0.02	26		0.02	30		0.02
trans-1,2-dichloroethene		350															
trans-1,3-dichloropropene	0.76	88															
trichloroethene (TCE)	2.98	8.8															
trichlorofluoromethane		3,066	2.2		<0.01	1.4		<0.01	1.5		<0.01	1.5		<0.01	1.4		<0.01
vinyl chloride	0.16	438															
Cumulative Risks and Hazard Indices:				3E-06	0.06		3E-06	0.10		4E-06	0.09		6E-06	0.11		1E-05	0.11

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United State Air Force

Surrogate list:

1,1-dichloroethene used as a surrogate for trans-1,2-dichloroethene

1,2-dichlorobenzene used as surrogate for 1,3-dichlorobenzene

cis-1,3-dichloropropene used as a surrogate for trans-1,3-dichloropropene

isopropyl alcohol used as surrogate for ethanol

total xylenes used as a surrogate for m, p, and o-xylenes and 1,3,5-trimethylbenzene

TABLE 11. INDOOR AIR RISK CALCULATION, BUILDING 4807 (USAF/CERCLA APPROACH) - FEBRUARY 2016

(Page 1 of 2)

	Indoor Air Screening Level ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane	---	21,900												
1,1,1,2-tetrachloroethane	1.65	---												
1,1,2,2-tetrachlorethane	0.21	---												
1,1,2-trichoroethane	0.76	1												
1,1,2-trichloro-1,2,2-trifluoroethane	---	131,400	0.52		<0.01	0.51		<0.01	0.59		<0.01	0.63		<0.01
1,1-dichloroethane	7.63	---	1.40	2E-07										
1,1-dichloroethene	---	876												
1,2,4-trichlorobenzene	---	8.76												
1,2,4-trimethylbenzene	---	31	0.65		0.02	0.40		0.01	1.90		0.06	0.35		0.01
1,2-dichlorobenzene	---	876												
1,2-dichloroethane	0.47	31	0.29	6E-07	<0.01									
1,2-dichloropropane	1.22	18	1.90	2E-06	0.11									
1,2-dichloro-1,1,2,2-tetrafluoroethane	---	131,400												
1,3,5-trimethylbenzene	---	438	0.22		<0.01	0.15		<0.01	0.64		<0.01			
1,3-butadiene	0.41	9	0.12	3E-07	0.01				0.06	1E-07	<0.01			
1,3-dichlorobenzene	---	876												
1,4-dichlorobenzene	1.11	3,504												
2-butanone (MEK)	---	21,900	14		<0.01	0.54		<0.01	3.1		<0.01	0.82		<0.01
2-hexanone	---	131							0.36		<0.01			
4-ethyltoluene	---	---	0.68			0.36			1.6			0.37		
4-methyl-2-pentanone	---	13,140	3.0		<0.01				0.36		<0.01	0.14		<0.01
acetone	---	135,780	44		<0.01	23		<0.01	59		<0.01	37		<0.01
acrylonitrile	0.18	9												
benzene	1.56	131	1.1	7E-07	<0.01	0.69	4E-07	<0.01	2.0	1E-06	0.02	0.58	4E-07	<0.01
benzyl chloride	0.25	4												
bromodichloromethane	0.33	---												
bromoform	11.1	---												
bromomethane	---	21.9												
carbon disulfide	---	3,066												
carbon tetrachloride	2.0	438	0.39	2E-07	<0.01	0.36	2E-07	<0.01	0.43	2E-07	<0.01	0.4	2E-07	<0.01
chlorobenzene	---	219												
chloroethane (ethyl chloride)	---	43,800												
chloroform	0.53	429	0.46	9E-07	<0.01	0.3	6E-07	<0.01	0.82	2E-06	<0.01	0.56	1E-06	<0.01
chloromethane	---	394	1.2		<0.01	1.2		<0.01	1.2		<0.01	1.2		<0.01
cis -1,2-dichloroethene	---	35.0												
cis -1,3-dichloropropene	3.05	88												
cyclohexane	---	26,280	1.5		<0.01	0.24		<0.01	1.4		<0.01	0.14		<0.01
dibromochloromethane	---	---												
dichlorodifluoromethane	---	438	4.5		0.01	2.9		<0.01	2.4		<0.01	2.4		<0.01
ethanol	---	1,752	66		0.04	11		<0.01	25		0.01	5.6		<0.01
ethyl acetate	---	307	38		0.12				2.8		<0.01			
ethylbenzene	4.88	4,380	2.2	5E-07	<0.01	0.23	5E-08	<0.01	1.8	4E-07	<0.01	0.35	7E-08	<0.01
ethylene dibromide (EDB)	0.02	39												
hexachlorobutadiene	0.55	---												
isopropyl alcohol	---	876	8.0		<0.01	0.93		<0.01	1.7		<0.01	0.56		<0.01
isopropyl benzene (cumene)	---	1,752	0.21		<0.01									
m,p-xylenes	---	438	6.0		0.01	1.0		<0.01	6.6		0.02	0.87		<0.01

TABLE 11. INDOOR AIR RISK CALCULATION, BUILDING 4807 (USAF/CERCLA APPROACH) - FEBRUARY 2016

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	Indoor Air Screening Level ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
tert-butyl methyl ether (MTBE)	46.9	13,140							0.16	3E-09	<0.01			
methylene chloride	1,220	2,628	2.7	2E-09	<0.01									
naphthalene	0.36	13	0.095	3E-07	<0.01				0.21	6E-07	0.02			
n-butyl benzene	---	---												
n-heptane	---	---	2.0			0.76			2.8			0.54		
n-hexane	---	3,066	2.3		<0.01	0.66		<0.01	3.8		<0.01	0.35		<0.01
o-xylene	---	438	3.0		<0.01	0.31		<0.01	2.4		<0.01	0.47		<0.01
p-isopropyl toluene	---	---												
propene	---	13,140												
sec-butyl benzene	---	---												
styrene	---	4,380	0.99		<0.01	0.09		<0.01	0.24		<0.01	0.15		<0.01
tetrachloroethene (PCE)	46.9	175	2.10	4E-08	0.01									
tetrahydrofuran (THF)	---	8,760	0.58		<0.01									
toluene	---	21,900	32		<0.01	12		<0.01	40		<0.01	20		<0.01
trans-1,2-dichloroethene	---	876												
trans-1,3-dichloropropene	3.05	88												
trichloroethene (TCE)	2.98	9												
trichlorofluoromethane	---	3,066	2.4		<0.01	3.0		<0.01	3.1		<0.01	2.1		<0.01
vinyl chloride	2.77	438												
Cumulative Risks and Hazard Indices:				5E-06	0.39		1E-06	0.04		4E-06	0.17		2E-06	0.04

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United State Air Force

Surrogate list:

1,1-dichloroethene used as a surrogate for trans-1,2-dichloroethene

1,2-dichlorobenzene used as surrogate for 1,3-dichlorobenzene

cis-1,3-dichloropropene used as a surrogate for trans-1,3-dichloropropene

isopropyl alcohol used as surrogate for ethanol

total xylenes used as a surrogate for m, p, and o-xylenes and 1,3,5-trimethylbenzene

TABLE 12. INDOOR AIR RISK CALCULATION, BUILDING 4807 (DTSC-PREFERRED APPROACH) - FEBRUARY 2016

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	California Indoor Air Screening Level ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		4,380												
1,1,1,2-tetrachloroethane	1.65	526												
1,1,2,2-tetrachlorethane	0.21	350												
1,1,2-trichoroethane	0.76	0.88												
1,1,2-trichloro-1,2,2-trifluoroethane		131,400	0.52		<0.01	0.51		<0.01	0.59		<0.01	0.63		<0.01
1,1-dichloroethane	7.63	3,504	1.40	2E-07	<0.01									
1,1-dichloroethene		307												
1,2,4-trichlorobenzene	1.67	8.8												
1,2,4-trimethylbenzene		31	0.65		0.02	0.40		0.01	1.90		0.06	0.35		0.01
1,2-dichlorobenzene		876												
1,2-dichloroethane	0.47	31	0.29	6E-07	<0.01									
1,2-dichloropropane	1.22	18	1.90	2E-06	0.11									
1,2-dichloro-1,1,2,2-tetrafluoroethane		131,400												
1,3,5-trimethylbenzene		175	0.22		<0.01	0.15		<0.01	0.64		<0.01			
1,3-butadiene	0.07	8.8	0.12	2E-06	0.01				0.06	8E-07	<0.01			
1,3-dichlorobenzene		438												
1,4-dichlorobenzene	1.11	3,504												
2-butanone (MEK)		21,900	14		<0.01	0.54		<0.01	3.1		<0.01	0.82		<0.01
2-hexanone		131							0.36		<0.01			
4-ethyltoluene			0.68			0.36			1.6			0.37		
4-methyl-2-pentanone		13,140	3.0		<0.01				0.36		<0.01	0.14		<0.01
acetone		135,780	44		<0.01	23		<0.01	59		<0.01	37		<0.01
acrylonitrile	0.04	8.8												
benzene	0.42	13	1.1	3E-06	0.08	0.69	2E-06	0.05	2.0	5E-06	0.15	0.58	1E-06	0.04
benzyl chloride	0.25	4.4												
bromodichloromethane	0.33	350												
bromoform	11.1	350												
bromomethane		21.9												
carbon disulfide		3,066												
carbon tetrachloride	0.29	175	0.39	1E-06	<0.01	0.36	1E-06	<0.01	0.43	1E-06	<0.01	0.4	1E-06	<0.01
chlorobenzene		219												
chloroethane (ethyl chloride)		43,800												
chloroform	0.53	429	0.46	9E-07	<0.01	0.3	6E-07	<0.01	0.82	2E-06	<0.01	0.56	1E-06	<0.01
chloromethane		394	1.2		<0.01	1.2		<0.01	1.2		<0.01	1.2		<0.01
cis -1,2-dichloroethene		35.0												
cis -1,3-dichloropropene	0.76	88												
cyclohexane		26,280	1.5		<0.01	0.24		<0.01	1.4		<0.01	0.14		<0.01
dibromochloromethane		350												
dichlorodifluoromethane		438	4.5		0.01	2.9		<0.01	2.4		<0.01	2.4		<0.01
ethanol		30,660	66		<0.01	11		<0.01	25		<0.01	5.6		<0.01
ethyl acetate		307	38		0.12				2.8		<0.01			
ethylbenzene	4.88	4,380	2.2	5E-07	<0.01	0.23	5E-08	<0.01	1.8	4E-07	<0.01	0.35	7E-08	<0.01
ethylene dibromide (EDB)	0.02	3.5												
hexachlorobutadiene	0.55	18												
isopropyl alcohol		30,660	8.0		<0.01	0.93		<0.01	1.7		<0.01	0.56		<0.01
isopropyl benzene (cumene)		1,752	0.21		<0.01									
m,p-xylenes		438	6.0		0.01	1.0		<0.01	6.6		0.02	0.87		<0.01

TABLE 12. INDOOR AIR RISK CALCULATION, BUILDING 4807 (DTSC-PREFERRED APPROACH) - FEBRUARY 2016

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	California Indoor Air Screening Level ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
tert-butyl methyl ether (MTBE)	46.9	13,140							0.16	3E-09	<0.01			
methylene chloride	12.2	1,752	2.7	2E-07	<0.01									
naphthalene	0.36	13	0.095	3E-07	<0.01				0.21	6E-07	0.02			
n-butyl benzene		767												
n-heptane			2.0			0.76			2.8			0.54		
n-hexane		3,066	2.3		<0.01	0.66		<0.01	3.8		<0.01	0.35		<0.01
o-xylene		438	3.0		<0.01	0.31		<0.01	2.4		<0.01	0.47		<0.01
p-isopropyl toluene														
propene		13,140												
sec-butyl benzene		1,752												
styrene		3,942	0.99		<0.01	0.09		<0.01	0.24		<0.01	0.15		<0.01
tetrachloroethene (PCE)	2.1	153	2.10	1E-06	0.01									
tetrahydrofuran (THF)		8,760	0.58		<0.01									
toluene		1,314	32		0.02	12		<0.01	40		0.03	20		0.02
trans-1,2-dichloroethene		350												
trans-1,3-dichloropropene	0.76	88												
trichloroethene (TCE)	2.98	8.8												
trichlorofluoromethane		3,066	2.4		<0.01	3.0		<0.01	3.1		<0.01	2.1		<0.01
vinyl chloride	0.16	438												
Cumulative Risks and Hazard Indices:				1E-05	0.45		3E-06	0.09		1E-05	0.32		4E-06	0.09

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United State Air Force

Surrogate list:

1,1-dichloroethene used as a surrogate for trans-1,2-dichloroethene

1,2-dichlorobenzene used as surrogate for 1,3-dichlorobenzene

cis-1,3-dichloropropene used as a surrogate for trans-1,3-dichloropropene

isopropyl alcohol used as surrogate for ethanol

n-hexane used as a surrogate for n-heptane

total xylenes used as a surrogate for m, p, and o-xylenes and 1,3,5-trimethylbenzene

TABLE 13. MAXIMUM CUMULATIVE INDOOR AIR RISK FROM VAPOR INTRUSION PATHWAY-RELATED CHEMICALS

		Cancer Risk		Non-cancer Hazard	
Building	Event	USAF/CERCLA Approach	DTSC-Preferred Approach	USAF/CERCLA Approach	DTSC-Preferred Approach
4806	March 2013	1E-06	4E-06	0.02	0.1
	August 2013	1E-06	2E-06	0.04	0.08
	February 2016	3E-07	1E-06	0.01	0.04
4807	March 2013	---	---	<0.01	<0.01
	August 2013	8E-07	3E-06	<0.01	0.09
	February 2016	4E-07	2E-06	<0.01	0.05
Maximum per approach:		1E-06	4E-06	0.04	0.1

Notes:

Results for the March and August 2013 vapor intrusion investigation at Building 4810 are not included as the building was demolished in September 2014.

--- No vapor intrusion pathway-related cancer risk identified.

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

DTSC Department of Toxic Substances Control

USAF United States Air Force

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TABLE 14. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION, BUILDING 4806 (USAF/CERCLA APPROACH) - FEBRUARY 2016

	Indoor Air Screening Level ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,2,4-trimethylbenzene	---	31	0.25		<0.01	0.18		<0.01	0.32		0.01	0.24		<0.01	0.47		0.02
2-butanone (MEK)	---	21,900	0.88		<0.01	4.6		<0.01	1.2		<0.01	3.3		<0.01	0.81		<0.01
4-ethyltoluene	---	---	0.20			0.18			0.28			0.21			0.39		
4-methyl-2-pentanone	---	13,140				0.25		<0.01				0.29		<0.01			
benzene	1.56	131	0.44	3E-07	<0.01	0.44	3E-07	<0.01	0.54	3E-07	<0.01	0.8	5E-07	<0.01	0.54	3E-07	<0.01
cyclohexane	---	26,280							0.10		<0.01	0.16		<0.01	0.16		<0.01
ethylbenzene	4.88	4,380							0.24	5E-08	<0.01	0.34	7E-08	<0.01	0.34	7E-08	<0.01
m,p-xylenes	---	438	0.38		<0.01	0.50		<0.01	0.66		<0.01	0.85		<0.01	1.1		<0.01
n-heptane	---	---	0.25			0.30			0.35			0.5			0.39		
n-hexane	---	3,066	0.31		<0.01	0.22		<0.01	0.36		<0.01	0.44		<0.01	0.41		<0.01
o-xylene	---	438				0.25		<0.01	0.37		<0.01	0.35		<0.01	0.36		<0.01
styrene	---	4,380				0.10		<0.01	0.14		<0.01	0.083		<0.01	0.18		<0.01
Cumulative Risks and Hazard Indices:				3E-07	0.01		3E-07	0.01		4E-07	0.02		6E-07	0.02		4E-07	0.02
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01		3E-07	0.01			<0.01		7E-08	0.01			<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United States Air Force

Surrogate list:

total xylenes used as a surrogate for m, p, and o-xylenes and 1,3,5-trimethylbenzene

Analyte is not likely vapor intrusion pathway (VIP)-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is VIP-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 15. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION, BUILDING 4806 (DTSC-PREFERRED APPROACH) - FEBRUARY 2016

	California Indoor Air Screening Level ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,2,4-trimethylbenzene		31	0.25		<0.01	0.18		<0.01	0.32		0.01	0.24		<0.01	0.47		0.02
2-butanone (MEK)		21,900	0.88		<0.01	4.6		<0.01	1.2		<0.01	3.3		<0.01	0.81		<0.01
4-ethyltoluene			0.20			0.18			0.28			0.21			0.39		
4-methyl-2-pentanone		13,140				0.25		<0.01				0.29		<0.01			
benzene	0.42	13	0.44	1E-06	0.03	0.44	1E-06	0.03	0.54	1E-06	0.04	0.80	2E-06	0.06	0.54	1E-06	0.04
cyclohexane		26,280							0.10		<0.01	0.16		<0.01	0.16		<0.01
ethylbenzene	4.88	4,380							0.24	5E-08	<0.01	0.34	7E-08	<0.01	0.34	7E-08	<0.01
m,p-xylenes		438	0.38		<0.01	0.50		<0.01	0.66		<0.01	0.85		<0.01	1.1		<0.01
n-heptane			0.25			0.30			0.35			0.5			0.39		
n-hexane		3,066	0.31		<0.01	0.22		<0.01	0.36		<0.01	0.44		<0.01	0.41		<0.01
o-xylene		438				0.25		<0.01	0.37		<0.01	0.35		<0.01	0.36		<0.01
styrene		3,942				0.10		<0.01	0.14		<0.01	0.083		<0.01	0.18		<0.01
Cumulative Risks and Hazard Indices:				1E-06	0.04		1E-06	0.04		1E-06	0.05		2E-06	0.07		1E-06	0.06
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01		1E-06	0.04			<0.01		7E-08	0.01			<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United States Air Force

Surrogate list:

total xylenes used as a surrogate for m, p, and o-xylenes and 1,3,5-trimethylbenzene

Analyte is not likely vapor intrusion pathway (VIP)-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is VIP-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 16. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION, BUILDING 4807 (USAF/CERCLA APPROACH) - FEBRUARY 2016

	Indoor Air Screening Level ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
benzene	1.56	131	1.1	7E-07	<0.01	0.69	4E-07	<0.01	2.0	1E-06	0.02	0.58	4E-07	<0.01
Cumulative Risks and Hazard Indices:				7E-07	<0.01		4E-07	<0.01		1E-06	0.02		4E-07	<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United States Air Force

Surrogate list:
1,1-dichloroethene used as a surrogate for trans-1,2-dichloroethene
1,2-dichlorobenzene used as surrogate for 1,3-dichlorobenzene
cis-1,3-dichloropropene used as a surrogate for trans-1,3-dichloropropene
isopropyl alcohol used as surrogate for ethanol
total xylenes used as a surrogate for m, p, and o-xylenes and 1,3,5-trimethylbenzene

Analyte is not likely vapor intrusion pathway (VIP)-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is VIP-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

TABLE 17. VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION, BUILDING 4807 (DTSC-PREFERRED APPROACH) - FEBRUARY 2016

	California Indoor Air Screening Level ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
benzene	0.42	13	1.1	3E-06	0.08	0.69	2E-06	0.05	2.0	5E-06	0.15	0.58	1E-06	0.04
Cumulative Risks and Hazard Indices:				3E-06	0.08		2E-06	0.05		5E-06	0.15		1E-06	0.04

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United States Air Force

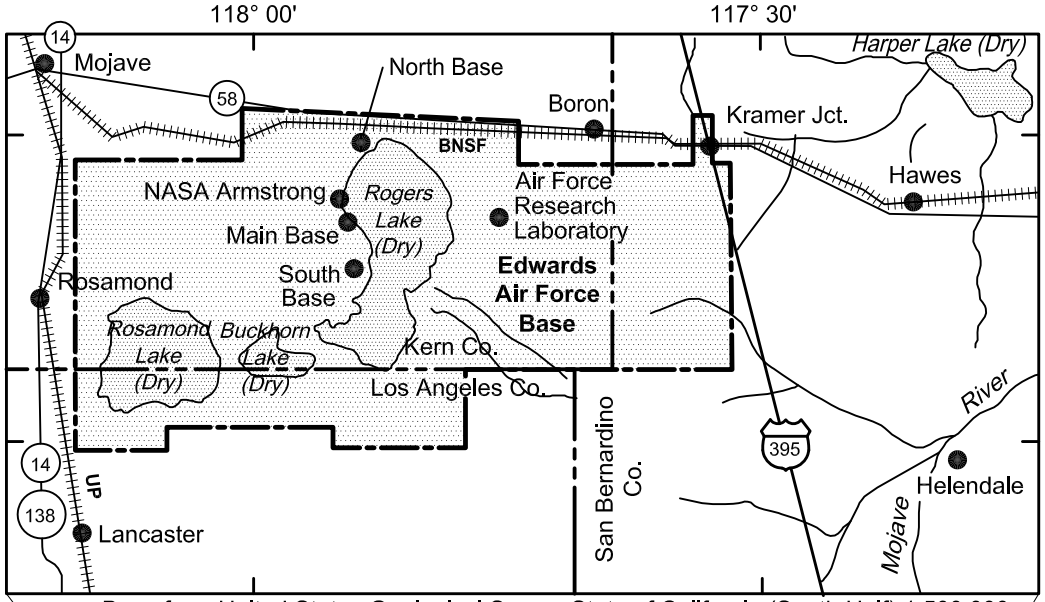
Surrogate list:
1,1-dichloroethene used as a surrogate for trans-1,2-dichloroethene
1,2-dichlorobenzene used as surrogate for 1,3-dichlorobenzene
cis-1,3-dichloropropene used as a surrogate for trans-1,3-dichloropropene
isopropyl alcohol used as surrogate for ethanol
n-hexane used as a surrogate for n-heptane
total xylenes used as a surrogate for m, p, and o-xylenes and 1,3,5-trimethylbenzene

Analyte is not likely vapor intrusion pathway (VIP)-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is VIP-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

FIGURES

- 1 Edwards Air Force Base Location Map
- 2 Operable Unit Location Map
- 3 Building Locations in Relation to TCE and Benzene Groundwater Plumes
- 4 Buildings 4806 and 4807 and Surrounding Features
- 5 Buildings 4806 and 4807 Sampling Locations



Base from United States Geological Survey State of California (South Half) 1:500,000

0 10 20 miles

0 10 20 30 km

Scale

NORTH

EXPLANATION

AFB = AIR FORCE BASE
BNSF = BURLINGTON NORTHERN SANTA FE
Co. = COUNTY
Jct. = JUNCTION
NASA = NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
UP = UNION PACIFIC
= COUNTY LINE
= RAILROAD
58 = STATE HIGHWAY
395 = INTERSTATE HIGHWAY

Edwards Air Force Base Location Map		
Date 09-2016	VI Investigation Report Addendum	Figure
Project No. 60444679	Operable Unit 6 Edwards AFB	1

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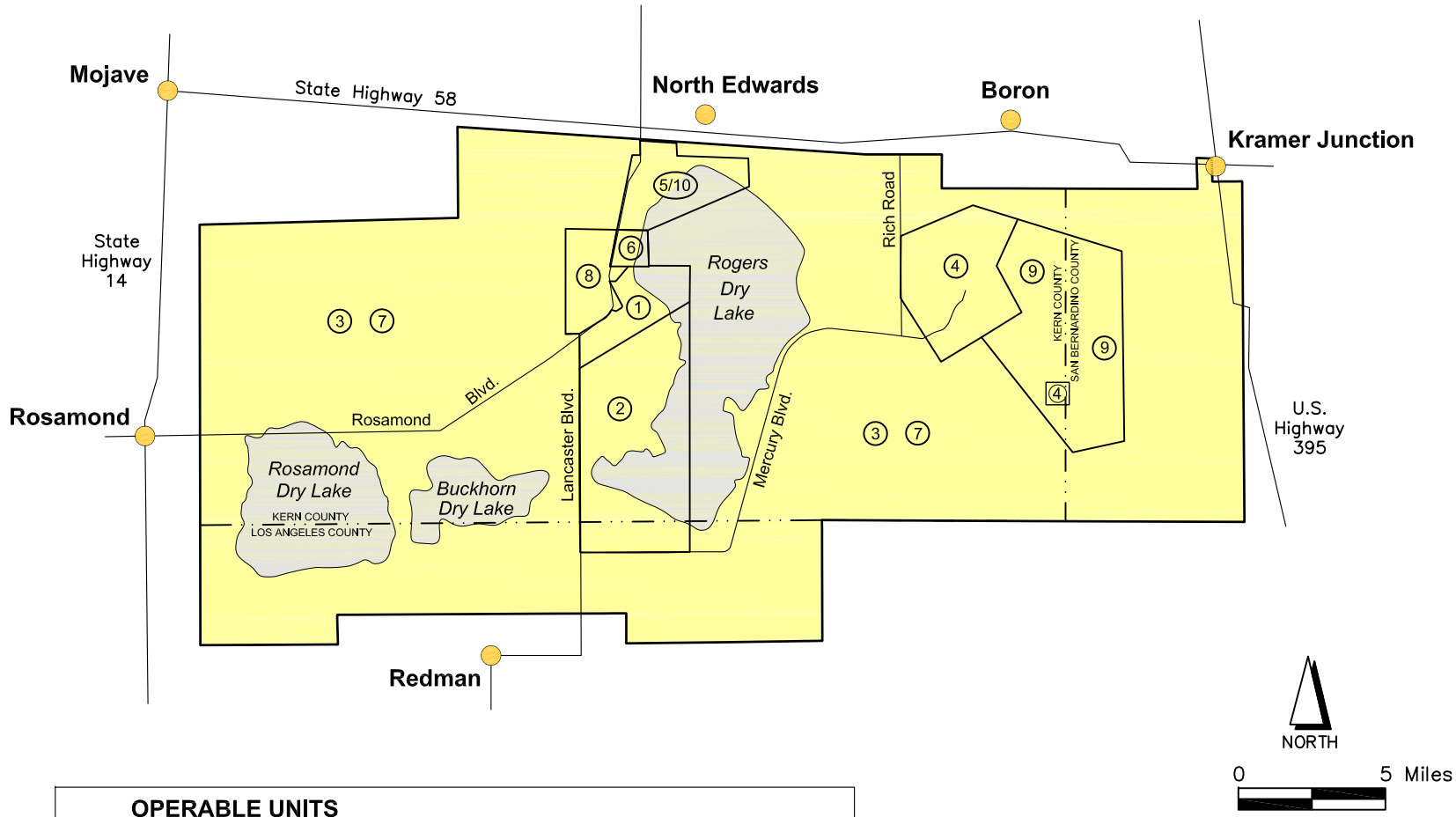
Date: Thursday, August 11, 2016



OPERABLE UNITS

1. Main Base Flightline
2. South Base
3. Basewide Water Wells
4. Air Force Research Laboratory
5/10. North Base
6. NASA Armstrong
7. Basewide Miscellaneous
8. Northwest Main Base
9. Air Force Research Laboratory-East

Operable Unit Location Map

Date 09-2016	VI Investigation Report Addendum	Figure
Project No. 60444679	Operable Unit 6 Edwards AFB	2

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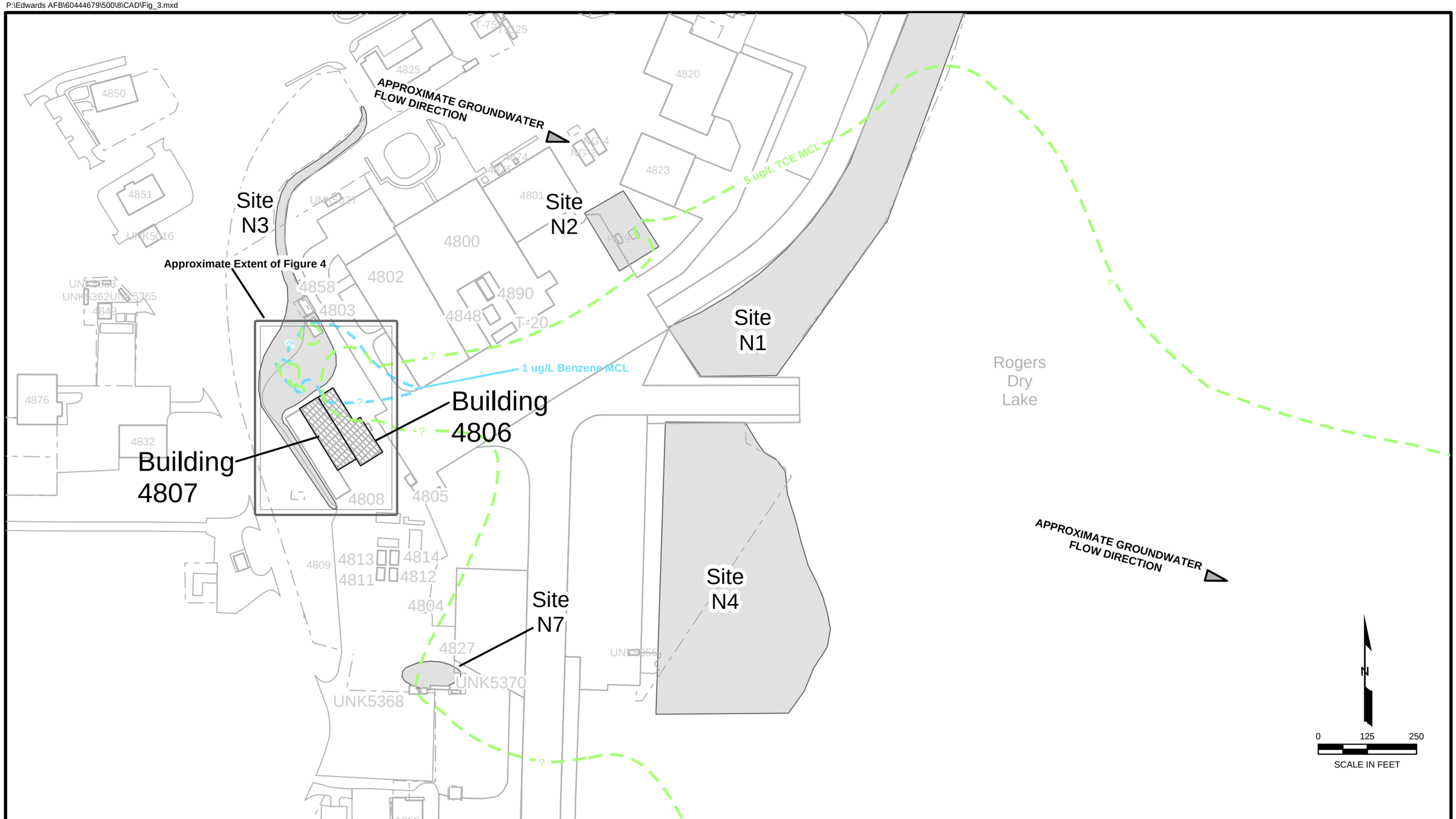

EXPLANATION

BUILDING INCLUDED IN CURRENT STUDY

SITE INCLUDED IN GROUNDWATER REMEDIAL ACTION

GROUNDWATER CONTAMINANT CONCENTRATION CONTOURS ARE BASED ON 2015 MONITORING RESULTS,

UG/L = MICROGRAMS PER LITER
MCL = MAXIMUM CONTAMINANT LEVEL
TCE = TRICHLOROETHENE

Building Locations in Relation to TCE and Benzene Groundwater Plumes

Date 09-2016	VI Investigation Report Addendum	Figure
Project No. 60444679	**Operable Unit 6 Edwards AFB**	**3**

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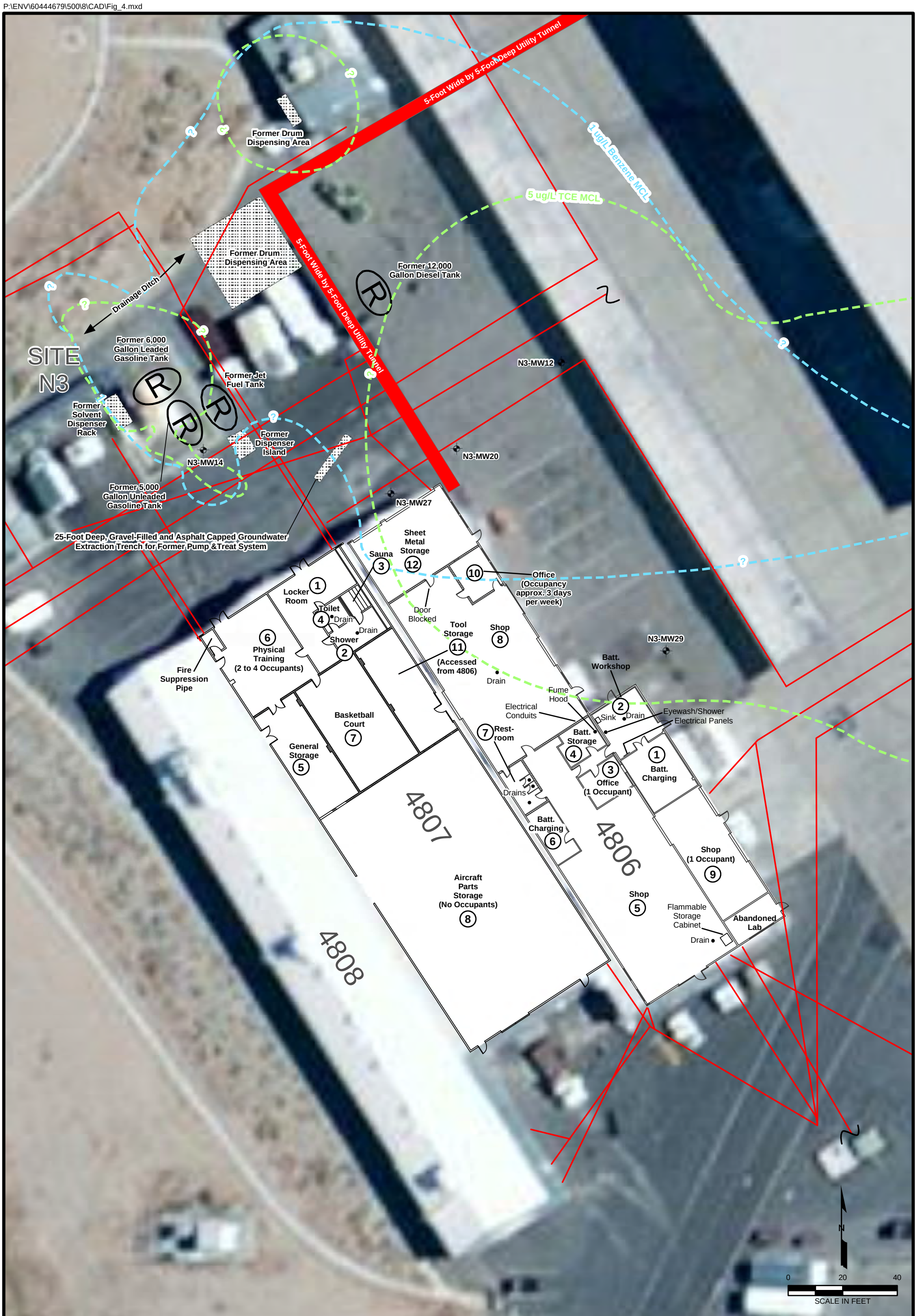

EXPLANATION

- EXISTING GROUNDWATER MONITORING WELL
- ② ROOM NUMBER
- Ⓡ REMOVED UNDERGROUND STORAGE TANK
- UTILITY LINE
- UTILITY LINE MAY EXTEND BEYOND THE DEPICTION BUT NO ADDITIONAL INFORMATION IS AVAILABLE

BUILDING OCCUPANCY

BUILDING 4806 - 2 TO 6
BUILDING 4807 - 4 TO 6

GROUNDWATER CONTAMINANT CONCENTRATION CONTOURS ARE BASED ON 2015 MONITORING RESULTS,

UG/L = MICROGRAMS PER LITER
MCL = MAXIMUM CONTAMINANT LEVEL
TCE = TRICHLOROETHENE

Buildings 4806 and 4807 and Surrounding Features

Date 09-2016	VI Investigation Report Addendum	Figure
Project No. 60444679	**Operable Unit 6 Edwards AFB**	**4**

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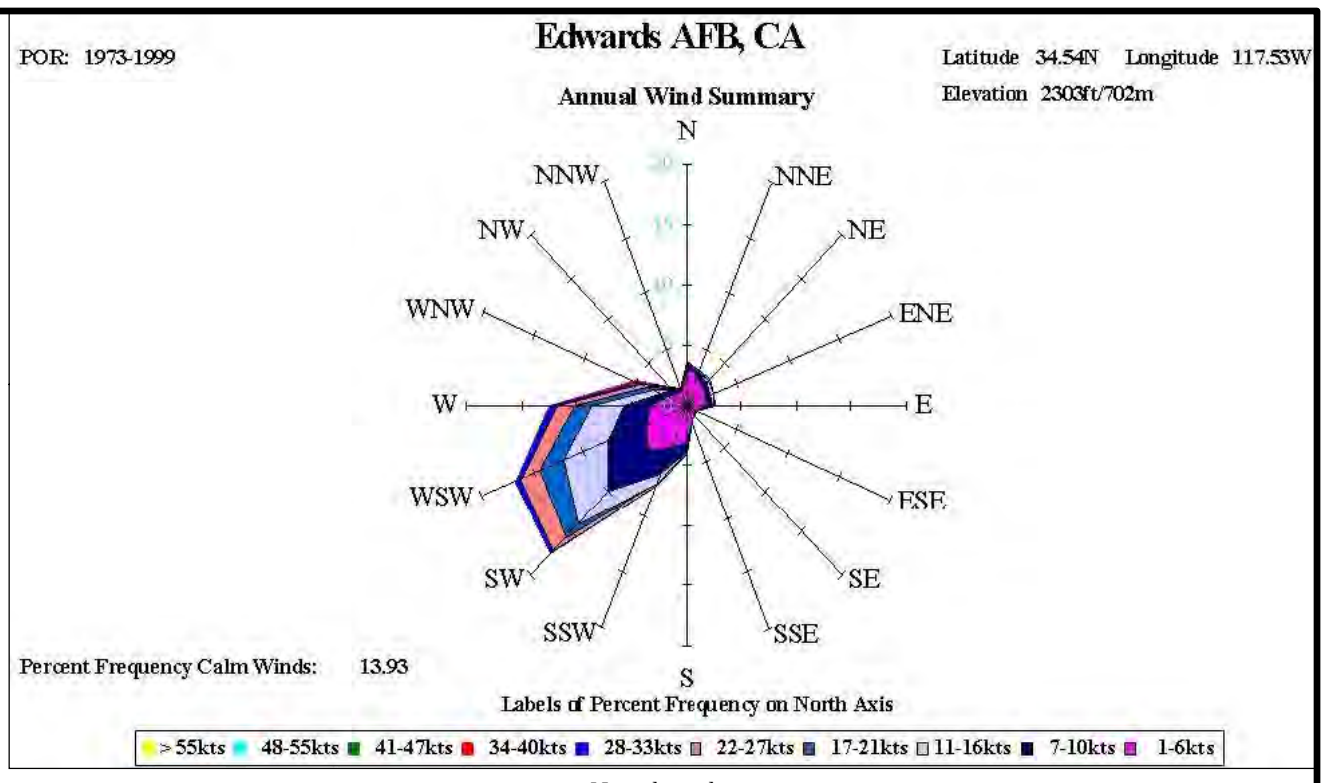


Note: kts = knots

BUILDING OCCUPANCY

BUILDING 4806 - 2 TO 6
BUILDING 4807 - 4 TO 6

BUILDING AREA

BUILDING 4806 - 10,030 SQUARE FEET
BUILDING 4807 - 11,011 SQUARE FEET

EXPLANATION

② ROOM NUMBER

NOTES:
1. SINGLE-STORY BUILDINGS ON CONCRETE SLAB.
2. OUTDOOR AIR SAMPLING LOCATIONS WERE PLACED AT A DISTANCE FROM THE BUILDING EQUAL TO TWICE THE HEIGHT OF THE BUILDING.
3. BENZENE CONCENTRATIONS ARE PRESENTED IN MICROGRAMS PER CUBIC METER.

● SS04 (2.4) SUB-SLAB VAPOR POINT SAMPLING LOCATION AND BENZENE CONCENTRATION

● IA04 (0.58) INDOOR AIR SAMPLING LOCATION AND BENZENE CONCENTRATION (PINK WERE THE BENZENE CONCENTRATION RESULTS IN RISK EXCEEDING 1X10-6)

● OA02 (0.42) OUTDOOR AIR SAMPLING LOCATION AND BENZENE CONCENTRATION

Buildings 4806 and 4807 Sampling Locations

Date 09-2016	VI Investigation Report Addendum	Figure
Project No. 60444679	Operable Unit 6 Edwards AFB	5

APPENDIX A

INITIAL BUILDING SURVEY SUPPLEMENT
(COMBINED ON CD WITH APPENDICES B AND E FOR RESOURCE CONSERVATION)

BLDG CONDITIONS ESSENTIALLY UNCHANGED FROM THE MARCH/AUGUST 2013 SAMPLING EVENTS

Building Survey Form

Date 2/1/16

Building ID: 4806

Project Name: NASA VIP SAMPLING

Project No.:

Preparer's Name: V. RODARTE

Building Location:

CONTACT ~~Facility Manager~~: MIKE (ROOM 10 TENANT)

Contract Number:

A. Building Informaton:

Estimated number of occupants: UP TO 6

Normal hours of operation: 6:30 AM – 4:00 PM

Building Activities:

OFFICE SPACE, BATTERY OPERATIONS, OIL TESTING, AND VEHICLE MAINTENANCE.

Describe how building space is used:

SEE ABOVE

B. Building Construction:

Foundation type: Slab-on grade (yes) / no

If no describe:

Foundation thickness (in inches): 4"

Foundation sealed/painted: yes / no

If yes describe where and type: UNKNOWN

Engineered fill below foundation: (yes) / no

If no describe:

Basement in building: yes / (no)

If yes does it contain a sump?: yes / no

Framing: Cinder block walls: (yes) / no

If no describe:

Building Age: 1953-1954 **Number of stories:** 1

Is building insulated? yes / (no)

Number of elevators in building: NONE

Condition of elevator pits (sealed, open, other):

Ceiling height: ≈ 8'-9' EXCEPT STORAGE AND VEHICLE MAINTENANCE AREAS ≈ 25'

Building Survey Form

Date 2/1/16

C. Building Ventilation:

Describe type of heating system: 3 NEW CEILING-MOUNTED HEATERS

Describe seasonal variation in HVAC operation: HIGH COOLING AND HEATING IN SUMMER AND WINTER MONTHS, RESPECTIVELY.

Describe operation of HVAC (recycled air /fresh air/combination):

Describe type of air conditioning:

List manufacturer of heating /cooling unit:

HVAC unit size:

HVAC estimated maximum flow:

Normal hours of HVAC operation: 6:30 AM - 4:00 PM

Temperature settings: TYPICALLY

a. Daytime: 68°F - 72°F

b. Night: OFF

c. Weekends: ON WHEN OCCUPIED

Windows or doors frequently left open: TYPICALLY NO

If yes describe why and location: ROLLUP DOOR WAS OBSERVED TEMPORARILY OPEN DURING SAMPLING ON 2/3/16 NEAR SAMPLE LOCATION ~~IA~~ 5

Describe other ventilation fans (bathroom, kitchen, open windows, mechanical fans) size, and frequently of use: CEILING-MOUNTED

D. Potential Indoor Sources

1. Does the building have a kitchen? Yes / No

If yes describe:

2. Are vehicles parked in the building? Yes / No

If yes describe:

3. Is there a workshop in the building? Yes / No

If yes describe:

4. Is there an inventory of products used in the building? Yes / No

MSDS available? SEE ATTACHED CHEMICAL LIST (HAS NOT CHANGED SINCE 2013).. Yes / No

Building Survey Form

Which of these items are present in the building? (Check all that apply)

Potential VOC Source	✓	Location of Source	Removed at least 1 week prior to sampling (Yes/No/NA; indicate when removed if less than 1 week)
Paints	X		
Gas-powered equipment	X		
Gasoline storage cans			
Cleaning solvents (thinner)			
Air fresheners	X	RESTROOM	NO
Oven cleaners			
Carpet/upholstery cleaners			
Hairspray			
Nail polish/polish remover			
Bathroom cleaner			
Appliance cleaner			
Furniture/Floor polish			
Mothballs			
Fuel tank			
Woodstove			
Fireplace			
Perfume/Colognes			
Hobby supplies (e.g., solvents, paints, lacquers, glues, photographic darkroom chemicals)			
Scented trees, wreaths, potpourri, etc.			
Polish/Wax			
Insecticide/Pesticide			
Kerosene			
Other HYDRAULIC MOTORIZED EQUIPMENT	X	BLDG 4807 SAMPLING LOCATION 4807-IA3/SS3	NO

E. Building Inspection for VIP pathways:

1. Are there any existing piping or conduits entering building through foundation? (Yes) / No

If yes describe and locate on sketch (Section H). REFER TO PHOTOS TAKEN DURING BLDG SURVEY CONDUCTED ON 6/5-6/2012

2. Are there any holes drilled in the foundation? Yes / (No) (ASIDE FROM SUB-SLAB PROBES)

If yes describe and locate on sketch (Section H).

3. Any flow observed from identified pathways: Yes (No)

If yes describe how it was evaluated (air flow tubes).

2/1/16

Building Survey Form

F. Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE FIELD LOGS

Window open during measurements? Yes / No

Instrument used to measure temperature: VELOCICALC

Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)

Outside pressure: _____ Pa (avoid windy location)

Prior to indoor air sampling

Time: _____

Room one

_____ Pa _____ °F

Room two

_____ Pa _____ °F

Room three

_____ Pa _____ °F

Room four

_____ Pa _____ °F

Room five

_____ Pa _____ °F

Room six

_____ Pa _____ °F

Sub-slab wells (if available):

Sub-slab well ID _____

_____ Pa

Sub-slab well ID _____

_____ Pa

At Conclusion of indoor air sampling

Time: _____

Room one

_____ Pa _____ °F

Room two

_____ Pa _____ °F

Room three

_____ Pa _____ °F

Room four

_____ Pa _____ °F

Room five

_____ Pa _____ °F

Room six

_____ Pa _____ °F

Sub-slab well ID _____

_____ Pa

Sub-slab well ID _____

_____ Pa

REFER TO FIELD LOGS/MEASUREMENTS COLLECTED ON 2/1/2016 2/3/2016 2/4/2016

G. Building Screening Results

Photo-ionization detector instrument used _____

Time measured: _____

Room one

_____ (ppm)

Room two

_____ (ppm)

Room three

_____ (ppm)

Room four

_____ (ppm)

Room five

_____ (ppm)

Room six

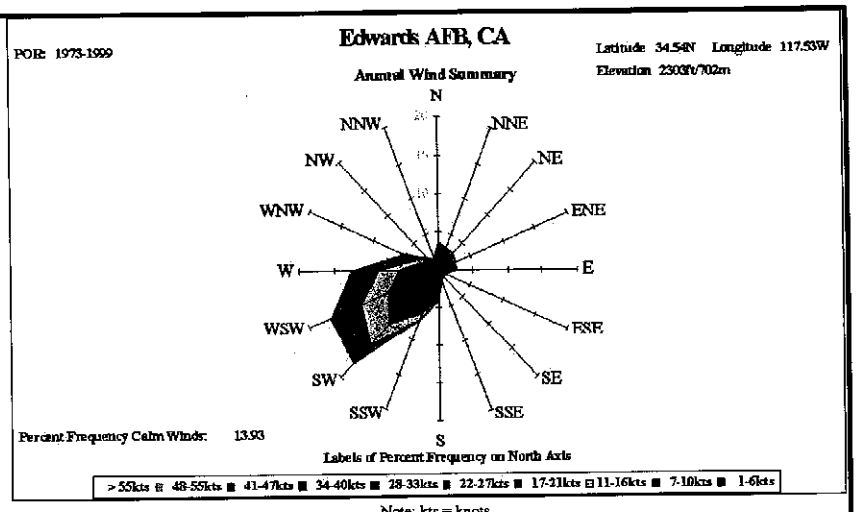
_____ (ppm)

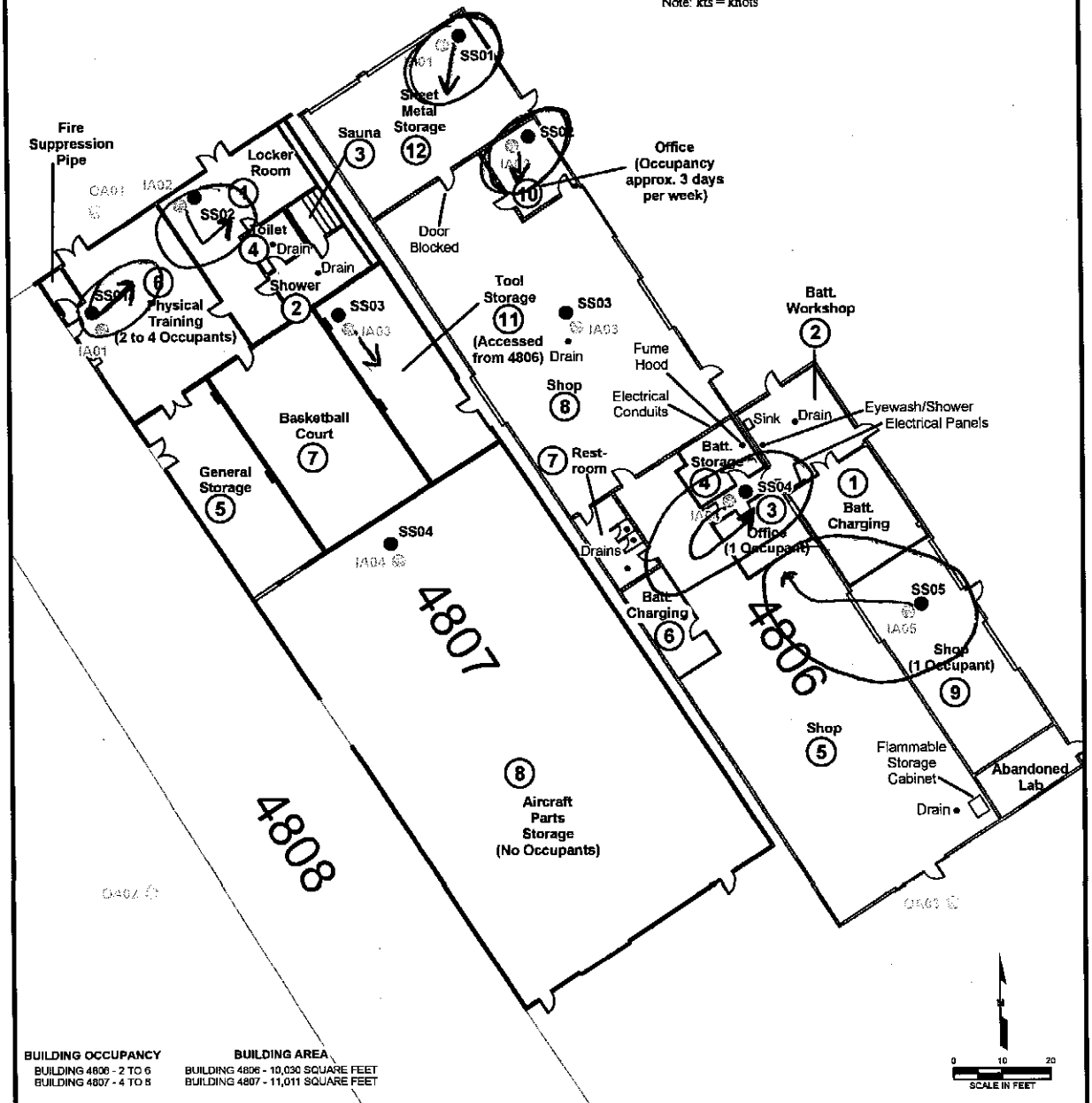
Building Survey Form

H. Sketch of Building:
(Include rooms and dimensions, locations of doorways, where pressure measurements where collected, ventilation fans, windows, air ducts, and locations of any potential pathways for vapor intrusion into the building from the subsurface, i.e., piping, conduits, sumps, elevator shafts, etc.)

REFER TO ATTACHED FIGURE

P:\60265922\8_Project Documents\03.90\CAD\Fig_12.mxd





BUILDING OCCUPANCY
BUILDING 4806 - 2 TO 6
BUILDING 4807 - 4 TO 8

BUILDING AREA
BUILDING 4806 - 10,030 SQUARE FEET
BUILDING 4807 - 11,011 SQUARE FEET

EXPLANATION

NOTES:
1. SINGLE-STORY BUILDINGS ON CONCRETE SLAB.
2. PROPOSED SAMPLING LOCATIONS ARE BASED ON INITIAL BUILDING SURVEYS.
3. FINAL SAMPLING LOCATIONS WILL BE BASED ON THE SAMPLING EVENT BUILDING SURVEYS.
4. SUB-SLAB VAPOR POINT SAMPLING LOCATIONS WILL BE PLACED 8 TO 10 FEET FROM WALLS (IF POSSIBLE).
5. OUTDOOR AIR SAMPLING LOCATIONS WILL BE PLACED AT A DISTANCE FROM THE BUILDING EQUAL TO TWICE THE HEIGHT OF THE BUILDING.

② ROOM NUMBER
SS01 ● PROPOSED SUB-SLAB VAPOR POINT SAMPLING LOCATION
IA01 PROPOSED INDOOR AIR SAMPLING LOCATION
OA01 PROPOSED OUTDOOR AIR SAMPLING LOCATION

DRAFT FINAL

Buildings 4806 and 4807 Proposed Sampling Locations

Date 12-2012	Operable Unit 6 Vapor Intrusion Sampling Plan & Risk Assessment Work Plan Edwards AFB	Figure 12
Project No. 60265922		

BLDG CONDITIONS WERE ESSENTIALLY UNCHANGED FROM THE MARCH/AUGUST 2013 SAMPLING EVENTS.

Building Survey Form

Date 2/1/16

Building ID: 4807

Project Name: NASA VIP SAMPLING

Project No.:

Preparer's Name: V. RODARTE

Building Location: NASA @ EAFB

Facility Manager: RAYMOND KINNEY
POC: PHIL WELLNER

Contract Number:

A. Building Informaton:

Estimated number of occupants: UP TO 13

Normal hours of operation: 6:30 AM - 4:00 PM

Building Activities:
NORTHERN SECTION - TRAINING AND LOCKER ROOM
SOUTHERN SECTION - STORAGE WAREHOUSE

Describe how building space is used:
TRAINING ROOM FOR PILOT TRAINING/TESTING; BASKET BALL COURT; AND LOCKER ROOM WITH SAUNA, SHOWERS, AND REST ROOMS.

B. Building Construction:

Foundation type: Slab-on grade (yes) / no

If no describe:

Foundation thickness (in inches): 6"

Foundation sealed/painted: yes / no

If yes describe where and type: UNKNOWN

Engineered fill below foundation: (yes) / no

If no describe:

Basement in building: yes / (no)

If yes does it contain a sump?: yes / no

Framing: Cinder block walls: (yes) / no

If no describe:

Building Age: ≈ 50 YRS **Number of stories:** 1

Is building insulated? (yes) / no

Number of elevators in building: NONE

Condition of elevator pits (sealed, open, other):

Ceiling height: 9 FT EXCEPT BASKETBALL COURT ≈ 25 FT.

Building Survey Form

Date 2/1/16

C. Building Ventilation:

Describe type of heating system: HEAT PUMP IN LOCKER ROOM 2250 CFM AIR FLOW

Describe seasonal variation in HVAC operation: HIGH COOLING AND HEATING DURING SUMMER AND WINTER MONTHS, RESPECTIVELY.

Describe operation of HVAC (recycled air /fresh air/combination):

Describe type of air conditioning:

List manufacturer of heating /cooling unit: TRANE MODEL #SHP504C

HVAC unit size:

HVAC estimated maximum flow: 60 CY CONDENSER FAN

Normal hours of HVAC operation: INTERMITTENLY USED (CONTROLLED BY FACILITY MAINTENANCE).

Temperature settings:

a. Daytime: TYPICALLY 68°F - 72°F

b. Night:

c. Weekends:

Windows or doors frequently left open: NO

If yes describe why and location:

Describe other ventilation fans (bathroom, kitchen, open windows, mechanical fans) size, and frequently of use: CEILING-MOUNTED

~~BASIS~~ 2/1/16

D. Potential Indoor Sources

1. Does the building have a kitchen? Yes / No

If yes describe:

2. Are vehicles parked in the building? Yes / No

If yes describe:

3. Is there a workshop in the building? Yes / No

If yes describe:

4. Is there an inventory of products used in the building? Yes / No

MSDS available? SEE ATTACHED CHEMICAL LIST (IF OBTAINED) Yes / No

CHEMICALS ARE NOT STORED IN THIS BLDG. THEY ARE CHECKED OUT (WITH MAX PERIOD OF 48 HOURS) AS NEEDED FROM ANOTHER LOCATION (BLDG 4800, RM 1811). EXCEPTION IS THE USE OF IPA FOR SANITIZING TRAINING GEAR.

2/1/10

Building Survey Form

Which of these items are present in the building? (Check all that apply)

Potential VOC Source	✓	Location of Source	Removed at least 1 week prior to sampling (Yes/No/NA; indicate when removed if less than 1 week)
Paints	X		
Gas-powered equipment	X		
Gasoline storage cans			
Cleaning solvents (thinner)			
Air fresheners			
Oven cleaners	X	RESTROOM	NO
Carpet/upholstery cleaners			
Hairspray			
Nail polish/polish remover			
Bathroom cleaner			
Appliance cleaner			
Furniture/Floor polish			
Mothballs			
Fuel tank			
Woodstove			
Fireplace			
Perfume/Colognes			
Hobby supplies (e.g., solvents, paints, lacquers, glues, photographic darkroom chemicals)			
Scented trees, wreaths, potpourri, etc.			
Polish/Wax			
Insecticide/Pesticide			
Kerosene			
Other HYDRAULIC/MOTORIZED EQUIPMENT	X	4807 SAMPLING LOCATIONS 4807-IA3/SS3	NO

E. Building Inspection for VIP pathways:

1. Are there any existing piping or conduits entering building through foundation? (Yes) / No

If yes describe and locate on sketch (Section H). REFER TO PHOTOS TAKEN DURING BLDG SURVEY CONDUCTED ON 6/6/2012

2. Are there any holes drilled in the foundation? Yes / (No) (ASIDE FROM SUB-SLAB PROBES)

If yes describe and locate on sketch (Section H).

3. Any flow observed from identified pathways: Yes / (No)

If yes describe how it was evaluated (air flow tubes).

2/1/16

Building Survey Form

F. Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE FIELD LOGS

Window open during measurements? Yes / No

Instrument used to measure temperature: VELOCICALC

Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: _____ °F (avoid direct sunlight)

Outside pressure: _____ Pa (avoid windy location)

Prior to indoor air sampling

Time: _____

Room one

_____ Pa _____ °F

Room two

_____ Pa _____ °F

Room three

_____ Pa _____ °F

Room four

_____ Pa _____ °F

Room five

_____ Pa _____ °F

Room six

_____ Pa _____ °F

Sub-slab wells (if available):

Sub-slab well ID _____

_____ Pa

Sub-slab well ID _____

_____ Pa

At Conclusion of indoor air sampling

Time: _____

Room one

_____ Pa _____ °F

Room two

_____ Pa _____ °F

Room three

_____ Pa _____ °F

Room four

_____ Pa _____ °F

Room five

_____ Pa _____ °F

Room six

_____ Pa _____ °F

Sub-slab well ID _____

_____ Pa

Sub-slab well ID _____

_____ Pa

REFER TO FIELD LOGS/MEASUREMENTS COLLECTED ON 2/1/2016 2/3/2016 2/4/2016

G. Building Screening Results

Photo-ionization detector instrument used _____

Time measured: _____

Room one

_____ (ppm)

Room two

_____ (ppm)

Room three

_____ (ppm)

Room four

_____ (ppm)

Room five

_____ (ppm)

Room six

_____ (ppm)

Building Survey Form

2/1/16

H. Sketch of Building:
(Include rooms and dimensions, locations of doorways, where pressure measurements where collected, ventilation fans, windows, air ducts, and locations of any potential pathways for vapor intrusion into the building from the subsurface, i.e., piping, conduits, sumps, elevator shafts, etc.)

REFER TO ~~FIGURE~~ ATTACHED FIGURE
VT 2/1/16

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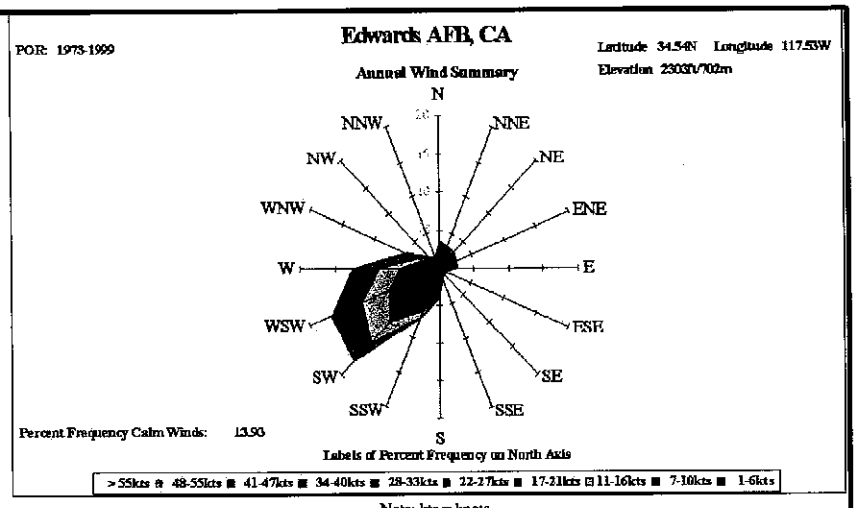

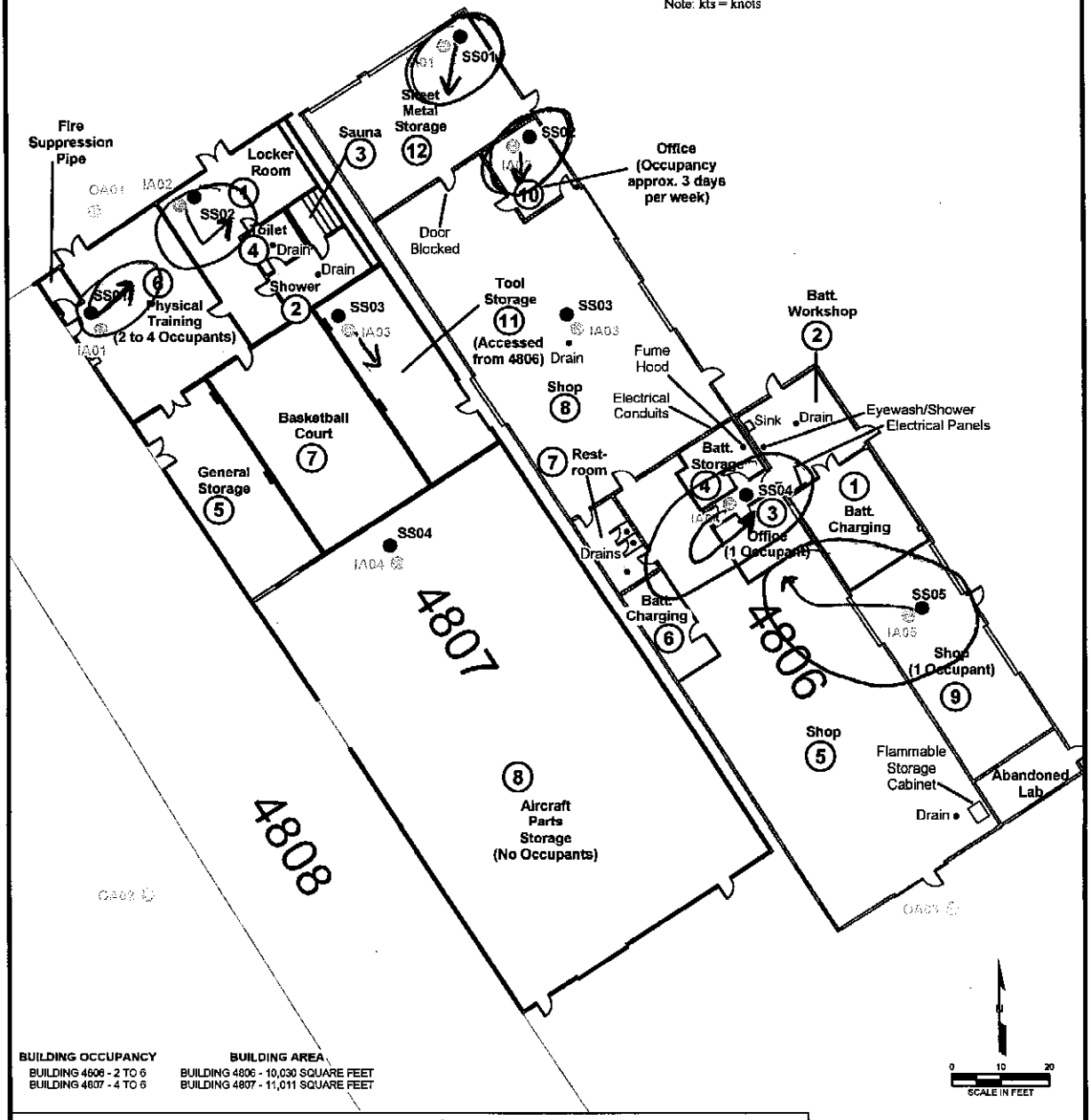

BUILDING OCCUPANCY

BUILDING 4806 - 2 TO 6
BUILDING 4807 - 4 TO 6

BUILDING AREA

BUILDING 4806 - 10,030 SQUARE FEET
BUILDING 4807 - 11,011 SQUARE FEET

EXPLANATION

NOTES:
1. SINGLE-STORY BUILDINGS ON CONCRETE SLAB.
2. PROPOSED SAMPLING LOCATIONS ARE BASED ON INITIAL BUILDING SURVEYS.
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4. SUB-SLAB VAPOR POINT SAMPLING LOCATIONS WILL BE PLACED 8 TO 10 FEET FROM WALLS (IF POSSIBLE)
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ROOM NUMBER
SS01 PROPOSED SUB-SLAB VAPOR POINT SAMPLING LOCATION
IA01 PROPOSED INDOOR AIR SAMPLING LOCATION
OA01 PROPOSED OUTDOOR AIR SAMPLING LOCATION

DRAFT FINAL

Buildings 4806 and 4807 Proposed Sampling Locations

Date 12-2012	Operable Unit 6 Vapor Intrusion Sampling Plan & Risk Assessment Work Plan Edwards AFB	Figure 12
Project No 60265922		

APPENDIX B

FIELD FORMS (INCLUDING SAMPLING EVENT BUILDING SURVEYS) (COMBINED ON CD WITH APPENDICES A AND E FOR RESOURCE CONSERVATION - SEE VIIR ADDENDUM APPENDIX A)

Sub Slab Vapor Well Field Data Sheet

PID Used: PPb RAE
He Detector: RAGD-2002
PA Meter: OMNIGUARD 4

Building: 4806

Page 1 of 2

Location	Sample ID	Cannister	Controller	Date	Shut In H_2O Test (Hg/min)	Differential Pressure (Pa)	Purge Vol ~~Time~~	PID Measurement (ppb)	Sample Time	Shroud Leak Test (Helium) (%)	Well Leak Test (Helium) (%)	Temp (°F)
EDWRD.N3.4806	SS03-VS3	35643	FC00231	2/4/16	100"	Initial: —	300 cc	Initial: —	Start: 0840	52%	Ø %	Initial: 76
Notes:					Initial Vacuum: -28				Mid: —	—	—	
					Final Vacuum: -5	Post: 0.0		Post: 130	Stop: 0843	53.8%	<1%	Post: 76
Location	Sample ID	Cannister	Controller	Date	Shut In H_2O Test (Hg/min)	Differential Pressure (Pa)	Purge Vol ~~Time~~	PID Measurement (ppb)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
EDWRD.N3.4806	SS02-VS3	1028	6743	2/4/16	100"	Initial: —	300 cc	Initial: —	Start: 0941	59.8%	<1%	Initial: 69.7
Notes:					Initial Vacuum: -28				Mid: —	—	—	
					Final Vacuum: -5	Post: +0.5		Post: 310	Stop: 0947	69.1%	<1%	Post: VB 2/4/16 ~~73.5~~ 69.7
Location	Sample ID	Cannister	Controller	Date	Shut In H_2O Test (Hg/min)	Differential Pressure (Pa)	Purge Vol ~~Time~~	PID Measurement (ppb)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
EDWRD.N3.4806	SS05-VS3	3825	FC00877	2/4/16	100"	Initial: —	300 cc	Initial: —	Start: 1233	58.8%	0	Initial: 63.5
Notes:					Initial Vacuum: -28.5				Mid: —	—	—	
					Final Vacuum: -5	Post: -1.5		Post: 128	Stop: 1238	78.1%	<1%	Post: 63.5
Location	Sample ID	Cannister	Controller	Date	Shut In H_2O Test (Hg/min)	Differential Pressure (Pa)	Purge Vol ~~Time~~	PID Measurement (ppb)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
EDWRD.N3.4806	SS04-VS3	33409	FC00742	2/4/16	100"	Initial: —	300cc	Initial: —	Start: 1454	51.9%	Ø	Initial: 73.7
Notes:					Initial Vacuum: -27				Mid: —	—	—	
					Final Vacuum: -5	Post: +0.5		Post: 0	Stop: 1458	88.9%	Ø	Post: 73.7

Sampler Name(s): MIKE SHORER (H&P)
Date: 2/4/16
Project Number: 60444679
Project Name: NASA VIP SAMPLING
Analytical Methods: TO-15

Comments:

Sub Slab Vapor Well Field Data Sheet

PID Used: PPb RAE
He Detector: MGD-2002
PA Meter: ONMI quard 4

Building: A806

Page 2 of 2

Location	Sample ID	Cannister	Controller	Date	Shut In Test (~~Hg~~ H_2O/min)	Differential Pressure (Pa)	Purge ~~Time~~ vol	PID Measurement (pp b)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
EDWARD N3-4806	SS01-VS3	37298	FC00801	2/4/16	100"	Initial: –	300cc	Initial: –	Start: 1340	58.8%	Ø	Initial: 48.1
Notes:					Initial Vacuum: 28				Mid: –	–	–	
					Final Vacuum: 5	Post: 0.0		Post: 70	Stop: 1345	84.7%	Ø	Post: 48.1

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Sampler Name(s): MIKE SCHORER (H&P)
Date: 2/4/16
Project Number: 60444679
Project Name: NASA VIP SAMPLING
Analytical Methods: TO-15

Comments:

2/4/16

Building: 4806
Date: 2/1/16
Project No.: 60444679
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CENTECH
Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings
(Note location where measurements were taken on sketch)

Outside temperature: 50 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 12:30 PM

Room 12 PID 5 PPB Purpose STORAGE ROOM Occupants _____ HVAC NO
+10.5 Pa 46.0 °F Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA01/SS01

Room 10 PID 0 PPB Purpose DISCRETE ROOM - OFFICE Occupants _____ HVAC WALL HEATER YES
+1.0 Pa 64.0 °F Piping/Conduit: Yes / No Comments:
ELECTRICAL HEATER ON WALL.
SAMPLE LOCATIONS: IA02/SS02

TIME: 2:15 PM

Room 8 PID 0 PPB Purpose WORK SHOP/STORAGE Occupants _____ HVAC ~~NO~~ YES JP 2/1/16
+1.0 Pa 59.3 °F Piping/Conduit: Yes / No Comments:
STREET SWEEPER PARKED IN BLDG. PID SCANNED OVER SWEEPER AND PID=0 PPB. SAMPLE LOCATIONS: IA03/SS03

~~ROOM (SWEEPER TRUCK)~~ (BLDG 4807) 2/1/16

Room 11 PID 60 PPB Purpose HYDRAULIC TOOL/MOTOR STORAGE (BLDG 4806) Occupants _____ HVAC NO
+1.0 Pa 60.0 °F Piping/Conduit: Yes / No Comments:
BLDG 4807 SAMPLE LOCATIONS: IA03/SS03. BLDG 4806 IS ACCESSED FOR THIS LOCATION.

Room PID _____ Purpose _____ Occupants _____ HVAC _____
_____ Pa _____ °F Piping/Conduit: Yes / No Comments:

Additional Comments:
ROOM 11 (BLDG 4807): SAMPLE LOCATION AREA WAS WALKED THROUGH WITH PID. PID CONCENTRATIONS WERE CONSISTENT IN AREA.
ROOM 11: IA03/SS03 SAMPLE LOCATIONS (BLDG 4807)

Building: 4806
Date: 2/1/16
Project No.: 60444679
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CENTECH
Instrument used to measure pressure: OMNIGUARD

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: 39.6 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 3:20 PM

Room 7
-10.0 Pa 62.0 °F
PID 65 PPB Purpose RESTROOM (MENS) Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:
EXHAUST FAN

Room 3
-17.0 Pa 74.0 °F
PID 46 PPB Purpose OFFICE Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA04 | SS04

Room 4
-8.5 Pa 70.8 °F
PID 22 PPB Purpose ROOM-BATTERY STORAGE Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

Room 2
-10.5 Pa 71.3 °F
PID 7 PPB Purpose ROOM-BATTERY WORKSHOP Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

Room 1
-10.0 Pa 71.8 °F
PID 4 PPB Purpose ROOM-BATTERY CHARGING Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

Additional Comments: WINDY CONDITIONS.

Building: 4806
Date: 2/1/16
Project No.: 60444679
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / (No)
Instrument used to measurement temperature: CEN TECH
Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings
(Note location where measurements were taken on sketch)

Outside temperature: 39.6 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 3:45 PM

Room (6) -1.5 Pa 63.5 °F PID 48 PPB Purpose ROOM-BATTERY CHARGING Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

Room (5) -1.5 Pa 64.9 °F PID 167 PPB Purpose SHOP Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:
CHEMICALS STORED IN THIS AREA OF SHOP
SAMPLE LOCATIONS: IA05/SS05

Room (9) -2.0 Pa 65.1 °F PID 82 PPB Purpose SHOP Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

~~Room ____ Pa ____ °F PID ____ Purpose ____ Occupants ____ HVAC ____ (UP) 2/1/16~~
~~Piping/Conduit: Yes / No Comments:~~

~~Room ____ Pa ____ °F PID ____ Purpose ____ Occupants ____ HVAC ____~~
~~Piping/Conduit: Yes / No Comments:~~

Additional Comments: WINDY CONDITIONS

ROOM (5): SAMPLE LOCATION AREA WAS WALKED THROUGH WITH PID. PID CONCENTRATIONS WERE CONSISTENT IN AREA.

Building: 4806 (IA/OA SAMPLING)
Date: 2/3/16
Project No.: 60444679
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CENTECH
Instrument used to measure pressure: OMNIGUARD

Pressure and Temperature Readings
(Note location where measurements were taken on sketch)

Outside temperature: 51.6 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 10:55

Room 12
+3.0 Pa 58.0 °F PID 0 PPB Purpose STORAG Occupants ____ HVAC NO
Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA01/SS01

Room 8
-1.0 Pa 62.9 °F PID 0 PPB Purpose ~~PARTS~~ STORAGE ROOM 2/3/16 Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:
STREET SWEEPER: PID=0
SAMPLE LOCATIONS: IA03/SS03

Room 10
-1.0 Pa 70.8 °F PID 0 PPB Purpose OFFICE Occupants ____ ~~HVAC~~ HEATER YES
Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA02/SS02

Room 11
-1.5 Pa 58.9 °F PID 0 PPB Purpose PARTS STORAGE ROOM Occupants ____ HVAC NO
Piping/Conduit: Yes / No Comments:
BLDG 4807 SAMPLING LOCATIONS: IA03/SS03

Room 7
-1.5 Pa 61.4 °F PID 0 PPB Purpose RESTROOM Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

Additional Comments:

Building: 4806 (IA/OA
Date: 2/3/16
Project No.: 60444679
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CENTECH
Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: 51.6 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 11:15

Room 6
-0.5 Pa 62.8 °F PID 0 PPB Purpose BATTERY CHARCHING Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

Room 5
-0.5 Pa 61.8 °F PID 0 PBB Purpose SHOP Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA05/SS05

Room 9
-1.0 Pa 64.1 °F PID DPPB Purpose SHOP Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:
SMALL (ROLL UP) BAY DOOR OPEN

Room 3
-0.5 Pa 70.8 °F PID 0 PPB Purpose OFFICE Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA04/SS04

Room 4
-1.0 Pa 68.6 °F PID 0 PPB Purpose BATTERY STORAGE Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

Additional Comments:

Building: 4806
Date: 2/3/16
Project No.: 60444679
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CENTECH
Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: 51.6 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 11:45

Room 2
-1.0 Pa 69.9 °F PID 0 PPB Purpose BATTERY WORKSHOP Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

Room 1
-0.5 Pa 73.1 °F PID 0 PPB Purpose BATTERY HARCHING Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

Room
____ Pa ____ °F PID ____ Purpose ____ Occupants ____ HVAC ____
Piping/Conduit: Yes / No Comments:

Room
____ Pa ____ °F PID ____ Purpose ____ Occupants ____ HVAC ____
Piping/Conduit: Yes / No Comments:

Room
____ Pa ____ °F PID ____ Purpose ____ Occupants ____ HVAC ____
Piping/Conduit: Yes / No Comments:

2/3/16

Additional Comments:

Building: 4806 (IA/OA SAMPLING EVENT)
Date: 2/3/16
Project No.: 60444476
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CENTECH
Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: 45.0 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 3:35

Room 12 PID 0 PPB Purpose STORAGE Occupants ____ HVAC NO
-0.5 Pa 49.5 °F Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA01/SS01

Room 10 PID 0 PPB Purpose OFFICE Occupants ____ HVAC WALL HEATER YES
-1.0 Pa 69.0 °F Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA02/SS02

Room 8 PID 0 PPB Purpose SHOP/STORAGE Occupants ____ HVAC YES
-1.0 Pa 62.0 °F Piping/Conduit: Yes / No Comments:
STREET SWEEPER: PID = 0 PPB
↳ PARKED IN BLDG ENTIRE DAY SAMPLE LOCATIONS: IA03/SS03

Room 11 PID 0 PPB Purpose PARTS ROOM Occupants ____ HVAC NO
-2.0 Pa 57.3 °F Piping/Conduit: Yes / No Comments:
BLDG 4807 SAMPLE LOCATIONS: IA03/SS03

Room 7 PID 0 PPB Purpose RESTROOM Occupants ____ HVAC YES
-1.5 Pa 52.9 °F Piping/Conduit: Yes / No Comments:

Additional Comments:

Building: 480B
Date: 2/3/16
Project No.: 60444679
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CENTECH
Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: 45.0 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 3:50

Room 5 PID 0 PPB Purpose SHOP Occupants ____ HVAC YES
-1.0 Pa 63.5 °F Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA05/SS05

Room 9 PID 0 PPB Purpose SHOP Occupants ____ HVAC YES
-1.0 Pa 63.4 °F Piping/Conduit: Yes / No Comments:
SMALL (ROLLUP) BAY DOOR OPEN

Room 1 PID 0 PPB Purpose BATTERY CHARGING Occupants ____ HVAC YES
-1.5 Pa 73.5 °F Piping/Conduit: Yes / No Comments:

Room 2 PID 0 PPB Purpose BATTERY WORKSHOP Occupants ____ HVAC YES
-1.5 Pa 71.6 °F Piping/Conduit: Yes / No Comments:

Room 3 PID 0 PPB Purpose OFFICE Occupants ____ HVAC YES
-1.5 Pa 70.4 °F Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA04/SS04

Additional Comments:

Building: 4806
Date: 2/3/16
Project No.: 60444679
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CENTECH
Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: 45.0 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 4:10

Room 4 PID 0 PPB Purpose BATTERY STORAGE Occupants _____ HVAC YES
-1.5 Pa 74.9 °F Piping/Conduit: Yes / No Comments:

Room 6 PID 0 PPB Purpose BATTERY CHARGING Occupants _____ HVAC YES
-1.0 Pa 63.9 °F Piping/Conduit: Yes / No Comments:

Room PID _____ Purpose _____ Occupants _____ HVAC _____
_____ Pa _____ °F Piping/Conduit: Yes / No Comments:

Room PID _____ Purpose _____ Occupants _____ HVAC _____
_____ Pa _____ °F Piping/Conduit: Yes / No Comments:

Room PID _____ Purpose _____ Occupants _____ HVAC _____
_____ Pa _____ °F Piping/Conduit: Yes / No Comments:

JD 2/3/16

Additional Comments:

Building: 4806 (SUB-SLAB SAMPLING EVENT)
Date: 2/4/16
Project No.: 60444579
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CENTECH
Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: 38.9 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 8:45

Room 8
-2.5 Pa 76.0 °F PID 0 PPB Purpose SHOP Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:
STREET SWEEPER PARKED IN BLDG.
STREET SWEEPER PID = 0 PPB SAMPLE LOCATIONS: IA03/SS03

Room 10
-2.0 Pa 65.9 °F PID 0 PPB Purpose OFFICE Occupants ____ HVAC WALL HEATER YES
Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA02/SS02

TIME: 12:35 TEMP:

Room 5
-1.0 Pa 67.3 °F PID 0 PPB Purpose SHOP Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA05/SS05

Room 9
-1.0 Pa 63.5 °F PID 455 PPB Purpose SHOP Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

Room 6
-1.0 Pa 64.8 °F PID 14 PPB Purpose BATTERY CHARGING Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

Additional Comments:

Building: 4806
Date: 2/4/16
Project No.: 60444679
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CENTECH
Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: 46.9 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 12:50

Room 7
-2.5 Pa 63.8 °F PID 0 PPB Purpose RESTROOM Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

TIME: 2:55 TEMP: 54.0 BATTERY CHARGING 2/4/16

Room 1
-1.5 Pa 75.2 °F PID 0 PPB Purpose ~~OFFICE~~ Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

Room 2
-1.5 Pa 73.5 °F PID 0 PPB Purpose BATTERY SHOP Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

Room 3
-1.5 Pa 73.4 °F PID 0 PPB Purpose OFFICE Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: TA04/SS04

Room 4
-1.0 Pa 72.1 °F PID 0 PP Purpose BATTERY STORAGE Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

Additional Comments:

Building: 4806 | 4807
Date: 2/4/16
Project No.: 60444679
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CENTECH
Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: 51.0 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 3:20

Room 11 / BLDG 4806 PID 0 PPB Purpose _____ Occupants _____ HVAC NO
0.0 Pa 53.2 °F Piping/Conduit: Yes / No Comments:
BLDG 4807 SAMPLE LOCATIONS: IA03 | SS03

Room 12 / BLDG 4806 PID 36 PPB Purpose _____ Occupants _____ HVAC NO
0.0 Pa 57.4 °F Piping/Conduit: Yes / No Comments:
BLDG 4806 SAMPLE LOCATIONS: IA01 | SS01

Room PID _____ Purpose _____ Occupants _____ HVAC NO 2/4/16
_____ Pa _____ °F Piping/Conduit: Yes / No Comments:

Room PID _____ Purpose _____ Occupants _____ HVAC _____
_____ Pa _____ °F Piping/Conduit: Yes / No Comments:

Room PID _____ Purpose _____ Occupants _____ HVAC _____
_____ Pa _____ °F Piping/Conduit: Yes / No Comments:

Additional Comments:

Indoor ~~and Outdoor Ambient~~ Air Field Data Sheet

Building: 4806

Page 1 of 1

Location	Sample ID	Cannister	Controller ID	Sample Date	Sample Start Time	Sample End Time	PID Measurement (pp___)	Initial Vacuum	Initial Temp	Final Vacuum	Final Temp	Comments
EDWRD-N3-4806-	IA01-VS3	34352	FC 00767	2/3/16	0930	1525	*	28.5	*	6	*	
EDWRD-N3-4806-	IA02-VS3	6L1224	FC 00406	2/3/16	0905	1723	*	27.5	*	6	*	
EDWRD-N3-4806-	IA03-VS3	1594	FC 00527	2/3/16	0915	1720	*	28.5	*	5.5	*	VIP 2/3/16 ~~SWEP~~ STREET SWEEPER PARKED
EDWRD-N3-4806-	IA04-VS3	N0416	FC 00774	2/3/16	0940	1730	*	28	*	6.5	*	
EDWRD-N3-4806-	IA05-VS3	9553	FC 00983	2/3/16	0945	1635	*	27	*	7	*	

Sampler Name(s): V. RODARTE | M MILES

Date: 2/3/16

Project Number: 60444679

Project Name: NASA VIP SAMPLING

Analytical Methods: TO-15 LOW LEVEL

Comments: * SEE FIELD LOGS FOR DATA

~~Indoor and~~ Outdoor Ambient Air Field Data Sheet

Building:s: 4806 | 4807

Page 1 of 1

Location	Sample ID	Cannister	Controller ID	Sample Date	Sample Start Time	Sample End Time	PID Measurement (pp___)	" Hg Initial Vacuum	°F Initial Temp	" Hg Final Vacuum	°F Final Temp	Comments
EDWRD-N3-4806-	OAØ1-VS3	33777	FC 00065	2/3/16	0715	1545	NA	28	29.8	5	46.5	
EDWRD-N3-4806-	OAØ2-VS3	34751	FC 00341	2/3/16	0735	1555	NA	28	29.8	6	46.5	
EDWRD-N3-4806-	OAØ3-VS3	N0415	FC 00813	2/3/16	0745	1557	NA	28	29.8	5.5	46.5	
	OA03-VS203		FC 00511	2/3/16	0745	1557	NA	26	29.8	6.5	46.5	
												UA 2/3/16

Sampler Name(s): M. MILE / V. RODARTE

Date: 2/3/16

Project Number: 60444679

Project Name: NASA VIP SAMPLING

Analytical Methods: TO-15 LOW LEVEL ~~[illegible]~~ UA 2/3/16

Comments: OAØ3: @ START UP JP-8 VEHICE PARKED IN AREA AND VEHICLE WAS RUNNING. END TIME OF RUNNING VEHICLE / DROVE OFF UNKNOWN @ 3:15 PM, MOBILE COMMUNICATION SYSTEM WAS OBSERVED TO BE RUNNING WHEN VISUAL CHECK OF SUMMA WAS PERFORMED. END TIME OF RUNNING VEHICLE / UNKNOWN

Sub Slab Vapor Well Field Data Sheet

PID Used: PPb RAE
He Detector: MGD-2002
PA Meter: OMNIQUAD 4

Building: 4807

2/4/16 Page 1 of 2

Location	Sample ID	Cannister	Controller	Date	Shut In H_2O Test (Hg/min)	Differential Pressure (Pa)	Purge Vol. Time	PID Measurement (ppb)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
EDWRD-N3-4807	SSØ1-VS3	37434	FC00564	2/4/16	100"	Initial: —	300 cc	Initial: —	Start: 1022	50.1 %	< 1%	Initial: 54.1
Notes:					Initial Vacuum: -27				Mid: —	—	—	
					Final Vacuum: -5	Post: -1.0		Post: 134	Stop: 1026	52.3%	8475 ppm	Post: 54.3

Location	Sample ID	Cannister	Controller	Date	Shut In H_2O Test (Hg/min)	Differential Pressure (Pa)	Purge Vol. Time	PID Measurement (ppb)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
EDWRD-N3-4807	SSØ2-VS3	14521	FC00340	2/4/16	100"	Initial: —	300 cc	Initial: —	Start: 1050	62.3%	< 1%	Initial: 48.7
Notes:					Initial Vacuum: -28				Mid: —	—	—	
					Final Vacuum: -5	Post: -1.0		Post: 91	Stop: 1054	54.7%	< 1%	Post: 49.1

Location	Sample ID	Cannister	Controller	Date	Shut In H_2O Test (Hg/min)	Differential Pressure (Pa)	Purge Vol. Time	PID Measurement (ppb)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
EDWRD-N3-4807	SSØ3-VS3	35604	FC00256	2/4/16	100"	Initial: —	300 cc	Initial: —	Start: 1255	64.4%	Ø	Initial: 56.6
Notes:					Initial Vacuum: -30				Mid: —	—	—	
					Final Vacuum: -5	Post: -0.5		Post: 123	Stop: 1259	71.7%	Ø	Post: 56.6

Location	Sample ID	Cannister	Controller	Date	Shut In H_2O Test (Hg/min)	Differential Pressure (Pa)	Purge Vol. Time	PID Measurement (ppb)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
EDWRD-N3-4807	SSØ3-VS203	35533	FC00785	2/4/16	100"	Initial: —	300 cc	Initial: —	Start: 1255	64.4%	Ø	Initial: 56.6
Notes:					Initial Vacuum: -28				Mid: —	—	—	
					Final Vacuum: -5	Post: -0.5		Post: 123	Stop: 1259	71.7%	Ø	Post: 56.6

Sampler Name(s): MIKE SCHORER (HGP)
Date: 2/4/16
Project Number: 60444674
Project Name: NASA VIP SAMPLING
Analytical Methods: TO-15

Comments:

Sub Slab Vapor Well Field Data Sheet

PID Used: PPb RAE
He Detector: MGD. 2002
PA Meter: OMNIGUARD 4

Building: 4807

Page 2 of 2

Location	Sample ID	Cannister	Controller	Date	Shut In Test (H_2O ~~Vol (ml~~ g/min)	Differential Pressure (Pa)	Purge Vol ~~Time~~	PID Measurement (pp b)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
EDWRD.N3 4807	5504.VS3	33727	FC00815	2/4/16	100 ml 300 cc	Initial: —	300 cc	Initial: —	Start: 1423	68.4%	Ø	Initial: 58.8
Notes:					Initial Vacuum: 28			50	Mid: —	—	—	
					Final Vacuum: 5	Post: -0.5	3/14/16	Post: ~~50%~~	Stop: 1429	54.4%	Ø	Post: 58.8

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Location	Sample ID	Cannister	Controller	Date	Shut In Test (Hg/min)	Differential Pressure (Pa)	Purge Time	PID Measurement (pp____)	Sample Time	Shroud Leak Test (Helium)	Well Leak Test (Helium)	Temp (°F)
						Initial:		Initial:	Start:			Initial:
Notes:					Initial Vacuum:				Mid:			
					Final Vacuum:	Post:		Post:	Stop:			Post:

Sampler Name(s): MIKE SCHORER (H2P)
Date: 2/4/16
Project Number: 60444679
Project Name: NASA VIP SAMPLING
Analytical Methods: TO-15

Comments:

Building: 4807
Date: 2/1/16
Project No.: 60444679
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CENTECH
Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: 52 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 1:30

Room 6 (IA01/SS01) PID 93 PPB Purpose TRAINING ROOM Occupants ____ HVAC YES
-22.5 Pa 60.0 °F Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA01/SS01

Room 7 PID 100 PB Purpose BASKETBALL COURT Occupants ____ HVAC YES
-30.0 Pa 59.0 °F Piping/Conduit: Yes / No Comments:

Room 1 PID 95 PPB Purpose LOCKER ROOM Occupants ____ HVAC YES
-50.5 Pa 51.0 °F Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA02/SS02

Room 2 PID 109 PPB Purpose SHOWER ROOM Occupants ____ HVAC YES
-24.0 Pa 51.0 °F Piping/Conduit: Yes / No Comments:
CLEANING PRODUCTS STORED IN ROOM

Room 4 PID 125 PPB Purpose RESTROOM Occupants ____ HVAC YES
-52.0 Pa 52.3 °F Piping/Conduit: Yes / No Comments:

Additional Comments: WINDY CONDITIONS

ROOM 5 NOT ACCESSIBLE FOR COLLECTION ~~FOR~~ FIELD DATA
REFER TO BLDG 4806 LOGS FOR BLDG 4807 ROOM 11 FIELD DATA.

Building: 4807
Date: 2/1/16
Project No.: 60441679
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / (No)
Instrument used to measurement temperature: CENTECH
Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: 52 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 1:55 PM

Room (3) PID 122 PPB Purpose SAUNA Occupants _____ HVAC NO
-24.0 Pa 50.1 °F Piping/Conduit: Yes / No Comments:

TIME: 4:05 PM

Room (8) PID 15 PPB Purpose STORAGE ROOM Occupants _____ HVAC NO
+2.5 Pa 54.7 °F Piping/Conduit: Yes / No Comments:

Room PID _____ Purpose _____ Occupants _____ HVAC _____
_____ Pa _____ °F Piping/Conduit: Yes / No Comments:

Room PID _____ Purpose _____ Occupants _____ HVAC _____
_____ Pa _____ °F Piping/Conduit: Yes / No Comments:

Room PID _____ Purpose _____ Occupants _____ HVAC _____
_____ Pa _____ °F Piping/Conduit: Yes / No Comments:

Additional Comments: WINDY CONDITIONS

Building: 4807
Date: 2/3/16
Project No.: 60444679
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / (No)
Instrument used to measurement temperature: CENTECH
Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: 43.3 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 12:00

Room (6) PID 0 PPB Purpose TRAINING ROOM Occupants ____ HVAC YES
-1.5 Pa 52.3 °F Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA01/SS01

Room (7) PID 0 PPB Purpose BASKETBALL COURT Occupants ____ HVAC YES
-1.5 Pa 48.8 °F Piping/Conduit: Yes / No Comments:

Room (1) PID 0 PPB Purpose LOCKER ROOM Occupants ____ HVAC YES
0.0 Pa 48.6 °F Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA02/SS02

Room (2) PID 0 PPB Purpose SHOWER ROOM Occupants ____ HVAC YES
-1.0 Pa 47.1 °F Piping/Conduit: Yes / No Comments:

Room (3) PID 0 PPB Purpose SAUNA Occupants ____ HVAC NO
0.0 Pa 40.6 °F Piping/Conduit: Yes / No Comments:

Additional Comments:

REFER TO BLDG 4806 FOR BLDG 4807/ROOM (11) FIELD DATA. (SAMPLE LOCATIONS: IA03/SS03).

Building: 4807 (IA/OA SAMPLING EVENT)
Date: 2/3/16
Project No.: 60444679
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CENTECH
Instrument used to measure pressure:

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: 43.3 ~~48.3~~ °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 12:10

Room 4 PID 0 PPB Purpose _____ Occupants _____ HVAC _____
-1.0 Pa 43.4 °F Piping/Conduit: Yes / No Comments:

~~[illegible]~~ 2/3/16

Room 5 PID 0 PPB Purpose GENERAL STORAGE Occupants _____ HVAC _____
-1.5 Pa 58.3 °F Piping/Conduit: Yes / No Comments:
ROOM AVAILABLE FOR COLLECTION OF FIELD DATA.

Room PID _____ Purpose _____ Occupants _____ HVAC _____ 2/3/16
_____ Pa _____ °F Piping/Conduit: Yes / No Comments:

Room PID _____ Purpose _____ Occupants _____ HVAC _____
_____ Pa _____ °F Piping/Conduit: Yes / No Comments:

Room PID _____ Purpose _____ Occupants _____ HVAC _____
_____ Pa _____ °F Piping/Conduit: Yes / No Comments:

Additional Comments: ROOM 8: -1.0 PA 47.3°F 0 PPB HVAC: NO
AIRCRAFT PARTS STORAGE | SAMPLE LOCATIONS: IA04 | SS04

Building: 4807
Date: 2/3/16
Project No.: 60444674
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CENTECH
Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: 48.6 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 2:50 PM

Room 6
-0.5 Pa 58.6 °F PID 0 PPB Purpose TRAINING ROOM Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

Room 7
-1.5 Pa 52.4 °F PID 0 PPB Purpose BASKETBALL COURT Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

Room 1
-0.5 Pa 48.8 °F PID 0 PPB Purpose LOCKER ROOM Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

Room 2
-1.0 Pa 48.7 °F PID 0 PPB Purpose SHOWER ROOM Occupants ____ HVAC YES
Piping/Conduit: Yes / No Comments:

Room 3
-1.0 Pa 44.0 °F PID 0 PPB Purpose SAUNA Occupants ____ HVAC ~~YES~~ NO VM 2/3/16
Piping/Conduit: Yes / No Comments:

Additional Comments:

REFER TO BLDG 4806 FOR ROOM 11 FIELD DATA
↳ SAMPLE LOCATIONS: IA03/SS03

Building: 4807
Date: 2/3/16
Project No.: 60444679
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / (No)
Instrument used to measurement temperature: CENTECH
Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: 48.6 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 3:00

Room (4) PID 0 PPB Purpose RESTROOM Occupants ____ HVAC YES
-1.0 Pa 47.2 °F Piping/Conduit: Yes / No Comments:

Room (5) PID 0 PPB Purpose STORAGE Occupants ____ HVAC ____
-1.0 Pa 53.2 °F Piping/Conduit: Yes / No Comments:

TIME: 4:25
Room (8) PID 0 PPB Purpose PARTS STORAGE ROOM Occupants ____ HVAC NO
-1.0 Pa 59.6 °F Piping/Conduit: Yes / No Comments:

~~Room PID Purpose Occupants HVAC (ON)~~
~~Pa °F Piping/Conduit: Yes / No Comments:~~ 2/3/16

~~Room PID Purpose Occupants HVAC~~
~~Pa °F Piping/Conduit: Yes / No Comments:~~

Additional Comments:

Building: 4807
Date: 2/4/16
Project No.: 60444679
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / (No)
Instrument used to measurement temperature: CENTEC
Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: 38.5 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 10:35

Room (6) PID 0 PPB Purpose TRAINING Occupants ____ HVAC YES
-1.5 Pa 54.3 °F Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA01/SS01

Room (7) PID 0 PPB Purpose BASKETBALL COURT Occupants ____ HVAC YES
-1.0 Pa 49.3 °F Piping/Conduit: Yes / No Comments:

Room (1) PID 0 PPB Purpose LOCKER ROOM Occupants ____ HVAC YES
-1.0 Pa 49.2 °F Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA02/SS02

Room (2) PID 0 PPB Purpose SHOWER Occupants ____ HVAC YES
-0.5 Pa 49.8 °F Piping/Conduit: Yes / No Comments:

Room (3) PID 0 PPB Purpose SAUNA Occupants ____ HVAC NO
-1.0 Pa 47.3 °F Piping/Conduit: Yes / No Comments:

Additional Comments:

Building: 4807
Date: 2/4/16
Project No.: 60444679
Project Name: NASA VIP SAMPLING

Building Temperature and Pressure Measurements

Building HVAC system ON or OFF during measurements: SEE BELOW
Windows open during measurements? Yes / No
Instrument used to measurement temperature: CENTECH
Instrument used to measure pressure: OMNIGUARD IV

Pressure and Temperature Readings

(Note location where measurements were taken on sketch)

Outside temperature: 38.5 °F (avoid direct sunlight)
Outside pressure: _____ Pa (avoid windy location)

Time: 10:45

Room 4
-0.5 Pa 44.3 °F PID 0 PPB Purpose RESTROOM Occupants _____ HVAC YES
Piping/Conduit: Yes / No Comments:

Room 5
-1.0 Pa 57.9 °F PID 0 PPB Purpose STORAGE Occupants _____ HVAC _____
Piping/Conduit: Yes / No Comments:

OUTSIDE
TIME: 3:20 PM TEMP: 59.2 °F

Room 8
-1.0 Pa 60.1 °F PID 70 PPB Purpose STORAGE Occupants _____ HVAC NO
Piping/Conduit: Yes / No Comments:
SAMPLE LOCATIONS: IA04/SS04

Room
_____ Pa _____ °F PID _____ Purpose _____ Occupants _____ HVAC 2/4/16
Piping/Conduit: Yes / No Comments:

Room
_____ Pa _____ °F PID _____ Purpose _____ Occupants _____ HVAC _____
Piping/Conduit: Yes / No Comments:

Additional Comments:

Indoor ~~and Outdoor Ambient~~ Air Field Data Sheet

Building: 4807

Page 1 of 1

Location	Sample ID	Cannister	Controller ID	Sample Date	Sample Start Time	Sample End Time	PID Measurement (pp___)	Initial Vacuum	Initial Temp	Final Vacuum	Final Temp	Comments
EDWRD-N3-4807-	IAΦ1-VS3	5787	FC00655	2/3/16	0840	1550	*	27	*	6.5	*	
EDWRD-N3-4807	IAΦ2-VS3	122004	FC00191	2/3/16	0840	1550	*	28	*	0	*	
EDWRD-N3-4807-	IAΦ3-VS3	6L1252	FC00196	2/3/16	0835	1605	(*)	28.5	(*)	1.5	(*)	
	IA03-VS2	03 12947	FC00300	2/3/16	0835	1605	(*)	28	(*)	4.5	(*)	
EDWRD-N3-4807-	IAΦ4-VS3	6L1328	FC40855	2/3/16	0905	1740	*	28.5	*	7.5	*	
												VN 2/3/16

Sampler Name(s): V. RODARTE / M. MILES

Date: 2/3/16

Project Number: 60444679

Project Name: NASA VIP SAMPLING

Analytical Methods: TO-15 LOW LEVEL / HELIUM

Comments: * SEE FIELD LOGS FOR DATA

(*) SEE BLDG 4806 FIELD LOGS FOR DATA

Ambient weather readings during VIP sample collection

Project Name: NASA VIP **Project Number:** 60444679-8

Morning Readings		Afternoon Readings	
Date: 2/1/16	Time: 1100	Time: 1600	
Temperature: 40	Humidity: 48	Temperature: 46	Humidity: 34 %
Wind speed & direction: 16 KNOTS OUT OF 290°		Wind speed & direction: 19 AT 270°	
Barometric pressure: 29.98		Barometric pressure: 30.03	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by: M. Miles		Recorded by: M. MILES	

VP 2/4/16

Date:	Time:	Time:	
Temperature:	Humidity:	Temperature:	Humidity:
Wind speed & direction:		Wind speed & direction:	
Barometric pressure:		Barometric pressure:	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by:		Recorded by:	

Date:	Time:	Time:	
Temperature:	Humidity:	Temperature:	Humidity:
Wind speed & direction:		Wind speed & direction:	
Barometric pressure:		Barometric pressure:	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by:		Recorded by:	

Date:	Time:	Time:	
Temperature:	Humidity:	Temperature:	Humidity:
Wind speed & direction:		Wind speed & direction:	
Barometric pressure:		Barometric pressure:	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by:		Recorded by:	

Date:	Time:	Time:	
Temperature:	Humidity:	Temperature:	Humidity:
Wind speed & direction:		Wind speed & direction:	
Barometric pressure:		Barometric pressure:	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by:		Recorded by:	

Ambient weather readings during VIP sample collection

Project Name: NASA **Project Number:** 60444679-8

Morning Readings		Afternoon Readings	
Date: 2/3/2016	Time: 0800	Time: 1600	
Temperature: 28°F	Humidity: 73	Temperature: 50°F	Humidity: 23
Wind speed & direction: 2 @ 290		Wind speed & direction: 4 @ 360	
Barometric pressure: 27.900		Barometric pressure: 27.885	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by: M. Miles		Recorded by: M. Miles	

Date:	Time:	Time:	
Temperature:	Humidity:	Temperature:	Humidity:
Wind speed & direction:		Wind speed & direction:	
Barometric pressure:		Barometric pressure:	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by:		Recorded by:	

Date:	Time:	Time:	
Temperature:	Humidity:	Temperature:	Humidity:
Wind speed & direction:		Wind speed & direction:	
Barometric pressure:		Barometric pressure:	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by:		Recorded by:	

Date:	Time:	Time:	
Temperature:	Humidity:	Temperature:	Humidity:
Wind speed & direction:		Wind speed & direction:	
Barometric pressure:		Barometric pressure:	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by:		Recorded by:	

Date:	Time:	Time:	
Temperature:	Humidity:	Temperature:	Humidity:
Wind speed & direction:		Wind speed & direction:	
Barometric pressure:		Barometric pressure:	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by:		Recorded by:	

Ambient weather readings during VIP sample collection

Project Name: NASA VIP SAMPLING **Project Number:** 60444679-8

Morning Readings		Afternoon Readings	
Date: 2/4/16	Time: 0730	Time: 1700	
Temperature: 28°F	Humidity: 72%	Temperature: 55°F	Humidity: 24%
Wind speed & direction: CALM		Wind speed & direction: 0.4 KTS @ 005	
Barometric pressure: 27.990		Barometric pressure: 27.332	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by: V. RODARTE		Recorded by: V. RODARTE	

Date:	Time:	Time:	02/4/16
Temperature:	Humidity:	Temperature:	Humidity:
Wind speed & direction:		Wind speed & direction:	
Barometric pressure:		Barometric pressure:	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by:		Recorded by:	

Date:	Time:	Time:	
Temperature:	Humidity:	Temperature:	Humidity:
Wind speed & direction:		Wind speed & direction:	
Barometric pressure:		Barometric pressure:	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by:		Recorded by:	

Date:	Time:	Time:	
Temperature:	Humidity:	Temperature:	Humidity:
Wind speed & direction:		Wind speed & direction:	
Barometric pressure:		Barometric pressure:	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by:		Recorded by:	

Date:	Time:	Time:	
Temperature:	Humidity:	Temperature:	Humidity:
Wind speed & direction:		Wind speed & direction:	
Barometric pressure:		Barometric pressure:	
Clear/Cloudy	Comments:	Clear/Cloudy	Comments:
Recorded by:		Recorded by:	

H&P Mobile Geochemistry Inc.

Log Sheet: Soil Vapor Sampling with Helium Shroud

H&P Project #: AFC02C316-TECH / HF
Date: 2-4-16
Site Address: Edwards AFB
Page: 1 of
Consultant: AECOM
H&P Rep(s): M Scherer
Reviewed:
Consultant Rep(s): Vonnie
Scanned:

Equipment Info	
Inline Gauge ID#:	115
Pump ID#:	
He Meter ID#:	017
Shroud ID#:	

Purge Volume	
PV Amount:	300
PV Includes:	
	☒ Tubing
	☒ Sand 40%
	☐ Dry Bent 50%

MGD 2002 Helium Detector Calibration	Time	Helium (%)
Calibration Standard	n/a	2.5
Opening Calibration	0800	2.5
Closing Calibration		
Acceptable Range	n/a	2.1 - 2.9

Shroud Procedure:
1. Shut in
2. purge into tedlar then test tedlar
3. if pass - collect sample
4. recollect tedlar & analyze

	Sample and Summa Information							Probe Specs							Purge & Collection Information						Shroud Info			
	Point ID	Summa ID #	Sample Kit ID #	Start Time	Initial Vac ("Hg)	End / Sample Time	End Vac ("Hg)	Probe Depth (ft)	Tube Length (ft)	Tube OD (in.)	Sand Ht (in.)	Sand Dia (in.)	Dry Bent Ht (in.)	Dry Bent Dia (in.)	Shut In Test 60 sec (✓)	Purge Vol (mL)	Purge Flow Rate (mL/min)	Pump Time (min: sec)	Sample Flow Rate (mL/min)	ProbeVac ☐ Hg ☒ H_2O	He % Before	He % After	Probe ppmv	
1	N3-4806-SS03-VS3	35543		840	-29	843	-5	SS	1	1/4	3	1	–	–	✓	300	200	–	200	5	52	53.8	0	– 800
2	N3-4806-SS02-VS3	1028		941	-27	0947	-5	SS	1	1/4	3	1	–	–	✓	300	200	–	200	0	59.8	68.1	8200	– 9.75
3	N3-4807-SS08-VS3	37434 35545		1022	-28	1026	-5	SS	1	1/4	3	1	–	–	✓	300	200	–	200	10	50.1	52.3	8200	– 8475
4	N3-4807-SS07-VS3	3204		1050	-27	1054	-5	SS	1	1/4	3	1	–	–	✓	300	200	–	200	2	62.3	54.7	75	– 75
5	N3-4806-SS05-VS3	3824		1233	-28	1238	-5	SS	1	1/4	3	1	–	–	✓	30	200	–	200	5	58.8	78.1	0	– 200
6	N3-4807-SS03-VS3	5041		-30	1255	1259	-5	SS	1	1/4	3	1	–	–	✓	300	200	–	200	0	64.4	71.7	0	– 0
7	N3-4807-SS[illegible]-VS3-dup	788		-28	1255	1259	-5	SS	1	1/4	3	1	–	–	✓	300	200	–	200	0	64.1	71.7	0	– 0
8	N3-4806-SS01-VS3	37294		-27	1340	1345	-5	SS	1	1/4	3	1	–	–	✓	300	200	–	200	10	58.8	54.7	0	– 0
9	N3-4807-SS04-VS3	33777		1423	-28	1429	-5	SS	1	1/4	3	1	–	–	✓	300	200	–	200	0	68.4	54.4	0	– 0
10	N3-N4806-SS04-VS3	33109		1454	-27	1458	-5	SS	1	1/4	3	1	–	–	✓	300	200	–	200	0	51.9	88.9	0	– 0

Site Notes such as weather, visitors, scope deviations, health & safety issues, etc. (When making sample specific notes, reference the line number above):
N3-4807-SS07-VS3-dup ; they had a T connector to make it a dup

AECOM

Chain-of-Custody Record

Laboratory:
Eurofins Air Toxics, Inc.
180 Blue Ravine Road, Suite B
Folsom, CA 95630
Contact: Kyle Vagadori
(916) 605-3339 phone
(916) 985-1020 fax

Client:
AECOM
2020 L St, Ste 400
Sacramento, CA 95811

Shipment Number: VR00001
Method of Shipment: FedEx
Air Bill Number:
Cooler Number: Box 1
Custody Seal No.:

Project Number: 60444679.08
Project Name: NASA VIP Sampling
Project Contact: Kimberly Coleman
(916) 361-6406 phone
(916) 361-6401 fax

Sampler's Signature: Vonnie Rodarte

Lab Job:
Ship Date: 2/5/2016
Page: 1 of 1

	Sample	Field Sample ID	Sampling Date	Sampling Time	Matrix Type	Type/Size of Container	Preservation Temp	Preservation Chemical	Filtered	No. of Containers	VOCs (TO15-LL) - ug/m3	Remarks
1A	06	EDWRD-N3-4806OA1-VS3	2/3/2016	0715	A	6L Summa	NA	NA		1	X	
2A	07	EDWRD-N3-4806OA2-VS3	2/3/2016	0735	A	6L Summa	NA	NA		1	X	
3A	08	EDWRD-N3-4806OA3-VS3	2/3/2016	0745	A	6L Summa	NA	NA		1	X	
1A	09	EDWRD-N3-4806OA3-VS203	2/3/2016	0745	A	6L Summa	NA	NA		1	X	

Analyses Requested

Custody Seal Intact?
Y N None Temp N/A
FedEX

Relinquished By	Date	Received By	Date
Signature: Vonnie Rodarte Printed: VONNIE RODARTE Company: AECOM Reason:	2/5/16 Time 1600	Signature: Printed: FEDEX Company:	2/5/16 Time 1600

Relinquished By	Date	Received By	Date
Signature: Printed: Company: Reason:	Time	Signature: Printed: M Holliday Company: EATL	2-9-16 Time 1135

Relinquished By	Date	Received By	Date
Signature: Printed: Company: Reason:	Time	Signature: Printed: Company:	Time

Comments:
Shipment summary: 24 samples, 5 coolers, 5 COC pages.

Distribution: WHITE to Analytical Laboratory Report, YELLOW to Laboratory File, PINK to Courier/Delivery Service or Field Office, GOLDEN to Project Office File

1602169

AECOM

Chain-of-Custody Record

Laboratory:
Eurofins Air Toxics, Inc.
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(916) 985-1020 fax

Client:
AECOM
2020 L St, Ste 400
Sacramento, CA 95811

Shipment Number: VR00001
Method of Shipment: FedEx
Air Bill Number:
Cooler Number: Box 2
Custody Seal No.:

Project Number: 60444679.08
Project Name: NASA VIP Sampling
Project Contact: Kimberly Coleman
(916) 361-6406 phone
(916) 361-6401 fax

Sampler's Signature: Donni Rodarte

Lab Job:
Ship Date: 2/5/2016
Page: 1 of 1

	Sample	Field Sample ID	Sampling Date	Sampling Time	Matrix Type	Type/Size of Container	Preservation Temp	Preservation Chemical	Filtered	No. of Containers	VOCs (TO15-LL) - µg/m3	Remarks
1A	01	EDWRD-N3-4806IA1-VS3	2/3/2016	0930	A	6L Summa	NA	NA		1	X	
2A	02	EDWRD-N3-4806IA2-VS3	2/3/2016	0905	A	6L Summa	NA	NA		1	X	
3A	03	EDWRD-N3-4806IA3-VS3	2/3/2016	0915	A	6L Summa	NA	NA		1	X	
4A	18	EDWRD-N3-4807IA3-VS203	2/3/2016	0835	A	6L Summa	NA	NA		1	X	

Analyses Requested

Custody Seal Intact?
Y N None Temp N/A
FedEx

Relinquished By	Date	Received By	Date
Signature: Donni Rodarte	2/5/16	Signature:	2/5/16
Printed: DONNI RODARTE	Time 1600	Printed: FEDEX	Time 1600
Company: AECOM		Company:	
Reason:			

Relinquished By	Date	Received By	Date
Signature:		Signature:	2-9-16
Printed:	Time	Printed: M Holliday	Time 1135
Company:		Company: EAI	
Reason:			

Relinquished By	Date	Received By	Date
Signature:		Signature:	
Printed:	Time	Printed:	Time
Company:		Company:	
Reason:			

Comments:
Shipment summary: 24 samples, 5 coolers, 5 COC pages.

Distribution: WHITE to Analytical Laboratory Report, YELLOW to Laboratory File, PINK to Courier/Delivery Service or Field Office, GOLDEN to Project Office File

1602168

AECOM

Chain-of-Custody Record

Laboratory:
Eurofins Air Toxics, Inc.
180 Blue Ravine Road, Suite B
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(916) 985-1020 fax

Client:
AECOM
2020 L St, Ste 400
Sacramento, CA 95811

Shipment Number: VR00001
Method of Shipment: FedEx
Air Bill Number:
Cooler Number: Box 4
Custody Seal No.:

Project Number: 60444679.08
Project Name: NASA VIP Sampling
Project Contact: Kimberly Coleman
(916) 361-6406 phone
(916) 361-6401 fax

Sampler's Signature: Vonnie Rodarte

Lab Job:
Ship Date: 2/5/2016
Page: 1 of 1

	Sample	Field Sample ID	Sampling Date	Sampling Time	Matrix Type	Type/Size of Container	Preservation Temp	Preservation Chemical	Filtered	No. of Containers	VOCs (TO15-LL) - µg/m3	Remarks
21A	04	EDWRD-N3-4806IA4-VS3	2/3/2016	0940	A	6L Summa	NA	NA		1	X	
22A	05	EDWRD-N3-4806IA5-VS3	2/3/2016	0945	A	6L Summa	NA	NA		1	X	

Custody Seal Intact?
Y N None Temp N/A
FedEx

Relinquished By	Date	Received By	Date	Relinquished By	Date	Received By	Date
Signature: Vonnie Rodarte	2/5/16	Signature:	2/5/16	Signature:		Signature:	2-9-16
Printed: VONNIE RODARTE	Time 1600	Printed: FEDEX	Time 1600	Printed:	Time	Printed:	Time 1135
Company: AECOM		Company:		Company:		Company: EATL	
Reason:				Reason:			

Comments:
Shipment summary: 24 samples, 5 coolers, 5 COC pages.

Relinquished By	Date	Received By	Date
Signature:		Signature:	
Printed:	Time	Printed:	Time
Company:		Company:	
Reason:			

Distribution: WHITE to Analytical Laboratory Report, YELLOW to Laboratory File, PINK to Courier/Delivery Service or Field Office, GOLDEN to Project Office File

1602165

AECOM

Chain-of-Custody Record

Laboratory:
Eurofins Air Toxics, Inc.
180 Blue Ravine Road, Suite B
Folsom, CA 95630
Contact: Kyle Vagadori
(916) 605-3339 phone
(916) 985-1020 fax

Client:
AECOM
2020 L St, Ste 400
Sacramento, CA 95811

Shipment Number: VR00001
Method of Shipment: FedEx
Air Bill Number:
Cooler Number: Box 3
Custody Seal No.:

Project Number: 60444679.08
Project Name: NASA VIP Sampling
Project Contact: Kimberly Coleman
(916) 361-6406 phone
(916) 361-6401 fax

Sampler's Signature: Vonnie Rodarte

Lab Job:
Ship Date: 2/5/2016
Page: 1 of 1

	Sample	Field Sample ID	Sampling Date	Sampling Time	Matrix Type	Type/Size of Container	Preservation Temp	Preservation Chemical	Filtered	No. of Containers	VOCs (TO15-LL) - ug/m3	Remarks
XA	15	EDWRD-N3-4807IA1-VS3	2/3/2016	0840	A	6L Summa	NA	NA		1	X	
2A	16	EDWRD-N3-4807IA2-VS3	2/3/2016	0840	A	6L Summa	NA	NA		1	X	
3A	17	EDWRD-N3-4807IA3-VS3	2/3/2016	0835	A	6L Summa	NA	NA		1	X	
4A	19	EDWRD-N3-4807IA4-VS3	2/3/2016	0905	A	6L Summa	NA	NA		1	X	

Custody Seal Intact?
Air Temp N/A
FedEx

Relinquished By	Date	Received By	Date	Relinquished By	Date	Received By	Date
Signature: Vonnie Rodarte	2/5/16	Signature:	2/5/16	Signature:		Signature: [illegible]	2-9-16
Printed: VONNIE RODARTE	Time 1600	Printed: FEDEX	Time 1600	Printed:	Time	Printed: W Holliday	Time 1135
Company: AECOM		Company:		Company:		Company: EATL	
Reason:				Reason:			

Comments:
Shipment summary: 24 samples, 5 coolers, 5 COC pages.

Relinquished By	Date	Received By	Date
Signature:		Signature:	
Printed:	Time	Printed:	Time
Company:		Company:	
Reason:			

Distribution: WHITE to Analytical Laboratory Report, YELLOW to Laboratory File, PINK to Courier/Delivery Service or Field Office, GOLDEN to Project Office File

1602167

AECOM

Chain-of-Custody Record

Laboratory:
Eurofins Air Toxics, Inc.
180 Blue Ravine Road, Suite B
Folsom, CA 95630
Contact: Kyle Vagadori
(916) 605-3339 phone
(916) 985-1020 fax

Client:
AECOM
2020 L St, Ste 400
Sacramento, CA 95811

Shipment Number: VR00001
Method of Shipment: FedEx
Air Bill Number:
Cooler Number: Box 5
Custody Seal No.:

Project Number: 60444679.08
Project Name: NASA VIP Sampling
Project Contact: Kimberly Coleman
(916) 361-6406 phone
(916) 361-6401 fax

Sampler's Signature:

Lab Job:
Ship Date: 2/5/2016
Page: 1 of 1

	Sample	Field Sample ID	Sampling Date	Sampling Time	Matrix Type	Type/Size of Container	Preservation Temp	Preservation Chemical	Filtered	No. of Containers	Helium (D1946)	VOCs (TO15) - µg/m3	Remarks
2A	10	EDWRD-N3-4806SS1-VS3	2/4/2016	1340	A	1L Summa	NA	NA		1	X	X	
2A	11	EDWRD-N3-4806SS2-VS3	2/4/2016	0941	A	1L Summa	NA	NA		1	X	X	
3A	12	EDWRD-N3-4806SS3-VS3	2/4/2016	0840	A	1L Summa	NA	NA		1	X	X	
4A	13	EDWRD-N3-4806SS4-VS3	2/4/2016	1454	A	1L Summa	NA	NA		1	X	X	
5A	14	EDWRD-N3-4806SS5-VS3	2/4/2016	1233	A	1L Summa	NA	NA		1	X	X	
6A	20	EDWRD-N3-4807SS1-VS3	2/4/2016	1022	A	1L Summa	NA	NA		1	X	X	
7A	21	EDWRD-N3-4807SS2-VS3	2/4/2016	1050	A	1L Summa	NA	NA		1	X	X	
8A	22	EDWRD-N3-4807SS3-VS3	2/4/2016	1255	A	1L Summa	NA	NA		1	X	X	
9A	23	EDWRD-N3-4807SS3-VS203	2/4/2016	1255	A	1L Summa	NA	NA		1	X	X	
10A	24	EDWRD-N3-4807SS4-VS3	2/4/2016	1423	A	1L Summa	NA	NA		1	X	X	

Custody Seal Intact?
Y N None Temp N/A
FedEx

Relinquished By	Date	Received By	Date
Signature: Vonnie Rodarte	2/5/16	Signature:	2/5/16
Printed: VONNIE RODARTE	Time 1600	Printed: FEDEX	Time 1600
Company: AECOM		Company:	
Reason:			

Relinquished By	Date	Received By	Date
Signature:		Signature:	2-9-16
Printed:	Time 1435	Printed: M. Holliday	Time 1435
Company:		Company: EATL	
Reason:			

Relinquished By	Date	Received By	Date
Signature:		Signature:	
Printed:	Time	Printed:	Time
Company:		Company:	
Reason:			

Comments:
Shipment summary: 24 samples, 5 coolers, 5 COC pages.

Distribution: WHITE to Analytical Laboratory Report, YELLOW to Laboratory File, PINK to Courier/Delivery Service or Field Office, GOLDEN to Project Office File

1602168

AECOM

Chain-of-Custody Record

Laboratory:
Eurofins Air Toxics, Inc.
180 Blue Ravine Road, Suite B
Folsom, CA 95630
Contact: Kyle Vagadori
(916) 605-3339 phone
(916) 985-1020 fax

Client:
AECOM
2020 L St, Ste 400
Sacramento, CA 95811

Shipment Number: VR00001
Method of Shipment: FedEx
Air Bill Number:
Cooler Number: Box 5
Custody Seal No.:

Project Number: 60444679.08
Project Name: NASA VIP Sampling
Project Contact: Kimberly Coleman
(916) 361-6406 phone
(916) 361-6401 fax

Sampler's Signature:

Lab Job:
Ship Date: 2/5/2016
Page: 1 of 1

	Sample	Field Sample ID	Sampling Date	Sampling Time	Matrix Type	Type/Size of Container	Preservation Temp	Preservation Chemical	Filtered	No. of Containers	Helium (D1946)	VOCs (TO15) – µg/m3	Remarks
1A	10	EDWRD-N3-4806SS1-VS3	2/4/2016	1340	A	1L Summa	NA	NA		1	X	X	
2A	11	EDWRD-N3-4806SS2-VS3	2/4/2016	0941	A	1L Summa	NA	NA		1	X	X	
3A	12	EDWRD-N3-4806SS3-VS3	2/4/2016	0840	A	1L Summa	NA	NA		1	X	X	
4A	13	EDWRD-N3-4806SS4-VS3	2/4/2016	1454	A	1L Summa	NA	NA		1	X	X	
5A	14	EDWRD-N3-4806SS5-VS3	2/4/2016	1233	A	1L Summa	NA	NA		1	X	X	
6A	20	EDWRD-N3-4807SS1-VS3	2/4/2016	1022	A	1L Summa	NA	NA		1	X	X	
7A	21	EDWRD-N3-4807SS2-VS3	2/4/2016	1050	A	1L Summa	NA	NA		1	X	X	
8A	22	EDWRD-N3-4807SS3-VS3	2/4/2016	1255	A	1L Summa	NA	NA		1	X	X	
9A	23	EDWRD-N3-4807SS3-VS203	2/4/2016	1255	A	1L Summa	NA	NA		1	X	X	
10A	24	EDWRD-N3-4807SS4-VS3	2/4/2016	1423	A	1L Summa	NA	NA		1	X	X	

Custody Seal Intact?
Y N None Temp N/A
FedEx

Relinquished By	Date	Received By	Date	Relinquished By	Date	Received By	Date
Signature: Vonnie Rodarte	2/5/16	Signature:	2/5/16	Signature:		Signature: [illegible]	2-9-16
Printed: VONNIE RODARTE	Time 1600	Printed: FEDEX	Time 1600	Printed:	Time 1135	Printed: M. Holliday	Time 1135
Company: AECOM		Company:		Company:		Company: EATL	
Reason:				Reason:			

Comments:
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APPENDIX C

2016 ANALYTICAL RESULTS AND INDOOR AIR SCREENING LEVELS

APPENDIX C-1 SUB-SLAB VAPOR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4806)
(Page 1 of 2)

Analyte	Sample Number	N3-4806SS1	N3-4806SS2	N3-4806SS3	N3-4806SS4	N3-4806SS5	SVSL[(a)]	CA-SVSL[(a)]
1,1,1-trichloroethane		<1.3	<1.3	<1.3	<1.1	<1.4	438,000	87,600
1,1,1,2-tetrachloroethane		<34	<35	<33	<28	<35	33	33
1,1,2,2-tetrachloroethane		<2.0	<2.0	<1.9	<1.6	<2.0	4	4
1,1,2-trichloroethane		<2.2	<2.3	<2.1	<1.8	<2.3	15	15
1,1,2-trichloro-1,2,2-trifluoroethane		<1.2	<1.2	<1.2	<0.99	<1.3	2,628,000	2,628,000
1,1-dichloroethane		<0.69	<0.71	<0.66	6.8	<0.71	153	153
1,1-dichloroethene		<2.2	<2.3	<2.1	<1.8	<2.3	17,520	6,132
1,2,4-trichlorobenzene		<6.3	<6.4	<6.0	<5.0	<6.5	175	33
1,2,4-trimethylbenzene		3.7	20	<2.1	2.9	3.9	613	613
1,2-dichlorobenzene		2.2	<1.0	<0.96	<0.81	<1.0	17,520	17,520
1,2-dichloroethane		0.96	<0.86	<0.81	0.92	<0.88	9	9
1,2-dichloropropane		<1.3	<1.3	<1.2	9.2	<1.3	24	24
1,2-dichloro-1,1,2,2-tetrafluoroethane		<1.6	<1.6	<1.5	<1.3	<1.7	2,628,000	2,628,000
1,3,5-trimethylbenzene		<3.0	10	<2.9	<2.4	<3.1	8,760	3,504
1,3-butadiene		<1.1	<1.1	<1.0	<0.88	<1.1	8	1
1,3-dichlorobenzene		1.9	<1.4	<1.3	<1.1	<1.4	17,520	17,520
1,4-dichlorobenzene		<1.6	<1.6	<1.5	<1.3	<1.6	22	22
2-butanone (MEK)		<4.1	<4.2	<4.0	46	<4.3	438,000	438,000
2-hexanone		<2.9	<3.0	<2.8	<2.3	<3.0	2,628	2,628
4-ethyltoluene		2.9	25	2.5	2.2	3.6		
4-methyl-2-pentanone (MIBK)		<1.5	<1.6	<1.5	9.0	<1.6	262,800	262,800
acetone		<13	<9.0	<9.4	70	<17	2,715,600	2,715,600
acrylonitrile		<11	<11	<10	<8.7	<11	4	1
benzene		3.4	6.0	1.1	4.2	2.9	31	8
benzyl chloride		<1.9	<1.9	<1.8	<1.5	<2.0	5	5
bromodichloromethane		<1.4	<1.5	<1.4	<1.2	<1.5	7	7
bromoform		3.1	<1.8	<1.7	<1.4	<1.8	222	222
bromomethane		<12	<12	<12	<9.9	<13	438	438
carbon disulfide		<2.7	<2.8	<2.6	3.9	<2.8	61,320	61,320
carbon tetrachloride		<1.9	<1.9	<1.8	<1.5	<1.9	41	6
chlorobenzene		1.3	<0.73	<0.69	<0.58	<0.74	4,380	4,380
chloroethane		<2.6	<2.7	<2.5	<2.1	<2.7	876,000	876,000
chloroform		<1.1	<1.1	<1.0	3.7	1.7	11	11
chloromethane		<5.0	<5.1	<4.8	<4.0	<5.2	7,884	7,884
cis-1,2-dichloroethene		<1.2	<1.2	<1.2	<0.96	<1.2	701	701
cis-1,3-dichloropropene		<0.92	<0.94	<0.88	<0.74	<0.95	61	15
cyclohexane		2.5	2.1	3.1	6.0	1.5	525,600	525,600
dibromochloromethane		<1.7	<1.7	<1.6	<1.4	<1.8		7,008

APPENDIX C-1 SUB-SLAB VAPOR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4806)
(Page 2 of 2)

Analyte	Sample Number	N3-4806SS1	N3-4806SS2	N3-4806SS3	N3-4806SS4	N3-4806SS5	SVSL[(a)]	CA-SVSL[(a)]
dichlorodifluoromethane		4.0	3.3	3.0	4.8	3.5	8,760	8,760
ethanol		4.9	16	14	<1.6	10	17,520	613,200
ethyl acetate		<18	<18	<17	<14	<18	6,132	6,132
ethylbenzene		<1.4	22	2.1	6.0	1.5	98	98
ethylene dibromide (EDB)		<1.8	<1.9	<1.8	<1.5	<1.9	0.4	0.4
hexachlorobutadiene		**12**	<8.4	<7.9	<6.6	<8.5	11	11
isopropyl alcohol		<12	<7.2	<6.8	30	<6.4	17,520	613,200
isopropylbenzene		1.2	3.1	<0.96	1.3	<1.0	35,040	35,040
m- & p-xylene		3.9	83	7.2	19	7.3	8,760	8,760
methyl tert-butyl ether (MTBE)		<0.34	<0.34	<0.32	<0.27	<0.35	938	938
methylene chloride		<3.5	<3.6	<3.3	<12	<3.6	24,400	244
naphthalene		0.70	0.70	<0.57	0.49	0.81	7	7
n-butylbenzene		<27	<28	<26	<22	<28		15,330
n-heptane		9.0	7.4	2.7	6.4	2.8		
n-hexane		<3.8	<1.6	<0.48	6.2	<1.6	61,320	61,320
o-xylene		1.9	24	3.1	9.2	2.5	8,760	8,760
p-isopropyl toluene		<27	<28	<26	<22	<28		
propene		<2.8	<2.8	<2.7	<2.2	<2.9	262,800	262,800
sec-butylbenzene		<27	<28	<26	<22	<28		35,040
styrene		0.98	<0.79	<0.74	3.2	<0.80	87,600	78,840
tetrachloroethene (PCE)		9.2	18	16	13	10	938	41
tetrahydrofuran		<1.2	<1.3	<1.2	<1.0	<1.3	175,200	175,200
toluene		3.8	71	8.2	77	5.6	438,000	26,280
trans-1,2-dichloroethene		<0.73	<0.74	<0.70	<0.59	<0.75	17,520	7,008
trans-1,3-dichloropropene		<1.0	<1.0	<0.96	<0.80	<1.0	61	15
trichloroethene (TCE)		2.4	<1.9	<1.8	70	65	60	60
trichlorofluoromethane		2.7	2.8	2.1	2.2	2.9	61,320	61,320
vinyl chloride		<0.69	<0.71	<0.66	<0.56	<0.72	55	3

Notes:

All concentrations are presented in micrograms per cubic meter.

[(a)] The SVSL is the IASL with a 0.05 attenuation factor applied. See Table 2 for IASL details.

CA-IASL California indoor air screening level
CA-SVSL California soil vapor screening level
IASL indoor air screening level
SVSL soil vapor screening level

APPENDIX C-2 SUB-SLAB VAPOR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4807)
(Page 1 of 2)

Analyte	Sample Number	N3-4807SS1	N3-4807SS2	N3-4807SS3	N3-4807SS3[a]	N3-4807SS4	SVSL[b]	CA-SVSL[b]
1,1,1-trichloroethane		<1.3	<1.3	<1.4	<1.4	<1.1	438,000	87,600
1,1,1,2-tetrachloroethane		<34	<34	<37	<35	<28	33	33
1,1,2,2-tetrachloroethane		<2.0	<2.0	<2.1	<2.0	<1.6	4	4
1,1,2-trichloroethane		<2.2	<2.2	<2.4	<2.3	<1.8	15	15
1,1,2-trichloro-1,2,2-trifluoroethane		<1.2	<1.2	<1.3	<1.3	<1.0	2,628,000	2,628,000
1,1-dichloroethane		<0.69	<0.70	<0.75	<0.71	<0.58	153	153
1,1-dichloroethene		<2.2	<2.2	<2.4	<2.3	<1.8	17,520	6,132
1,2,4-trichlorobenzene		<6.2	<6.3	<6.8	<6.4	<5.2	175	33
1,2,4-trimethylbenzene		3.8	<2.2	<2.3	<2.2	2.0	613	613
1,2-dichlorobenzene		<1.0	<1.0	<1.1	<1.0	<0.84	17,520	17,520
1,2-dichloroethane		<0.84	<0.86	<0.92	<0.87	<0.71	9	9
1,2-dichloropropane		<1.3	<1.3	<1.4	<1.3	<1.1	24	24
1,2-dichloro-1,1,2,2-tetrafluoroethane		<1.6	<1.6	<1.7	<1.6	<1.3	2,628,000	2,628,000
1,3,5-trimethylbenzene		<3.0	<3.0	<3.3	<3.1	<2.5	8,760	3,504
1,3-butadiene		<1.1	<1.1	<1.2	<1.1	<0.91	8	1
1,3-dichlorobenzene		<1.4	<1.4	<1.5	<1.4	<1.1	17,520	17,520
1,4-dichlorobenzene		<1.6	<1.6	<1.7	<1.6	<1.3	22	22
2-butanone (MEK)		<4.1	<4.2	<4.5	<4.3	4.3	438,000	438,000
2-hexanone		<2.9	<2.9	<3.2	<3.0	<2.4	2,628	2,628
4-ethyltoluene		3.2	2.1	<1.6	<1.5	1.8		
4-methyl-2-pentanone (MIBK)		<1.5	<1.6	<1.7	<1.6	<1.3	262,800	262,800
acetone		<7.8	<18	<9.0	<17	<17	2,715,600	2,715,600
acrylonitrile		<11	<11	<12	<11	<9.0	4	1
benzene		<0.85	7.7	1.1	1.2	2.4	31	8
benzyl chloride		<1.9	<1.9	<2.1	<2.0	<1.6	5	5
bromodichloromethane		<1.4	<1.4	<1.5	<1.5	<1.2	7	7
bromoform		<1.7	<1.8	<1.9	<1.8	<1.5	222	222
bromomethane		<12	<12	<13	<13	<10	438	438
carbon disulfide		<2.7	<2.7	3.5	<2.8	8.0	61,320	61,320
carbon tetrachloride		<1.8	<1.9	<2.0	<1.9	<1.6	41	6
chlorobenzene		<0.71	<0.72	<0.77	<0.74	<0.60	4,380	4,380
chloroethane		<2.6	<2.7	<2.8	<2.7	<2.2	876,000	876,000
chloroform		<1.0	1.2	<1.1	<1.1	<0.88	11	11
chloromethane		<5.0	<5.0	<5.4	<5.2	<4.2	7,884	7,884
cis-1,2-dichloroethene		<1.2	<1.2	<1.3	<1.2	<1.0	701	701
cis-1,3-dichloropropene		<0.91	<0.93	<1.0	<0.95	<0.77	61	15
cyclohexane		1.4	<0.66	<0.71	<0.68	<0.55	525,600	525,600
dibromochloromethane		<1.7	<1.7	<1.8	<1.8	<1.4		7,008

APPENDIX C-2 SUB-SLAB VAPOR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4807)

Analyte	Sample Number	N3-4807SS1	N3-4807SS2	N3-4807SS3	N3-4807SS3[a]	N3-4807SS4	SVSL[b]	CA-SVSL[b]
dichlorodifluoromethane		2.9	5.9	4.5	4.8	3.1	8,760	8,760
ethanol		2.4	4.4	7.4	6.8	8.5	17,520	613,200
ethyl acetate		<18	<18	<19	<18	<15	6,132	6,132
ethylbenzene		<1.4	<1.4	<1.5	<1.4	<1.2	98	98
ethylene dibromide (EDB)		<1.8	<1.9	<2.0	<1.9	<1.5	0.4	0.4
hexachlorobutadiene		<8.1	<8.3	<8.9	<8.4	<6.8	11	11
isopropyl alcohol		<7.3	<5.8	<6.4	<5.6	<12	17,520	613,200
isopropylbenzene		<0.99	<1.0	<1.1	<1.0	<0.83	35,040	35,040
m- & p-xylene		7.1	3.4	2.3	2.6	3.1	8,760	8,760
methyl tert-butyl ether (MTBE)		<0.33	<0.34	<0.36	<0.34	<0.28	938	938
methylene chloride		<3.4	<3.5	<3.8	<3.6	<2.9	24,400	244
naphthalene		<0.59	<0.60	<0.64	0.65	<0.49	7	7
n-butylbenzene		<27	<28	<30	<28	<23		15,330
n-heptane		2.7	2.7	<2.5	<2.3	2.6		
n-hexane		<1.2	<1.2	<1.5	<1.6	<1.5	61,320	61,320
o-xylene		2.4	1.4	<1.2	<1.2	1.0	8,760	8,760
p-isopropyl toluene		<27	<28	<30	<28	<23		
propene		<2.8	<2.8	<3.0	<2.9	<2.3	262,800	262,800
sec-butylbenzene		<27	<28	<30	<28	<23		35,040
styrene		<0.77	<0.78	<0.83	<0.79	<0.64	87,600	78,840
tetrachloroethene (PCE)		1.6	1.6	3.0	2.4	2.1	938	41
tetrahydrofuran		<1.2	<1.3	<1.4	<1.3	<1.0	175,200	175,200
toluene		4.4	3.6	2.8	2.6	3.2	438,000	26,280
trans-1,2-dichloroethene		<0.72	<0.73	<0.79	<0.75	<0.61	17,520	7,008
trans-1,3-dichloropropene		<0.99	<1.0	<1.1	<1.0	<0.83	61	15
trichloroethene (TCE)		<1.8	25	2.3	2.2	<1.5	60	60
trichlorofluoromethane		1.6	1.2	3.1	2.8	2.5	61,320	61,320
vinyl chloride		<0.69	<0.70	<0.75	<0.71	<0.58	55	3

Notes:

All concentrations are presented in micrograms per cubic meter.

[a] Duplicate sample.

[b] The SVSL is the IASL with a 0.05 attenuation factor applied. See Table 2 for IASL details.

CA-IASL California indoor air screening level
CA-SVSL California soil vapor screening level
IASL indoor air screening level
SVSL soil vapor screening level

APPENDIX C-3 INDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4806)
(Page 1 of 2)

Analyte	Sample Number	N3-4806IA1	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	IASL[a]	CA-IASL[b]
1,1,1-trichloroethane		<0.22	<0.22	<0.21	<0.24	<0.25	21,900	4,380
1,1,1,2-tetrachloroethane		<5.8	<5.9	<5.6	<6.3	<6.7	1.65	1.65
1,1,2,2-tetrachloroethane		<0.12	<0.12	<0.11	<0.13	<0.14	0.21	0.21
1,1,2-trichloroethane		<0.46	<0.47	<0.45	<0.50	<0.53	0.76	0.76
1,1,2-trichloro-1,2,2-trifluoroethane		0.48	0.54	0.55	0.57	0.53	131,400	131,400
1,1-dichloroethane		<0.087	<0.088	<0.085	<0.094	<0.10	7.63	7.63
1,1-dichloroethene		<0.13	<0.14	<0.13	<0.14	<0.16	876	307
1,2,4-trichlorobenzene		<0.25	<0.26	<0.24	<0.27	<0.29	8.76	1.67
1,2,4-trimethylbenzene		0.25	0.18	0.32	0.24	0.47	31	31
1,2-dichlorobenzene		<0.31	<0.32	<0.30	<0.34	<0.36	876	876
1,2-dichloroethane		<0.23	<0.23	<0.22	<0.25	<0.26	0.47	0.47
1,2-dichloropropane		<0.17	<0.17	<0.16	<0.18	<0.20	1.22	1.22
1,2-dichloro-1,1,2,2-tetrafluoroethane		<0.22	<0.22	<0.21	<0.24	<0.25	131,400	131,400
1,3,5-trimethylbenzene		<0.14	<0.15	<0.14	<0.16	<0.17	438	175
1,3-butadiene		<0.054	<0.055	<0.053	<0.059	<0.063	0.41	0.07
1,3-dichlorobenzene		<0.13	<0.13	<0.13	<0.14	<0.15	876	876
1,4-dichlorobenzene		<0.14	<0.14	<0.14	<0.15	<0.16	1.11	1.11
2-butanone (MEK)		0.88	4.6	1.2	3.3	0.81	21,900	21,900
2-hexanone		<0.36	0.60	<0.35	<0.39	<0.42	131	131
4-ethyltoluene		0.20	0.18	0.28	0.21	0.39		
4-methyl-2-pentanone (MIBK)		<0.12	0.25	<0.12	0.29	<0.15	13,140	13,140
acetone		18	37	40	71	58	135,780	135,780
acrylonitrile		<1.8	<1.8	<1.8	<2.0	<2.1	0.18	0.04
benzene		0.44	0.44	0.54	0.80	0.54	1.56	0.42
benzyl chloride		<0.18	<0.19	<0.18	<0.20	<0.21	0.25	0.25
bromodichloromethane		<0.17	<0.18	<0.17	<0.19	<0.20	0.33	0.33
bromoform		<0.32	<0.33	<0.31	<0.35	<0.38	11.1	11.1
bromomethane		<1.0	<1.0	<0.98	<1.1	<1.2	21.9	21.9
carbon disulfide		<0.21	<0.21	<0.20	<0.23	<0.24	3,066	3,066
carbon tetrachloride		0.38	0.37	0.29	0.36	0.32	2.0	0.29
chlorobenzene		<0.19	<0.20	<0.19	<0.21	<0.23	219	219
chloroethane		<0.35	<0.36	<0.34	<0.38	<0.41	43,800	43,800
chloroform		0.31	0.39	0.65	1.5	5.0	0.53	0.53
chloromethane		1.1	1.3	1.2	1.2	1.2	394	394
cis-1,2-dichloroethene		<0.19	<0.19	<0.19	<0.21	<0.22	35.0	35.0
cis-1,3-dichloropropene		<0.16	<0.16	<0.16	<0.18	<0.19	3.05	0.76
cyclohexane		<0.098	<0.099	0.10	0.16	0.16	26,280	26,280

APPENDIX C-3 INDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4806)

Analyte	Sample Number	N3-4806IA1	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	IASL[a]	CA-IASL[b]
dibromochloromethane		<0.24	<0.24	<0.23	<0.26	<0.28		350
dichlorodifluoromethane		2.4	2.5	2.4	3.7	2.4	438	438
ethanol		5.0	140	7.5	19	3.9	876	30,660
ethyl acetate		<3.0	6.7	<3.0	<3.3	<3.5	307	307
ethylbenzene		<0.21	<0.21	0.24	0.34	0.34	4.88	4.88
ethylene dibromide (EDB)		<0.22	<0.22	<0.22	<0.24	<0.26	0.02	0.02
hexachlorobutadiene		<0.45	<0.46	<0.44	<0.49	<0.52	0.55	0.55
isopropyl alcohol		0.63	7.8	0.90	9.4	1.8	876	30,660
isopropylbenzene		<0.13	<0.13	<0.13	<0.14	<0.15	1,752	1,752
m- & p-xylene		0.38	0.50	0.66	0.85	1.1	438	438
methyl tert-butyl ether (MTBE)		<0.080	<0.082	<0.078	<0.087	<0.094	46.9	46.9
methylene chloride		<0.29	<0.31	<0.31	<0.26	<0.27	1,220	12.2
naphthalene		<0.098	0.13	0.12	<0.11	<0.11	0.36	0.36
n-butylbenzene		<4.6	<4.7	<4.5	<5.0	<5.4		767
n-heptane		0.25	0.30	0.35	0.50	0.39		
n-hexane		0.31	0.22	0.36	0.44	0.41	3,066	3,066
o-xylene		<0.18	0.25	0.37	0.35	0.36	438	438
p-isopropyl toluene		<4.6	<4.7	<4.5	<5.0	<5.4		
propene		<0.38	<0.39	<0.38	<0.42	<0.45	13,140	13,140
sec-butylbenzene		<4.6	<4.7	<4.5	<5.0	<5.4		1,752
styrene		<0.073	0.10	0.14	0.083	0.18	4,380	3,942
tetrachloroethene (PCE)		<0.31	<0.32	<0.30	<0.34	<0.36	46.9	2.1
tetrahydrofuran		<0.42	<0.43	<0.42	0.82	<0.50	8,760	8,760
toluene		8.0	12	20	26	30	21,900	1,314
trans-1,2-dichloroethene		<0.20	<0.20	<0.19	<0.22	<0.23	876	350
trans-1,3-dichloropropene		<0.16	<0.17	<0.16	<0.18	<0.19	3.05	0.76
trichloroethene (TCE)		<0.27	<0.27	<0.26	<0.29	<0.31	2.98	2.98
trichlorofluoromethane		2.2	1.4	1.5	1.5	1.4	3,066	3,066
vinyl chloride		<0.095	<0.097	<0.093	<0.10	<0.11	2.77	0.16

Notes:

Shaded cell indicates sample concentration exceeds IASL or CA-IASL.

All concentrations are presented in micrograms per cubic meter.

[a] See Table 2 for details.

[b] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level
IASL indoor air screening level

APPENDIX C-4 INDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4807)
(Page 1 of 2)

Analyte	Sample Number	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA3[a]	N3-4807IA4	IASL[b]	CA-IASL[c]
1,1,1-trichloroethane		<0.21	<0.22	<0.19	<0.21	<0.23	21,900	4,380
1,1,1,2-tetrachloroethane		<5.6	<5.8	<5.0	<5.5	<6.0	1.65	1.65
1,1,2,2-tetrachloroethane		<0.11	<0.12	<0.10	<0.11	<0.12	0.21	0.21
1,1,2-trichloroethane		<0.44	<0.46	<0.40	<0.44	<0.48	0.76	0.76
1,1,2-trichloro-1,2,2-trifluoroethane		0.52	0.51	0.59	0.54	0.63	131,400	131,400
1,1-dichloroethane		1.4	<0.088	<0.075	<0.083	<0.090	7.63	7.63
1,1-dichloroethene		<0.13	<0.13	<0.12	<0.13	<0.14	876	307
1,2,4-trichlorobenzene		<0.24	<0.25	<0.22	<0.24	<0.26	8.76	1.67
1,2,4-trimethylbenzene		0.65	0.40	1.9	1.7	0.35	31	31
1,2-dichlorobenzene		<0.30	<0.32	<0.27	<0.30	<0.32	876	876
1,2-dichloroethane		0.29	<0.23	<0.20	<0.22	<0.24	0.47	0.47
1,2-dichloropropane		1.9	<0.17	<0.15	<0.16	<0.18	1.22	1.22
1,2-dichloro-1,1,2,2-tetrafluoroethane		<0.21	<0.22	<0.19	<0.21	<0.22	131,400	131,400
1,3,5-trimethylbenzene		0.22	0.15	0.64	0.50	<0.15	438	175
1,3-butadiene		0.12	<0.055	0.055	<0.052	<0.056	0.41	0.07
1,3-dichlorobenzene		<0.13	<0.13	<0.11	<0.13	<0.14	876	876
1,4-dichlorobenzene		<0.14	<0.14	<0.12	<0.14	<0.15	1.11	1.11
2-butanone (MEK)		14	0.54	3.1	0.76	0.82	21,900	21,900
2-hexanone		<0.35	<0.37	0.36	<0.35	<0.38	131	131
4-ethyltoluene		0.68	0.36	1.6	1.6	0.37		
4-methyl-2-pentanone (MIBK)		3.0	<0.13	0.36	0.15	0.14	13,140	13,140
acetone		44	23	59	52	37	135,780	135,780
acrylonitrile		<1.8	<1.8	<1.6	<1.7	<1.9	0.18	0.04
benzene		1.1	0.69	2.0	2.0	0.58	1.56	0.42
benzyl chloride		<0.18	<0.18	<0.16	<0.18	<0.19	0.25	0.25
bromodichloromethane		<0.17	<0.17	<0.15	<0.16	<0.18	0.33	0.33
bromoform		<0.31	<0.32	<0.28	<0.31	<0.34	11.1	11.1
bromomethane		<0.97	<1.0	<0.87	<0.96	<1.0	21.9	21.9
carbon disulfide		<0.67	<0.21	<0.18	<0.20	<0.22	3,066	3,066
carbon tetrachloride		0.39	0.36	0.43	0.41	0.40	2.0	0.29
chlorobenzene		<0.19	<0.20	<0.17	<0.18	<0.20	219	219
chloroethane		<0.34	<0.36	<0.30	<0.34	<0.36	43,800	43,800
chloroform		0.46	0.30	0.77	0.82	0.56	0.53	0.53
chloromethane		1.2	1.2	1.1	1.2	1.2	394	394
cis-1,2-dichloroethene		<0.18	<0.19	<0.16	<0.18	<0.20	35.0	35.0
cis-1,3-dichloropropene		<0.16	<0.16	<0.14	<0.15	<0.17	3.05	0.76
cyclohexane		1.5	0.24	1.4	1.4	0.14	26,280	26,280

APPENDIX C-4 INDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4807)
(Page 2 of 2)

Analyte	Sample Number	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA3[a]	N3-4807IA4	IASL[b]	CA-IASL[c]
dibromochloromethane		<0.23	<0.24	<0.20	<0.23	<0.24		350
dichlorodifluoromethane		4.5	2.9	2.2	2.4	2.4	438	438
ethanol		66	11	25	19	5.6	876	30,660
ethyl acetate		38	<3.1	2.8	<2.9	<3.2	307	307
ethylbenzene		2.2	0.23	1.8	1.8	0.35	4.88	4.88
ethylene dibromide (EDB)		<0.21	<0.22	<0.19	<0.21	<0.23	0.02	0.02
hexachlorobutadiene		<0.43	<0.46	<0.39	<0.43	<0.47	0.55	0.55
isopropyl alcohol		8.0	0.93	1.7	0.98	0.56	876	30,660
isopropyl benzene		0.21	<0.13	<0.11	<0.12	<0.14	1,752	1,752
m- & p-xylene		6.0	1.0	6.4	6.6	0.87	438	438
methyl tert-butyl ether (MTBE)		<0.077	<0.081	0.16	0.14	<0.084	46.9	46.9
methylene chloride		2.7	<0.30	<0.42	<0.44	<0.35	1,220	12.2
naphthalene		0.095	<0.099	0.21	0.16	<0.10	0.36	0.36
n-butylbenzene		<4.4	<4.7	<4.0	<4.4	<4.8		767
n-heptane		2.0	0.76	2.8	2.1	0.54		
n-hexane		2.3	0.66	3.6	3.8	0.35	3,066	3,066
o-xylene		3.0	0.31	2.4	2.2	0.47	438	438
p-isopropyl toluene		<4.4	<4.7	<4.0	<4.4	<4.8		
propene		<0.37	<0.39	<0.33	<0.37	<0.40	13,140	13,140
sec-butylbenzene		<4.4	<4.7	<4.0	<4.4	<4.8		1,752
styrene		0.99	0.088	0.15	0.24	0.15	4,380	3,942
tetrachloroethene (PCE)		2.1	<0.32	<0.27	<0.30	<0.32	46.9	2.1
tetrahydrofuran		0.58	<0.43	<0.37	<0.41	<0.44	8,760	8,760
toluene		32	12	37	40	20	21,900	1,314
trans-1,2-dichloroethene		<0.19	<0.20	<0.17	<0.19	<0.21	876	350
trans-1,3-dichloropropene		<0.16	<0.16	<0.14	<0.16	<0.17	3.05	0.76
trichloroethene (TCE)		<0.26	<0.27	<0.23	<0.26	<0.28	2.98	2.98
trichlorofluoromethane		2.4	3.0	3.1	3.0	2.1	3,066	3,066
vinyl chloride		<0.092	<0.097	<0.082	<0.091	<0.099	2.77	0.16

Notes:

Shaded cell indicates sample concentration exceeds IASL or CA-IASL.

All concentrations are presented in micrograms per cubic meter.

[a] Duplicate sample.

[b] See Table 2 for details.

[c] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level

IASL indoor air screening level

APPENDIX C-5 OUTDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDINGS 4806 AND 4807)
(Page 1 of 2)

Analyte	Sample Number	N3-4806OA1	N3-4806OA2	N3-4806OA3	N3-4806OA3[a]	IASL[b]	CA-IASL[c]
1,1,1-trichloroethane		<0.21	<0.23	<0.22	<0.22	21,900	4,380
1,1,1,2-tetrachloroethane		<5.6	<6.1	<5.9	<5.8	1.65	1.65
1,1,2,2-tetrachloroethane		<0.11	<0.12	<0.12	<0.12	0.21	0.21
1,1,2-trichloroethane		<0.45	<0.49	<0.47	<0.46	0.76	0.76
1,1,2-trichloro-1,2,2-trifluoroethane		0.51	0.72	0.64	0.67	131,400	131,400
1,1-dichloroethane		<0.085	<0.092	<0.088	0.75	7.63	7.63
1,1-dichloroethene		<0.13	<0.14	<0.14	<0.13	876	307
1,2,4-trichlorobenzene		<0.24	<0.27	<0.26	<0.25	8.76	1.67
1,2,4-trimethylbenzene		<0.16	0.22	<0.16	0.47	31	31
1,2-dichlorobenzene		<0.30	<0.33	<0.32	<0.31	876	876
1,2-dichloroethane		<0.22	<0.24	<0.23	0.23	0.47	0.47
1,2-dichloropropane		<0.16	<0.18	<0.17	1.0	1.22	1.22
1,2-dichloro-1,1,2,2-tetrafluoroethane		<0.21	<0.23	<0.22	<0.22	131,400	131,400
1,3,5-trimethylbenzene		<0.14	<0.15	<0.15	0.18	438	175
1,3-butadiene		<0.053	<0.058	<0.055	<0.054	0.41	0.07
1,3-dichlorobenzene		<0.13	<0.14	<0.13	<0.13	876	876
1,4-dichlorobenzene		<0.14	<0.15	<0.14	<0.14	1.11	1.11
2-butanone (MEK)		0.34	1.3	3.0	8.2	21,900	21,900
2-hexanone		<0.35	<0.38	0.46	<0.36	131	131
4-ethyltoluene		<0.17	0.20	<0.18	0.37		
4-methyl-2-pentanone (MIBK)		<0.12	0.32	0.16	1.9	13,140	13,140
acetone		2.5	5.6	11	20	135,780	135,780
acrylonitrile		<1.8	<1.9	<1.8	<1.8	0.18	0.04
benzene		0.49	0.42	0.37	0.84	1.56	0.42
benzyl chloride		<0.18	<0.20	<0.19	<0.18	0.25	0.25
bromodichloromethane		<0.17	<0.18	<0.18	<0.17	0.33	0.33
bromoform		<0.31	<0.34	<0.33	<0.32	11.1	11.1
bromomethane		<0.98	<1.1	<1.0	<1.0	21.9	21.9
carbon disulfide		<0.20	<0.22	<0.21	<0.46	3,066	3,066
carbon tetrachloride		0.38	<0.10	0.46	0.40	2.0	0.29
chlorobenzene		<0.19	<0.21	<0.20	<0.19	219	219
chloroethane		<0.34	<0.37	<0.36	<0.35	43,800	43,800
chloroform		<0.16	<0.18	<0.17	0.21	0.53	0.53
chloromethane		1.1	1.1	1.2	1.4	394	394
cis-1,2-dichloroethene		<0.19	<0.20	<0.19	<0.19	35.0	35.0
cis-1,3-dichloropropene		<0.16	<0.17	<0.16	<0.16	3.05	0.76
cyclohexane		<0.095	0.24	<0.099	1.2	26,280	26,280

APPENDIX C-5 OUTDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDINGS 4806 AND 4807)
(Page 2 of 2)

Analyte	Sample Number	N3-4806OA1	N3-4806OA2	N3-4806OA3	N3-4806OA3[a]	IASL[b]	CA-IASL[c]
dibromochloromethane		<0.23	<0.25	<0.24	<0.24		350
dichlorodifluoromethane		2.6	2.6	2.4	2.6	438	438
ethanol		4.6	13	5.5	44	876	30,660
ethyl acetate		<3.0	<3.2	<3.1	29	307	307
ethylbenzene		<0.20	0.27	<0.21	1.1	4.88	4.88
ethylene dibromide (EDB)		<0.22	<0.24	<0.22	<0.22	0.02	0.02
hexachlorobutadiene		<0.44	<0.48	<0.46	<0.45	0.55	0.55
isopropyl alcohol		0.26	0.88	0.48	4.3	876	30,660
isopropylbenzene		<0.13	<0.14	<0.13	0.13	1,752	1,752
m- & p-xylene		0.29	0.77	0.16	3.3	438	438
methyl tert-butyl ether (MTBE)		<0.078	<0.086	<0.082	<0.080	46.9	46.9
methylene chloride		<0.26	<0.41	<0.26	<1.9	1,220	12.2
naphthalene		<0.095	<0.10	<0.099	<0.098	0.36	0.36
n-butylbenzene		<4.5	<4.9	<4.7	<4.6		767
n-heptane		<0.15	0.47	0.27	1.1		
n-hexane		0.16	0.60	0.17	1.3	3,066	3,066
o-xylene		<0.17	0.20	<0.18	1.8	438	438
p-isopropyl toluene		<4.5	<4.9	<4.7	<4.6		
propene		<0.38	<0.41	<0.39	<0.38	13,140	13,140
sec-butylbenzene		<4.5	<4.9	<4.7	<4.6		1,752
styrene		<0.071	0.12	<0.074	0.41	4,380	3,942
tetrachloroethene (PCE)		<0.30	<0.33	<0.32	1.2	46.9	2.1
tetrahydrofuran		<0.42	<0.45	<0.43	<0.42	8,760	8,760
toluene		0.58	2.4	0.45	15	21,900	1,314
trans-1,2-dichloroethene		<0.19	<0.21	<0.20	<0.20	876	350
trans-1,3-dichloropropene		<0.16	<0.17	<0.17	<0.16	3.05	0.76
trichloroethene (TCE)		<0.26	<0.29	<0.27	<0.27	2.98	2.98
trichlorofluoromethane		1.3	1.3	1.2	1.4	3,066	3,066
vinyl chloride		<0.093	<0.10	<0.097	<0.095	2.77	0.16

Notes:

All concentrations are presented in micrograms per cubic meter.

[a] Duplicate sample.

[b] See Table 2 for details.

[c] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level

IASL indoor air screening level

APPENDIX D

QUALITY ASSURANCE SUMMARY REPORT AND LABORATORY ANALYTICAL RESULTS

APPENDIX D
QUALITY ASSURANCE SUMMARY REPORT

D.1 INTRODUCTION

This quality assurance summary report (QASR) was prepared for the February 2016 indoor/outdoor ambient air and sub-slab soil gas samples at Site N3 Buildings 4806 and 4807 in NASA Armstrong Flight Research Center (AFRC) Operable Unit (OU) 6, located on the northwestern edge of Rogers Dry Lake at Edwards Air Force Base (AFB), California. The Building 4806/4807 sampling events include indoor/outdoor ambient air samples collected on 3 February 2016 and sub-slab soil gas samples collected on 4 February 2016. This QASR discusses the quality and usability of the definitive-level analytical data for the soil gas and ambient air samples collected during this sampling event.

The data for the soil gas and ambient air samples for this sampling event were reported as definitive-level data. The results indicate the overall high quality of the definitive-level data collected for this project. The completeness goal of 95 percent for analytical results was achieved.

Data review and validation were performed on the entire definitive-level data set. None of the definitive-level data) were qualified as rejected and approximately 3.2 percent were qualified as estimated for exceeding quality assurance objectives specified in the *Edwards AFB Base-wide Generic Uniform Federal Policy Quality Assurance Project Plan* (the G-QAPP) (AECOM 2014) for precision, accuracy, representativeness, comparability, and completeness (PARCC), as referenced in the *Vapor Intrusion Sampling Plan and Risk Assessment Work Plan, Operable Unit 6* (AECOM 2013) (the VIP Work Plan). For the 3.2 percent of the definitive-level data qualified for exceeding PARCC criteria, 2.3 percent were qualified due to exceedance of laboratory accuracy and precision criteria and 0.9 percent were due to matrix-related issues. The remaining definitive-level data met the PARCC criteria.

Definitive-level laboratory analyses were performed by Eurofins Air Toxics, Inc., of Folsom, California (EUTF) according to low level United States Environmental Protection Agency (EPA) Method TO-15 (TO15-SC-U) for volatile organic compounds (VOCs) in ambient air samples and sub-slab soil gas samples, and ASTM Method D1946 for helium in sub-slab soil gas samples. The analyses were performed according to the methods and requirements specified in the Edwards AFB Basewide

G-QAPP. The testing methods used, parameters and analytes reported, and reporting limits (RLs) required are listed in Table 15-1 and Appendix D-10 of the G-QAPP and Table 15-2 of the VIP Work Plan, with specific RLs and Method Detection Limits (MDLs) presented in the Appendix D tables.

The definitive-level analytical data provided by EUTF were reported in Air Force Civil Engineer Center (AFCEC) Level II (EPA Level 4) format. This included the Level I (EPA Level 3) data consisting of case narratives, completed chain-of-custody (COC) documentation, laboratory analysis results reporting forms, quality control (QC) summary forms, and preparation and instrument run logs, as well as the raw data generated from the analytical method performed. Raw data consist of sample calibration data, chromatograms, mass spectra, calculation sheets, and instrument generated quantitation reports and printouts. The data were also provided in electronic format by the laboratory in file formats specified by AECOM.

D.2 DATA VALIDATION

The definitive-level analytical data were validated according to the quality assurance (QA) requirements and control limits specified in the Edwards AFB Basewide G-QAPP. The validation was performed utilizing guidelines and procedures outlined in the *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review* (EPA/540/R-08/01 June 2008) and data validation procedures utilized by the Quality Assurance Section of EPA Region 9. The reviewer's professional judgment was used to evaluate data quality when called for in the Functional Guidelines and in instances with no clear policy or conflicting guidance on how the data should be qualified. EPA Level 3 (EPA Stage 2B) validation, which includes assessment of all QC results, completeness and internal consistency, and conformance with method requirements, was performed on 100 percent of the definitive-level analytical data collected for this data set. The data validation process was performed by the AECOM project chemist in San Jose, California.

Data validation is a systematic and independent process of reviewing and qualifying the definitive-level analytical data against an established set of criteria. Validation is performed to ensure the quality of the definitive-level data and to assess limitations on usability based on the PARCC parameters defined in the Edwards AFB Basewide G-QAPP, as well as to evaluate laboratory compliance with specified

methods and protocols. The following documentation and QC parameters were evaluated, as appropriate for each method.

- Case Narrative
- Data Summary Sheets
- Sample Custody
- Holding Times
- Initial and Continuing Calibrations
- Instrument Tunes
- Method Blanks
- Individual Canister Certifications
- Laboratory Control Sample (LCS) Recoveries
- Surrogate Recoveries for System Monitoring Compounds
- Internal Standards
- Target Compound Identification and Quantitation
- MDLs and RLs
- Instrument Run Logs
- Sample Preparation Sheets
- Field Duplicate Relative Percent Differences (RPDs)

Qualifiers were assigned by the reviewer to all definitive-level data that failed to meet specified analytical and QC criteria. No data were qualified with the "R" qualifier as rejected and considered unusable. Data qualified with the "J" qualifier are considered estimated and usable for decision-making purposes. "J+" indicates the possibility that the result may be biased high, and that the actual chemical concentration may be lower than the reported result. No data were qualified "J-" to indicate that the possibility that the result may be biased low, and that the actual chemical concentration may be higher than the reported result or detection limit reported for a nondetected result. Blank-qualified results are qualified with the "UJ" qualifiers and the "U" qualifier is included before the "J" qualifier where applicable for non-detected results. Additional codes indicate the reason for data qualification. A list of these qualifiers and their descriptions is provided in Section D.5.

D.2.1 CHAIN-OF-CUSTODY

The quality of the analytical data collected is highly dependent on the integrity of the samples from site collection to laboratory receipt and eventual analysis. The COC records are an integral link in the legal documentation intended to ensure this integrity. Review of the completed COC records includes all entries for custody signatures and dates, sample description, sample collection times and dates, sample

container types and preservatives, analyses requested, and condition of the sample containers upon receipt at the laboratory.

The sample coolers and containers used in this project were received sealed and intact by the project laboratories. All of the samples were collected in appropriate containers. The COC records were properly signed and dated.

D.2.2 CASE NARRATIVE

The case narratives included with the data packages for all of the sample delivery groups provide a summary and additional information on method, matrix, and QA problems encountered during the analytical process.

D.2.3 HOLDING TIMES

Technical holding times are the maximum allowable times between sample collection and sample preparation or extraction (if applicable) and analysis, and include sample preservation requirements. Technical holding time criteria are derived from requirements specified for the analytical methods used and are specified in Table 19-1 of the Edwards AFB Basewide G-QAPP. Note that a 30-day holding time was applied for the TO-15 analyses instead of the 14 days listed in Table 19-1 per the analytical method and laboratory statement of work for the analytical method. The analyses for 7 samples were performed 15 days after sample collection and the analyses for 3 samples were performed 16 days after sample collection. The analyses meet technical requirements, including those specified by California Department of Toxic Substances control (CA DTSC), for samples collected in passivated stainless canisters (e.g., Summa canisters); therefore, the data are considered to be acceptable and were not qualified for holding time exceedances. The quality of the data is not considered to be affected.

Holding times are evaluated by comparing the sample collection dates and sample preservation information on the COC records with the sample preparation, extraction, and analysis dates and information shown on the laboratory summary reports, extraction logs, or analysis run logs. When holding time criteria are exceeded, all detected results are estimated and qualified as “J/UJ” (reason code “3”). If sample integrity and temperature are maintained and the holding time is not grossly exceeded (exceeded by more than two times), nondetected results for stable analytes are qualified as

"J/UJ" (reason code "3"). If the holding time is grossly exceeded, nondetected results for stable or unstable or volatile analytes such as VOCs by EPA Method TO-15 may be rejected and qualified as "R" (reason code "2").

None of the definitive-level data were qualified as estimated or rejected for holding time related problems.

D.2.4 INSTRUMENT PERFORMANCE CRITERIA

In order to ensure the validity of data generated, several analytical methods specify instrument performance criteria that must be met before sample analysis can proceed. These methods include the gas chromatography/mass spectrometry (GC/MS) analyses of VOCs by EPA Method TO15-SC-U.

The GC/MS performance checks are performed to ensure acceptable mass resolution, correct identification and relative abundance of ions, and acceptable instrument sensitivity, as specified in Worksheet 28 of the Edwards AFB Basewide G-QAPP. For each analytical method, conformance is demonstrated by analyzing a standard material and meeting specified criteria. Failure to meet the GC/MS instrument performance criteria results in the qualification of the data as either estimated "J/UJ" (reason code "7") or rejected and considered unusable and flagged as "R" (reason code "5") depending on the severity of the problem.

Conformance with the instrument performance criteria is verified by reviewing the appropriate QA summary forms and raw data when available. There were no definitive-level data qualified as either estimated or rejected due to GC/MS instrument performance results.

D.2.5 CALIBRATION

Calibration criteria ensure that the analytical instruments are capable of producing accurate and reproducible data. The Edwards AFB Basewide G-QAPP specifies the calibration procedures that must be followed, the calibration frequency requirements, and the acceptance criteria that must be met to demonstrate satisfactory conformance based on requirements in the methods and other guidance documents. Worksheet 28 of the Edwards AFB Basewide G-QAPP summarizes the calibration procedures and criteria used by the laboratories.

The initial calibration demonstrates that the system is capable of producing acceptable data at the beginning of the analytical sequence utilizing linear response with an acceptable correlation coefficient (r) for the calibration curve. For GC/MS analyses, review of the initial calibration also includes evaluation of the relative response factor (RRF), percent relative standard deviation (percent RSD) of the RRFs, and retention times for each analyte in the target list.

When the initial calibration (ICAL) correlation coefficient (r) or the percent RSD is not within control limits for an analyte or compound, or if the RRF does not meet the minimum criterion of 0.05, associated results are estimated and qualified as "J/UJ" (reason code "7"). If the correlation coefficient or the percent RSD is grossly outside of control limits (r less than 0.980 or RSD greater than two times the control limit), or if the RRF does not meet the minimum criterion of 0.01, associated nondetected results are rejected and qualified as "R" (reason code "8") unless each result can be demonstrated to fall within an acceptable portion of the calibration curve for detected results, or unless the response can be demonstrated to be adequate at the limit of detection for nondetected results. Such results and detected results associated with initial calibrations grossly outside control limits are estimated and qualified as "J/UJ" (reason code "7").

Initial calibration verification (ICV) samples for inorganic methods and continuing calibration verification (CCV) standards for all methods are performed by analyzing standards of known concentration at the frequency specified for each analytical method used. Acceptable recoveries of the ICVs and CCVs indicate conformance with the analytical requirements. For GC/MS analyses, continuing calibration review includes the evaluation of the RRF and the percent difference (percent D) between the RRF of the continuing calibration standard and the average RRF of the initial calibration curve, or the percent drift (also referred to as percent D) between the true and reported concentrations of the CCV. Results associated with ICVs or CCVs outside of specified control limits are estimated and qualified as "J/UJ" (reason code "7") if detected or not grossly outside of QC limits, or rejected and qualified as "R" (reason code "8") if nondetected and grossly outside of QC limits, according to EPA guidelines.

None of the definitive-level data were qualified as estimated or rejected due to exceeded calibration criteria.

D.2.6 FIELD AND LABORATORY BLANKS

Contamination may occur in various stages of the sample collection and laboratory analytical processes, which can affect the validity of the data collected. The results from the analyses of field and laboratory blanks indicate the presence and magnitude of the contamination. The QC requirements and the frequency of collection are specified in the field sampling plan for this project, and are summarized in Worksheet 28 of the Edwards AFB Basewide G-QAPP and Table 28-1 of the VIP Work Plan.

Equipment blanks are used to evaluate the cleanliness of the sampling devices used and reflect the efficiency of the decontamination procedures employed in the field. They are prepared by collecting analyte-free gas passed through the sampling device into an appropriate sample container. Equipment blanks are used for reusable sampling equipment. Equipment blanks were not used for these sampling events as equipment blanks are used for reusable sampling equipment and all samples were collected using dedicated or disposable equipment. Individual Canister Certifications, which met requirements that all analytes be less than the RL, were provided by the laboratory, and were evaluated on the same basis as sample-specific equipment blanks.

Trip blanks are used to evaluate sample VOC contamination that may occur while the samples are in transit from the sampling site to the laboratory. They are prepared in the laboratory and are shipped to the sampling site where they remain unopened. Trip blanks accompany all samples for volatile analyses in the sample coolers in the field, and remain with those samples until returned to the laboratory with each shipment of samples requiring volatile analyses. Trip blanks were not used for these sampling events, as trip blanks are not applicable to samples collected in Summa™ canisters.

Blanks used to evaluate laboratory contamination consisted of method and calibration (laboratory) blanks. One method blank is extracted and analyzed with each analytical batch of 20 samples or less. Laboratory blanks are analyte-free solutions used to evaluate the cleanliness of the analytical instruments during the analytical runs. Method and calibration blanks are analyzed with each analytical sequence according to frequency requirements specified in Worksheet 28 of the Edwards AFB Basewide G-QAPP and Table 28-1 of the VIP Work Plan for the analytical method used.

Whenever blank contamination is detected, the analytical data for the associated samples are evaluated to determine if data needs to be qualified. Sample results less than 5 times (10 times for organic

common laboratory contaminants) the maximum level found in the associated blanks are qualified according to the blank qualification rules.

Blank-qualified results are considered to be nondetected at the reported concentration; therefore, the "U" qualifier is included with the "J" qualifier according to the blank qualification rules. Results qualified for laboratory blank contamination are estimated and qualified as "UJ" (reason code "1"); results qualified for field, trip, or equipment blank contamination or for detections in individual canister certifications are qualified as "UJ" (reason code "B"). If, in the data reviewer's professional judgment, a result for a laboratory contaminant reported at less than 5 times (10 times for organic common laboratory contaminants) the maximum level found in the associated blank is judged to be actually representative of the concentration of that compound in the sample, the result may be blank-qualified as "J+ 1" or "J+ B" without the "U" qualifier. For the common laboratory contaminants acetone and methylene chloride by EPA Method TO-15, results less than the RL may be blank-qualified as "UJ" (reason code "b") and results greater the RL but less than 5-times the RL may be blank-qualified as "J+" (reason code "b") using professional judgment if the validator considers the results to be potential false positives or biased high due to common laboratory contamination.

Approximately 2.9 percent of the definitive-level data were qualified due to blank contamination. The trace results (results detected below the RL) for isopropanol in 7 soil gas samples, methylene chloride in 9 indoor air samples and 3 outdoor air samples, and n-hexane in 8 soil gas samples by EPA Method TO15-SC-U were blank-qualified "UJ 1a" and the low concentration results less than 5-times the RL for isopropanol in 2 soil gas samples and methylene chloride in 1 outdoor air sample were blank-qualified "UJ 1" due to laboratory blank contamination. These results should be considered non-detected at the reported concentrations.

In addition, the low concentration results less than 3-times the RL for acetone in 2 outdoor air samples and less than 5-times the RL for ethanol in 1 indoor air sample were blank-qualified "J+ 1" due to laboratory blank contamination. These results should be considered as potentially biased high due to laboratory contamination.

The trace results for carbon disulfide in 1 indoor air sample and one outdoor air sample were blank-qualified "UJ Ba" due to trace canister certification detections. The trace results for the common

laboratory contaminants acetone in 9 soil gas samples and methylene chloride in 1 soil gas sample by EPA Method TO15-SC-U were blank-qualified "UJ ba" as common laboratory contamination. These results should be considered non-detected at the reported concentrations.

The low concentration results less than 3-times the RL for the common laboratory contaminants acetone in 1 soil gas sample and methylene chloride in 1 indoor air sample by EPA Method TO15-SC-U by EPA Method TO15-SC-U were qualified "J+ b" using professional judgment. These results should be considered as potentially biased high due to laboratory contamination.

All blank detections were at very low concentrations and blank-qualified results were less than project action levels and less than the RL, with several results less than 5-times the RL that were qualified for potential high bias. Therefore, the blank-qualifications are not expected to significantly affect project objectives.

D.2.7 SYSTEM MONITORING COMPOUNDS (SURROGATES)

Surrogate standards are used in most organic analyses to help evaluate the accuracy of the data collected. Surrogates are compounds that are not included in the target analyte list and are not expected to be present in environmental samples. A known concentration of the surrogate compound is added to all standards, blanks, and samples before preparation and analysis, and the recovery of the compound is compared to control limits specified in the Edwards AFB Basewide G-QAPP for each organic method to evaluate the performance of the analytical system and determine if there is any matrix interference affecting the method performance. The surrogate compounds and acceptance criteria for each method and matrix are shown in Worksheet 28 of the Edwards AFB Basewide G-QAPP. Samples with unacceptable surrogate recoveries are reanalyzed if possible. If the results of the reanalysis are still outside the limits and acceptable surrogate recoveries are obtained in the method blank and laboratory control sample (LCS) analyses, the problem is attributed to matrix effects.

Nondetected results for samples with surrogate recoveries less than 10 percent are rejected and qualified as "R" (reason code "1") and detected results for samples with surrogate recoveries less than 10 percent are estimated and qualified as "J-" (reason code "5L"). Results for samples with surrogate recoveries less than the lower control limit (LCL), but greater than 10 percent, are qualified as "J-"

(reason code “4L”). Detected results for samples with surrogate recoveries greater than the upper control limit (UCL) are qualified as “J+” (reason code “4K”).

None of the definitive-level data were qualified as estimated or rejected due to surrogate recoveries outside the acceptance criteria.

D.2.8 MATRIX SPIKE/MATRIX SPIKE DUPLICATES (MS/MSD)

Matrix-specific accuracy is evaluated using MS/MSD recoveries. Matrix spike samples are actual environmental samples spiked with known concentrations of analytes, which are processed like regular samples. The MS/MSD recoveries are indicators of interference specific to the sample matrix. Such interference includes the possibility of instrument response suppression or enhancement due to chemical or physical interference, and digestion or extraction efficiency for the sample matrix. When MS/MSD recoveries are outside the control limits and LCS results are acceptable, matrix-related interference is indicated. Acceptance criteria for MS/MSD recoveries are established for each method by matrix, and are shown in Worksheet 28 of the Edwards AFB Basewide G-QAPP.

Only the results for the parent sample are associated and qualified for data with outlying MS/MSD results. However, by using professional judgment, the validator may, on a case-by-case basis, assign qualifiers to all samples associated with the MS/MSD exceedances. If exceedances in recoveries or RPDs are due to dilution of the MS/MSD, no qualifiers will be assigned. Nondetected organic results in the parent QC sample are rejected and qualified as “R” (reason code “M1”) and detected organic results are estimated and qualified as “J-” (reason code “M1”) for MS and/or MSD percent recoveries less than 10 percent. Nondetected inorganic results associated with MS/MSD recoveries less than 30 percent are rejected and qualified as “R” (reason code “M1”). Detected inorganic results associated with MS/MSD recoveries less than 10 percent are estimated and qualified as “J-” (reason code “M1”). All remaining organic and inorganic results not within specified control limits are estimated and qualified as “J-” (detects) or “UJ-” (non-detects) (reason code “M1”).

Matrix spike analyses were not performed as they are not applicable to samples collected in Summa™ canisters, as specified for EPA Method TO-15 in the Edwards AFB Basewide G-QAPP.

D.2.9 LABORATORY CONTROL SAMPLES

Laboratory accuracy is evaluated using LCS recoveries. LCSs are reagent water or contamination-free soil or sand spiked with known concentrations of analytes that are processed like regular samples. Since LCSs are matrix interference free, they are indicators of laboratory and method performance. Acceptance criteria for LCS recoveries are established for each method by matrix, and are shown in Worksheet 28 of the Edwards AFB Basewide G-QAPP and Table 12-2 of the VIP Work Plan.

Nondetected results associated with LCS recoveries less 10 percent for organic analyses or less than 40 percent for aqueous inorganic analyses are rejected and qualified as "R" (reason code "3"). Nondetected results for analyses associated with LCS recoveries less than the LCL and greater than 10 percent for organics or 50 percent for inorganics are qualified as "UJ-" (reason code "8"). Detected results associated with LCS recoveries outside of specified control limits are qualified as "J-" or "J+" (reason code "8").

Five sample results (approximately 0.3 percent of the definitive level data) were qualified as estimated and none of the data were qualified as rejected due to LCS or LCSD recoveries outside the acceptance criteria. The detected results for naphthalene in 5 soil gas samples by EPA Method TO15-SC-U were qualified as estimated (J+ 8) due to a slightly high LCSD recovery (the LCS was acceptable). The results may be biased slightly high.

D.2.10 LABORATORY DUPLICATE PRECISION

Laboratory precision is evaluated using the RPDs between results for the analysis of laboratory duplicate samples for vapor analyses by EUTF. MS/MSD analyses are not performed for vapor samples; therefore, LCS/LCSD results are evaluated. RPDs are compared with acceptance criteria specified for each method, analyte, and matrix in Worksheet 28 of the Edwards AFB Basewide G-QAPP for LCS/LCSDs. For laboratory duplicate RPDs outside of control limits, associated detected sample results are estimated and qualified as "J" (reason code "Md"). For LCS/LCSD analyses RPDs outside of control limits, associated detected sample results are estimated and qualified as "J" (reason code "d"). Non-detected results are not qualified for high RPDs in QC samples with mid-range spikes. For LCS/LCSDs, all sample results from the same preparation and/or analytical batch are associated and estimated if RPD criteria are exceeded.

None of the data were qualified due to laboratory duplicate or LCS/LCSD analyses.

D.2.11 FIELD DUPLICATE PRECISION

Field precision is evaluated for definitive-level data using field duplicate samples for ambient air and soil gas samples. Field duplicate samples are collected at an approximate frequency of 10 percent of the original number of samples per matrix and method on a project-wide basis (rather than a sampling-round or site-specific basis). The field duplicate samples were analyzed for all requested methods, and the results compared with established acceptance criteria specified for each method, analyte, and matrix, as presented in Worksheet 28 of the Edwards AFB Basewide G-QAPP.

For this sample event, 1 field duplicate soil gas sample was collected for 9 parent soil gas samples for EPA Method TO15-SC-U and ASTM Method D1946 (11.1-percent frequencies) and 2 field duplicate ambient air samples were collected for 12 parent indoor and outdoor ambient air samples for EPA Method TO15-SC-U (16.7-percent frequency). The field duplicate results were compared with established acceptance criteria specified for each method, analyte, and matrix, as presented in Worksheet 28 of the Edwards AFB Basewide G-QAPP.

All results for the soil gas field duplicate sample and indoor air ambient air field duplicate sample were within specified criteria. All results for the outdoor ambient air field duplicate sample were within specified criteria, with the following exceptions. The results for 14 VOCs exceeded specified criteria of less-than 45 RPD or difference less than the RL for results less than 5-times RL in outdoor ambient air field duplicate sample pair N3-4806OA3-VS3 and N3-4806OA3-VS203. The results that exceeded field duplicate sample criteria are presented below.

Field Duplicate Samples: N3-4806OA3-VS3 / N3-4806OA3-VS203
Sampling Date: 3 February 2016
Matrix: Ambient Air
Units: $\mu g/M^3$

Analyte	Result 1	Result 2	RL	Difference	RPD	QC Limits (RPD/Difference)
acetone	11	20	2	N/A	58.06	<45 RPD/<1xRL
2-butanone (MEK)	3.0	8.2	2.5	5.2	N/A	<45 RPD/<1xRL
cyclohexane	ND<0.099	1.2	0.58	1.2	N/A	<45 RPD/<1xRL
ethanol	5.5	44	1.6	N/A	156	<45 RPD/<1xRL
ethyl acetate	ND<3.1	29	3.1	N/A	161*	<45 RPD/<1xRL
ethylbenzene	ND<0.21	1.1	0.74	1.1	N/A	<45 RPD/<1xRL
n-heptane	0.27	1.1	0.70	0.83	N/A	<45 RPD/<1xRL
n-hexane	0.17	1.3	0.60	1.13	N/A	<45 RPD/<1xRL
isopropanol	0.48	4.3	2.1	3.82	N/A	<45 RPD/<1xRL
4-methyl-2-pentanone	0.16	1.9	0.70	1.74	N/A	<45 RPD/<1xRL
methylene chloride	0.26	1.9	1.2	1.64	N/A	<45 RPD/<1xRL
toluene	0.45	15	0.64	14.55	188	<45 RPD/<1xRL
m- & p-xylene	0.16	3.3	0.74	3.14	N/A	<45 RPD/<1xRL
o-xylene	ND<0.18	1.8	0.74	1.8	N/A	<45 RPD/<1xRL

* RPD calculated using detected result and detection limit for non-detect.
1xRL = 1-Time the RL
NA = Not applicable
ND = Non-detected (less than MDL, or RL for certain non-standard VOCs for which MDLs not available.
RPD = Relative percent difference

According to the data validation standard operating procedure (SOP) referenced in the G-QAPP (EAFB Data Validation Procedure QA-9), data are not qualified due to field duplicate results (Section 6.4.10 - Field Duplicates). For the results for the VOCs presented above for duplicate sample results, no qualifiers were applied, per the data validation SOP. Note that with the exceptions of ethanol, ethyl acetate, and toluene, the outliers were not significantly greater than the specified criteria. All other field duplicate sample results met the specified criteria.

For the definitive-level data for this data set, 93.1-percent compliance with the precision criteria presented in Worksheet 28 of the Edwards AFB Basewide G-QAPP was achieved for all reported results for the field duplicate samples, demonstrating acceptable field and laboratory precision.

D.2.12 INTERNAL STANDARDS

For GC/MS analyses by EPA Method TO-15, internal standard area counts are monitored to ensure that GC/MS sensitivity and response are stable during the analysis. For GC/MS by TO-15, the area counts

of the internal standards in the sample must fall within 60-140 percent of the internal standard area counts in the calibration verification standard for the 12-hour tune period. In addition, the retention times of the internal standards in the sample must be within ±30 seconds of the retention times in the calibration standard. Nondetected results associated with extremely low internal standard area counts or internal area counts abruptly dropping off indicating severe loss of sensitivity are considered rejected and qualified as "R" (reason code "7"). Results associated with area counts not within the specified control limits are estimated and qualified as "J" (reason code "M3").

None of the definitive-level data were qualified as rejected or estimated due to associated internal standard results outside the acceptance criteria.

D.2.13 ANALYTE IDENTIFICATION

Qualitative criteria for identifying target analytes were established to minimize the possibility of reporting false positives and false negatives. Most of the identification criteria are directed toward ensuring that a compound is positively identified, and thus toward preventing false positives.

For GC/MS methods, compound identification is made based on comparison of the relative retention times (RRTs) of the chromatographic peaks for the sample and calibration standards, then on comparison of the sample mass spectra against reference mass spectra for each potential target compound. For EPA Method TO-15, positive identification is made when all of the following criteria are met: a) all ions present in the reference mass spectrum at relative intensity greater than 10 percent are also present in the sample mass spectrum; b) the relative intensities of these ions in the reference and sample mass spectra agree to within 20 percent; c) all ions greater than 10 percent in the sample mass spectrum but not in the reference mass spectrum are accounted for; and d) the compound elutes within ±0.06 RRT units of the RRT for that target compound in the calibration standards. Review of the summary forms and data for GC/MS analyses did not show any problems associated with correct analyte identification for EPA Method TO-15.

Results for which compound or analyte identification is considered to be questionable are estimated as presumptively identified and qualified as "NJ." Examples may include retention times for either column in GC methods not within specified limits, percent differences greater than 50 percent between GC

primary and confirmation columns, isotopic ratios exceeding specified control limits, or other reasons a compound or analyte is believed to be misidentified.

None of the definitive-level data were qualified as estimated due to analyte uncertainty.

D.2.14 ANALYTE QUANTITATION

When compound or analyte quantitation is considered questionable, results are estimated and qualified as "J" (reason code "q") indicating that the results may be quantitatively uncertain. Examples may include unaccountable differences in results between dilutions, related results that do not add up, percent differences greater than 50 between GC primary and confirmation columns, or other reasons for quantitative uncertainty. In addition, usable results quantitated and reported from above the demonstrated calibration range of an instrument are qualified as "J" (reason code "2").

None of the definitive-level data were qualified as estimated due to analyte quantitation.

D.2.15 REPORTING OF RESULTS AND DETECTION LIMITS

All analytical results and RLs are adjusted for dilutions resulting from the preparation procedures required by the method and sample-specific stoichiometric factors for each canister or to get the result for a compound or analyte within the calibration range of the instrument. Note that the 1.45 to 1.96-time sample-specific dilution factors (with one 3.42-time factor) for ambient air samples differed from the 1.75-time factor for ambient air samples and the 2.01 to 2.55-time sample-specific dilution factors for soil gas samples differed from the 2.6-time factor for soil gas samples provided by the laboratory and presented in the Appendix D tables. The differences in dilution factors result in slightly different RLs and MDLs as presented in the Appendix D tables.

For the definitive-level data, analytical results that are reported as non-detected are reported as non-detected at the MDL (unless no MDL is established, in which case non-detected results are reported at the reporting limit). For the current data set, no MDLs were established for 1,1,1,2-tetrachloroethane, acrylonitrile, ethyl acetate, n-butylbenzene, p-isopropyltoluene, and sec-butylbenzene, as EUTF considered these to be non-standard analytes).

Results reported at or above the MDL, but below the RL, are reported by the analytical laboratories. Such trace results are considered estimated due to quantitative uncertainty near the limit of detection, and are qualified as "J" by the laboratory. The reason code "a" is added to the database and is included with the reason codes for qualified data for trace results, but the results are not qualified with a validation "J" qualifier as these qualifications do not indicate analytical problems, and are not included in the calculation of qualification percentages.

For the definitive-level data, approximately 20.0 percent of the definitive-level data were qualified with the laboratory "J" qualifier and "a" validation reason code. These qualifications do not indicate analytical problems, do not affect the PARCC objectives, and are not included in calculation of data qualification percentages for PARCC parameters.

D.2.16 METHOD COMPLIANCE AND ANALYTICAL PERFORMANCE

In addition to the QC parameters discussed above, additional method and QC parameters are evaluated as part of the full data validation process. These parameters are used to assess the laboratory's performance and compliance with the analytical method requirements. The laboratory met the performance criteria specified under each method used.

In addition, for the sub-slab soil gas sampling, helium was used as a tracer gas for leak detection within the shrouds surrounding the sub-slab soil gas sampling points. If the concentration of the tracer compound in the purge sample is greater than or equal to five percent of the tracer compound concentration in the shroud, corrective action is necessary. All helium results were non-detected or reported at less than five percent of the tracer compound concentration in the shroud and were therefore below the corrective action threshold. The field sampling protocols were confirmed and are considered valid per the guidelines, therefore all leak detection objectives were met, and no data were qualified for helium detections.

D.3 PARCC EVALUATION SUMMARY

The following sections discuss the overall definitive-level data quality in terms of the PARCC goals established for this project.

D.3.1 PRECISION

Precision measures the reproducibility of the experimental value for the same parameter in the same sample under the same conditions. The parameters evaluated to assess precision during the data validation process are the RPDs for field duplicates. The RPDs were compared against established acceptance criteria specified for each method, analyte, and matrix presented in Worksheet 28 of the Edwards AFB Basewide G-QAPP.

For these sample events, field duplicate soil gas samples were collected at a frequency of 16.7 percent and field duplicate ambient air samples were collected at a frequency of 11.1 percent. The field duplicate results were compared with established acceptance criteria specified for each method, analyte, and matrix, as presented in Worksheet 28 of the Edwards AFB Basewide G-QAPP.

All results for the soil gas and indoor ambient air field duplicate samples were within specified criteria. All results for the outdoor ambient air field duplicate samples were within specified criteria, with the exception of the results for 14 VOCs, as presented in Section D.2.11.

For the definitive-level data, 93.1-percent compliance with the precision criteria presented in Worksheet 28 of the Edwards AFB Basewide G-QAPP was achieved for all reported results for the field duplicate samples, demonstrating acceptable field and laboratory precision.

D.3.2 ACCURACY

One of the major objectives of the data validation process is to evaluate the accuracy of the definitive-level data collected. Accuracy measures the deviation between the reported or experimental value and the true value. To assess accuracy, known concentrations of the analytes of interest are spiked into samples and percent recoveries of the spiked analytes are calculated. The parameters evaluated to assess accuracy during the data validation process include surrogate recoveries where applicable, and LCS recoveries. Additional factors affecting accuracy such as calibration, analyte identification and quantitation are also reviewed.

The surrogate recoveries are indicators of interference specific to the sample matrix. LCS/LCSD recoveries are indicators of laboratory performance. Spike, surrogate, calibration, quantitation problems (including blank-qualifications), and other accuracy-related parameters resulted in rejection of

none percent of the definitive-level data and estimation of approximately 2.3 percent definitive-level data.

For the definitive-level data, of the 2.3 percent of the data qualified as estimated for accuracy-related parameters, all were qualified due to exceeded laboratory accuracy criteria and none of the qualifications were due to matrix interference. The remaining data met the accuracy criteria.

D.3.3 REPRESENTATIVENESS

Representativeness measures how accurately the sample data reflect the actual media and environmental conditions being measured. Sampling locations that were representative of the medium being sampled were chosen. Sampling protocols were developed to ensure that samples collected represented the actual medium and that no contamination was introduced during sample collection. Proper sample handling and preservation protocols were observed in the field to ensure that the samples maintained their integrity while being collected and transported to the laboratory for analysis.

The protocols followed by the field crew while collecting the samples are described in the Edwards AFB Basewide G-QAPP (AECOM 2014) and the *Vapor Intrusion Sampling Plan and Risk Assessment Work Plan, Operable Unit 6* (AECOM 2013).

D.3.4 COMPLETENESS

Completeness is defined as the percentage of the definitive-level data that are within the acceptance criteria for a given data set and are, therefore, considered valid. Completeness is measured by comparing the total number of acceptable data points (valid data) against the total number of data points reported. Valid or acceptable data consist of analytical results that met all the QC acceptance criteria and analytical results that were estimated and qualified as "J" and can still be used for their intended purpose.

The definitive-level data reviewed for this project showed a technical completeness of 100 percent, exceeding the project completeness goals of 95 percent for the analytical portion and 90 percent for the project as a whole, as specified in the Edwards AFB Basewide G-QAPP. No critical samples were identified for this sampling event.

D.3.5 COMPARABILITY

Comparability reflects the internal consistency of the measurements and how well the definitive-level data set can be compared to another data set generated by a different organization. The generation of comparable data requires the use of certified or approved laboratories and established and widely accepted protocols that produce comparable results. Review of the data generated by the laboratory for this project indicate the use of approved and nationally accepted sampling and testing methods approved by the EPA, National Environmental Laboratory Accreditation Program (ELAP), California ELAP, and AFCEC, thereby ensuring a high degree of comparability. Analytical methods used for the special analytical services are proprietary methods based on modifications of testing methods approved by the EPA.

D.4 DATA QUALITY AND USABILITY

The data review and validation performed on the entire definitive-level data set indicate the overall high quality of the definitive-level data collected for this project.

None of the definitive-level data were qualified as rejected and approximately 3.2 percent were qualified as estimated for exceeding PARCC parameters. Of the 3.2 percent of the data qualified as estimated, 2.3 percent were qualified due to exceedance of laboratory accuracy and precision criteria and 0.9 percent were due to matrix-related issues. The remaining definitive-level data met the PARCC criteria.

The data review included assessment of definitive-level data for compliance with the QA elements of the data quality objectives (DQOs) specified throughout the Edwards AFB Basewide G-QAPP. This includes achievement of DQOs related to sample collection, handling, labeling, and custody; analytical methods and procedures; laboratory data reduction, validation, reporting, and management; data package and electronic deliverables verification, validation, and assessment; and documentation and reporting. The compliance with the QA elements of the DQOs indicates a high level of confidence in the data, allowing the data to be used for its intended purposes within the constraints of the data qualifiers.

No data were qualified with the "R" qualifier as considered technically rejected and unusable. Data qualified with the "J" qualifier are considered estimated and usable within the constraints of the qualifiers for project decision-making purposes. Otherwise, the data as presented are of acceptable quality and can be used to support environmental decision-making.

D.5 DATA QUALIFIERS AND THEIR DEFINITIONS

The following data qualifiers were used by AECOM to qualify the laboratory data generated for this project. Most of these qualifiers were taken from *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review,* (EPA/540/R-08/01 June 2008) and *National Functional Guidelines for Inorganic Data Review* (EPA/540/R-04/004 October 2004), and the AFCEC Quality Assurance Project Plan (Version 4.0, July 2006). Most of the qualifiers taken from these references were modified and made more specific. Additional qualifiers were developed and used when required. Note that multiple reason codes may apply to data qualified for more than one QC parameter.

General Qualifiers:

U (not detected)	The analyte was tested for but was not detected above the detection limit for inorganic analyses, or the RL for organic analyses. This is added before qualifiers for all nondetected (ND) results.
UJ, UJ- (estimated)	The analyte is ND but the result is an estimate due to QC failure or data quality limitations. UJ- indicates detection limit may be biased low.
J, J+, J- (estimated)	The analyte is positively identified but the reported concentration is an estimate due to QC failure or data quality limitations. J+ indicates high bias, J- indicates low bias.
R (unusable)	The result is rejected due to QC failure or data quality limitations. The presence or absence of the analyte in the sample cannot be verified, or the reported result is so severely compromised as to be unusable.
N (unusable)	Presumptively identified. The compound identification is considered qualitatively uncertain.

Qualifiers With Reason Codes:

UJ 1	Qualified for laboratory blank contamination according to the blank qualification rules. Reported result is considered to be ND at the reported level, or at the RL for organic compounds reported at less than the RL; therefore, the "U" qualifier is included.
UJ B	Blank-qualified for canister certification contamination.
UJ b	Common laboratory contaminant not found in blank, sample result is less than the RL. Estimate to alert data user the result may be a laboratory artifact, or apply blank qualification rules as above if the contaminant is a demonstrated systemic contaminant.
J+1, J+b	Qualified for potential analyte contamination. Reported compound is considered to be present in sample, but may be biased high due to potential laboratory or field contamination.
J+ 8	LCS and/or LCSD greater than UCL, Detects.
a (Laboratory J)	Detected above the detection limit but less than the RL. Considered quantitatively uncertain.

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APPENDIX D-1 SUB-SLAB VAPOR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4806)

	Base		EDWRD			EDWRD			EDWRD		
	Site		AOC N3			AOC N3			AOC N3		
	Point		N3-4806SS1			N3-4806SS2			N3-4806SS3		
	Sampling Date		02/04/2016 13:40			02/04/2016 09:41			02/04/2016 08:40		
	Sample Depth		-			-			-		
	Sample Type		N1			N1			N1		
	Field Sample		N3-4806SS1-VS3			N3-4806SS2-VS3			N3-4806SS3-VS3		
	Lab Sample		1602168A-01A			1602168A-02A			1602168A-03A		
	Status		*Validated*			*Validated*			*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]
helium	D1946	% v/v	**0.049 J**	**a**	[0.0049, 0.12, 2.5]	**1.0**		[0.0050, 0.13, 2.55]	**1.0**		[0.0047, 0.12, 2.4]
acetone	TO15-U	ug/m^3	NDV 13 J	**UJ b,a**	[4.1, 30, 2.5]	NDV 9.0 J	**UJ b,a**	[4.2, 30, 2.55]	NDV 9.4 J	**UJ b,a**	[3.9, 28, 2.4]
acrylonitrile	TO15-U	ug/m^3	NDD		[11, 11, 2.5]	NDD		[11, 11, 2.55]	NDD		[10, 10, 2.4]
benzene	TO15-U	ug/m^3	**3.4 J**	**a**	[0.86, 4.0, 2.5]	**6.0**		[0.87, 4.1, 2.55]	**1.1 J**	**a**	[0.82, 3.8, 2.4]
benzyl chloride	TO15-U	ug/m^3	NDD		[1.9, 6.5, 2.5]	NDD		[1.9, 6.6, 2.55]	NDD		[1.8, 6.2, 2.4]
bromodichloromethane	TO15-U	ug/m^3	NDD		[1.4, 8.4, 2.5]	NDD		[1.5, 8.5, 2.55]	NDD		[1.4, 8.0, 2.4]
bromoform	TO15-U	ug/m^3	**3.1 J**	**a**	[1.8, 13, 2.5]	NDD		[1.8, 13, 2.55]	NDD		[1.7, 12, 2.4]
bromomethane	TO15-U	ug/m^3	NDD		[12, 48, 2.5]	NDD		[12, 50, 2.55]	NDD		[12, 47, 2.4]
1,3-butadiene	TO15-U	ug/m^3	NDD		[1.1, 2.8, 2.5]	NDD		[1.1, 2.8, 2.55]	NDD		[1.0, 2.6, 2.4]
2-butanone (MEK)	TO15-U	ug/m^3	NDD		[4.1, 15, 2.5]	NDD		[4.2, 15, 2.55]	NDD		[4.0, 14, 2.4]
n-butylbenzene	TO15-U	ug/m^3	NDD		[27, 27, 2.5]	NDD		[28, 28, 2.55]	NDD		[26, 26, 2.4]
sec-butylbenzene	TO15-U	ug/m^3	NDD		[27, 27, 2.5]	NDD		[28, 28, 2.55]	NDD		[26, 26, 2.4]
carbon disulfide	TO15-U	ug/m^3	NDD		[2.7, 16, 2.5]	NDD		[2.8, 16, 2.55]	NDD		[2.6, 15, 2.4]
carbon tetrachloride	TO15-U	ug/m^3	NDD		[1.9, 7.9, 2.5]	NDD		[1.9, 8.0, 2.55]	NDD		[1.8, 7.6, 2.4]
chlorobenzene	TO15-U	ug/m^3	**1.3 J**	**a**	[0.72, 5.8, 2.5]	NDD		[0.73, 5.9, 2.55]	NDD		[0.69, 5.5, 2.4]
chloroethane	TO15-U	ug/m^3	NDD		[2.6, 13, 2.5]	NDD		[2.7, 13, 2.55]	NDD		[2.5, 13, 2.4]
chloroform	TO15-U	ug/m^3	NDD		[1.1, 6.1, 2.5]	NDD		[1.1, 6.2, 2.55]	NDD		[1.0, 5.8, 2.4]
chloromethane	TO15-U	ug/m^3	NDD		[5.0, 26, 2.5]	NDD		[5.1, 26, 2.55]	NDD		[4.8, 25, 2.4]
cyclohexane	TO15-U	ug/m^3	**2.5 J**	**a**	[0.66, 4.3, 2.5]	**2.1 J**	**a**	[0.67, 4.4, 2.55]	**3.1 J**	**a**	[0.63, 4.1, 2.4]
dibromochloromethane	TO15-U	ug/m^3	NDD		[1.7, 11, 2.5]	NDD		[1.7, 11, 2.55]	NDD		[1.6, 10, 2.4]
1,2-dichlorobenzene	TO15-U	ug/m^3	**2.2 J**	**a**	[1.0, 7.5, 2.5]	NDD		[1.0, 7.7, 2.55]	NDD		[0.96, 7.2, 2.4]
1,3-dichlorobenzene	TO15-U	ug/m^3	**1.9 J**	**a**	[1.4, 7.5, 2.5]	NDD		[1.4, 7.7, 2.55]	NDD		[1.3, 7.2, 2.4]
1,4-dichlorobenzene	TO15-U	ug/m^3	NDD		[1.6, 7.5, 2.5]	NDD		[1.6, 7.7, 2.55]	NDD		[1.5, 7.2, 2.4]
dichlorodifluoromethane	TO15-U	ug/m^3	**4.0 J**	**a**	[1.3, 6.2, 2.5]	**3.3 J**	**a**	[1.4, 6.3, 2.55]	**3.0 J**	**a**	[1.3, 5.9, 2.4]
1,1-dichloroethane	TO15-U	ug/m^3	NDD		[0.69, 5.0, 2.5]	NDD		[0.71, 5.2, 2.55]	NDD		[0.66, 4.8, 2.4]
1,2-dichloroethane	TO15-U	ug/m^3	**0.96 J**	**a**	[0.85, 5.0, 2.5]	NDD		[0.86, 5.2, 2.55]	NDD		[0.81, 4.8, 2.4]
1,1-dichloroethene	TO15-U	ug/m^3	NDD		[2.2, 5.0, 2.5]	NDD		[2.3, 5.0, 2.55]	NDD		[2.1, 4.8, 2.4]
cis-1,2-dichloroethene	TO15-U	ug/m^3	NDD		[1.2, 5.0, 2.5]	NDD		[1.2, 5.0, 2.55]	NDD		[1.2, 4.8, 2.4]
trans-1,2-dichloroethene	TO15-U	ug/m^3	NDD		[0.73, 5.0, 2.5]	NDD		[0.74, 5.0, 2.55]	NDD		[0.70, 4.8, 2.4]
1,2-dichloropropane	TO15-U	ug/m^3	NDD		[1.3, 5.8, 2.5]	NDD		[1.3, 5.9, 2.55]	NDD		[1.2, 5.5, 2.4]
cis-1,3-dichloropropene	TO15-U	ug/m^3	NDD		[0.92, 5.7, 2.5]	NDD		[0.94, 5.8, 2.55]	NDD		[0.88, 5.4, 2.4]
trans-1,3-dichloropropene	TO15-U	ug/m^3	NDD		[1.0, 5.7, 2.5]	NDD		[1.0, 5.8, 2.55]	NDD		[0.96, 5.4, 2.4]
1,2-dichlorotetrafluoroethane	TO15-U	ug/m^3	NDD		[1.6, 8.7, 2.5]	NDD		[1.6, 8.9, 2.55]	NDD		[1.5, 8.4, 2.4]
1,4-dioxane	TO15-U	ug/m^3	NDD		[3.4, 18, 2.5]	NDD		[3.5, 18, 2.55]	NDD		[3.3, 17, 2.4]
ethanol	TO15-U	ug/m^3	**4.9 J**	**a**	[2.0, 9.4, 2.5]	**16**		[2.0, 9.6, 2.55]	**14**		[1.9, 9.0, 2.4]
ethyl acetate	TO15-U	ug/m^3	NDD		[18, 18, 2.5]	NDD		[18, 18, 2.55]	NDD		[17, 17, 2.4]
ethylbenzene	TO15-U	ug/m^3	NDD		[1.4, 5.4, 2.5]	**22**		[1.4, 5.5, 2.55]	**2.1 J**	**a**	[1.3, 5.2, 2.4]
ethylene dibromide (EDB)	TO15-U	ug/m^3	NDD		[1.8, 9.6, 2.5]	NDD		[1.9, 9.8, 2.55]	NDD		[1.8, 9.2, 2.4]

APPENDIX D-1 SUB-SLAB VAPOR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4806)

	Base		EDWRD			EDWRD			EDWRD		
	Site		AOC N3			AOC N3			AOC N3		
	Point		N3-4806SS1			N3-4806SS2			N3-4806SS3		
	Sampling Date		02/04/2016 13:40			02/04/2016 09:41			02/04/2016 08:40		
	Sample Depth		-			-			-		
	Sample Type		N1			N1			N1		
	Field Sample		N3-4806SS1-VS3			N3-4806SS2-VS3			N3-4806SS3-VS3		
	Lab Sample		1602168A-01A			1602168A-02A			1602168A-03A		
	Status		*Validated*			*Validated*			*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]
4-ethyltoluene	TO15-U	ug/m^3	**2.9 J**	**a**	[1.5, 6.1, 2.5]	**25**		[1.5, 6.3, 2.55]	**2.5 J**	**a**	[1.4, 5.9, 2.4]
n-heptane	TO15-U	ug/m^3	**9.0**		[2.3, 5.1, 2.5]	**7.4**		[2.3, 5.2, 2.55]	**2.7 J**	**a**	[2.2, 4.9, 2.4]
hexachlorobutadiene	TO15-U	ug/m^3	**12 J**	**a**	[8.2, 53, 2.5]	NDD		[8.4, 54, 2.55]	NDD		[7.9, 51, 2.4]
n-hexane	TO15-U	ug/m^3	NDV 3.8 J	**UJ 1,a**	[0.50, 4.4, 2.5]	NDV 1.6 J	**UJ 1,a**	[0.51, 4.5, 2.55]	NDD		[0.48, 4.2, 2.4]
2-hexanone	TO15-U	ug/m^3	NDD		[2.9, 20, 2.5]	NDD		[3.0, 21, 2.55]	NDD		[2.8, 20, 2.4]
isopropanol	TO15-U	ug/m^3	NDV 12	**UJ 1**	[2.0, 12, 2.5]	NDV 7.2 J	**UJ 1,a**	[2.1, 12, 2.55]	NDV 6.8 J	**UJ 1,a**	[1.9, 12, 2.4]
isopropylbenzene	TO15-U	ug/m^3	**1.2 J**	**a**	[1.0, 6.1, 2.5]	**3.1 J**	**a**	[1.0, 6.3, 2.55]	NDD		[0.96, 5.9, 2.4]
p-isopropyltoluene	TO15-U	ug/m^3	NDD		[27, 27, 2.5]	NDD		[28, 28, 2.55]	NDD		[26, 26, 2.4]
methyl tert-butyl ether (MTBE)	TO15-U	ug/m^3	NDD		[0.34, 4.5, 2.5]	NDD		[0.34, 4.6, 2.55]	NDD		[0.32, 4.3, 2.4]
4-methyl-2-pentanone (MIBK)	TO15-U	ug/m^3	NDD		[1.5, 5.1, 2.5]	NDD		[1.6, 5.2, 2.55]	NDD		[1.5, 4.9, 2.4]
methylene chloride	TO15-U	ug/m^3	NDD		[3.5, 43, 2.5]	NDD		[3.6, 44, 2.55]	NDD		[3.3, 42, 2.4]
naphthalene	TO15-U	ug/m^3	**0.70 J**	**J+ 8,a**	[0.59, 13, 2.5]	**0.70 J**	**J+ 8,a**	[0.61, 13, 2.55]	NDD		[0.57, 12, 2.4]
propene	TO15-U	ug/m^3	NDD		[2.8, 8.6, 2.5]	NDD		[2.8, 8.8, 2.55]	NDD		[2.7, 8.3, 2.4]
styrene	TO15-U	ug/m^3	**0.98 J**	**a**	[0.77, 5.3, 2.5]	NDD		[0.79, 5.4, 2.55]	NDD		[0.74, 5.1, 2.4]
1,1,1,2-tetrachloroethane	TO15-U	ug/m^3	NDD		[34, 34, 2.5]	NDD		[35, 35, 2.55]	NDD		[33, 33, 2.4]
1,1,2,2-tetrachloroethane	TO15-U	ug/m^3	NDD		[2.0, 8.6, 2.5]	NDD		[2.0, 8.8, 2.55]	NDD		[1.9, 8.2, 2.4]
tetrachloroethene (PCE)	TO15-U	ug/m^3	**9.2**		[1.5, 8.5, 2.5]	**18**		[1.5, 8.6, 2.55]	**16**		[1.4, 8.1, 2.4]
tetrahydrofuran	TO15-U	ug/m^3	NDD		[1.2, 3.7, 2.5]	NDD		[1.3, 3.8, 2.55]	NDD		[1.2, 3.5, 2.4]
toluene	TO15-U	ug/m^3	**3.8 J**	**a**	[0.57, 4.7, 2.5]	**71**		[0.58, 4.8, 2.55]	**8.2**		[0.54, 4.5, 2.4]
1,2,4-trichlorobenzene	TO15-U	ug/m^3	NDD		[6.3, 37, 2.5]	NDD		[6.4, 38, 2.55]	NDD		[6.0, 36, 2.4]
1,1,1-trichloroethane	TO15-U	ug/m^3	NDD		[1.3, 6.8, 2.5]	NDD		[1.3, 7.0, 2.55]	NDD		[1.3, 6.5, 2.4]
1,1,2-trichloroethane	TO15-U	ug/m^3	NDD		[2.2, 6.8, 2.5]	NDD		[2.3, 7.0, 2.55]	NDD		[2.1, 6.5, 2.4]
trichloroethene (TCE)	TO15-U	ug/m^3	**2.4 J**	**a**	[1.8, 6.7, 2.5]	NDD		[1.9, 6.8, 2.55]	NDD		[1.8, 6.4, 2.4]
trichlorofluoromethane	TO15-U	ug/m^3	**2.7 J**	**a**	[1.2, 7.0, 2.5]	**2.8 J**	**a**	[1.2, 7.2, 2.55]	**2.1 J**	**a**	[1.1, 6.7, 2.4]
1,1,2-trichlorotrifluoroethane	TO15-U	ug/m^3	NDD		[1.2, 9.6, 2.5]	NDD		[1.2, 9.8, 2.55]	NDD		[1.2, 9.2, 2.4]
1,2,4-trimethylbenzene	TO15-U	ug/m^3	**3.7 J**	**a**	[2.2, 6.1, 2.5]	**20**		[2.2, 6.3, 2.55]	NDD		[2.1, 5.9, 2.4]
1,3,5-trimethylbenzene	TO15-U	ug/m^3	NDD		[3.0, 6.1, 2.5]	**10**		[3.1, 6.3, 2.55]	NDD		[2.9, 5.9, 2.4]
vinyl chloride	TO15-U	ug/m^3	NDD		[0.69, 3.2, 2.5]	NDD		[0.71, 3.2, 2.55]	NDD		[0.66, 3.1, 2.4]
m- & p-xylene	TO15-U	ug/m^3	**3.9 J**	**a**	[1.0, 5.4, 2.5]	**83**		[1.0, 5.5, 2.55]	**7.2**		[0.99, 5.2, 2.4]
o-xylene	TO15-U	ug/m^3	**1.9 J**	**a**	[1.2, 5.4, 2.5]	**24**		[1.2, 5.5, 2.55]	**3.1 J**	**a**	[1.1, 5.2, 2.4]

Notes:

Qualifier definitions are presented in the QASR in Appendix D.

[(a)] See Table 2 for details.

% v/v percent volume/volume

QASR Quality Assurance Summary Report

ug/m3 micrograms per cubic meter

APPENDIX D-1 SUB-SLAB VAPOR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4806)

	Base		EDWRD			EDWRD		
	Site		AOC N3			AOC N3		
	Point		N3-4806SS4			N3-4806SS5		
	Sampling Date		02/04/2016 14:54			02/04/2016 12:33		
	Sample Depth		-			-		
	Sample Type		N1			N1		
	Field Sample		N3-4806SS4-VS3			N3-4806SS5-VS3		
	Lab Sample		1602168A-04A			1602168A-05A		
	Status		*Validated*			*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]
helium	D1946	% v/v	**0.017 J**	**a**	[0.0039, 0.10, 2.01]	NDD		[0.0050, 0.13, 2.58]
acetone	TO15-U	ug/m^3	**70**	**J+ b**	[3.3, 24, 2.01]	NDV 17 J	**UJ b,a**	[4.2, 31, 2.58]
acrylonitrile	TO15-U	ug/m^3	NDD		[8.7, 8.7, 2.01]	NDD		[11, 11, 2.58]
benzene	TO15-U	ug/m^3	**4.2**		[0.69, 3.2, 2.01]	**2.9 J**	**a**	[0.88, 4.1, 2.58]
benzyl chloride	TO15-U	ug/m^3	NDD		[1.5, 5.2, 2.01]	NDD		[2.0, 6.7, 2.58]
bromodichloromethane	TO15-U	ug/m^3	NDD		[1.2, 6.7, 2.01]	NDD		[1.5, 8.6, 2.58]
bromoform	TO15-U	ug/m^3	NDD		[1.4, 10, 2.01]	NDD		[1.8, 13, 2.58]
bromomethane	TO15-U	ug/m^3	NDD		[9.9, 39, 2.01]	NDD		[13, 50, 2.58]
1,3-butadiene	TO15-U	ug/m^3	NDD		[0.88, 2.2, 2.01]	NDD		[1.1, 2.8, 2.58]
2-butanone (MEK)	TO15-U	ug/m^3	**46**		[3.3, 12, 2.01]	NDD		[4.3, 15, 2.58]
n-butylbenzene	TO15-U	ug/m^3	NDD		[22, 22, 2.01]	NDD		[28, 28, 2.58]
sec-butylbenzene	TO15-U	ug/m^3	NDD		[22, 22, 2.01]	NDD		[28, 28, 2.58]
carbon disulfide	TO15-U	ug/m^3	**3.9 J**	**a**	[2.2, 12, 2.01]	NDD		[2.8, 16, 2.58]
carbon tetrachloride	TO15-U	ug/m^3	NDD		[1.5, 6.3, 2.01]	NDD		[1.9, 8.1, 2.58]
chlorobenzene	TO15-U	ug/m^3	NDD		[0.58, 4.6, 2.01]	NDD		[0.74, 5.9, 2.58]
chloroethane	TO15-U	ug/m^3	NDD		[2.1, 11, 2.01]	NDD		[2.7, 14, 2.58]
chloroform	TO15-U	ug/m^3	**3.7 J**	**a**	[0.86, 4.9, 2.01]	**1.7 J**	**a**	[1.1, 6.3, 2.58]
chloromethane	TO15-U	ug/m^3	NDD		[4.0, 21, 2.01]	NDD		[5.2, 27, 2.58]
cyclohexane	TO15-U	ug/m^3	**6.0**		[0.53, 3.4, 2.01]	**1.5 J**	**a**	[0.68, 4.4, 2.58]
dibromochloromethane	TO15-U	ug/m^3	NDD		[1.4, 8.6, 2.01]	NDD		[1.8, 11, 2.58]
1,2-dichlorobenzene	TO15-U	ug/m^3	NDD		[0.81, 6.0, 2.01]	NDD		[1.0, 7.8, 2.58]
1,3-dichlorobenzene	TO15-U	ug/m^3	NDD		[1.1, 6.0, 2.01]	NDD		[1.4, 7.8, 2.58]
1,4-dichlorobenzene	TO15-U	ug/m^3	NDD		[1.3, 6.0, 2.01]	NDD		[1.6, 7.8, 2.58]
dichlorodifluoromethane	TO15-U	ug/m^3	**4.8 J**	**a**	[1.1, 5.0, 2.01]	**3.5 J**	**a**	[1.4, 6.4, 2.58]
1,1-dichloroethane	TO15-U	ug/m^3	**6.8**		[0.56, 4.1, 2.01]	NDD		[0.71, 5.2, 2.58]
1,2-dichloroethane	TO15-U	ug/m^3	**0.92 J**	**a**	[0.68, 4.1, 2.01]	NDD		[0.88, 5.2, 2.58]
1,1-dichloroethene	TO15-U	ug/m^3	NDD		[1.8, 4.0, 2.01]	NDD		[2.3, 5.1, 2.58]
cis-1,2-dichloroethene	TO15-U	ug/m^3	NDD		[0.96, 4.0, 2.01]	NDD		[1.2, 5.1, 2.58]
trans-1,2-dichloroethene	TO15-U	ug/m^3	NDD		[0.59, 4.0, 2.01]	NDD		[0.75, 5.1, 2.58]
1,2-dichloropropane	TO15-U	ug/m^3	**9.2**		[1.0, 4.6, 2.01]	NDD		[1.3, 6.0, 2.58]
cis-1,3-dichloropropene	TO15-U	ug/m^3	NDD		[0.74, 4.6, 2.01]	NDD		[0.95, 5.8, 2.58]
trans-1,3-dichloropropene	TO15-U	ug/m^3	NDD		[0.80, 4.6, 2.01]	NDD		[1.0, 5.8, 2.58]
1,2-dichlorotetrafluoroethane	TO15-U	ug/m^3	NDD		[1.3, 7.0, 2.01]	NDD		[1.7, 9.0, 2.58]
1,4-dioxane	TO15-U	ug/m^3	NDD		[2.8, 14, 2.01]	NDD		[3.5, 18, 2.58]
ethanol	TO15-U	ug/m^3	NDD		[1.6, 7.6, 2.01]	**10**		[2.1, 9.7, 2.58]
ethyl acetate	TO15-U	ug/m^3	NDD		[14, 14, 2.01]	NDD		[18, 18, 2.58]
ethylbenzene	TO15-U	ug/m^3	**6.0**		[1.1, 4.4, 2.01]	**1.5 J**	**a**	[1.4, 5.6, 2.58]
ethylene dibromide (EDB)	TO15-U	ug/m^3	NDD		[1.5, 7.7, 2.01]	NDD		[1.9, 9.9, 2.58]

APPENDIX D-1 SUB-SLAB VAPOR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4806)

	Base		EDWRD			EDWRD		
	Site		AOC N3			AOC N3		
	Point		N3-4806SS4			N3-4806SS5		
	Sampling Date		02/04/2016 14:54			02/04/2016 12:33		
	Sample Depth		-			-		
	Sample Type		N1			N1		
	Field Sample		N3-4806SS4-VS3			N3-4806SS5-VS3		
	Lab Sample		1602168A-04A			1602168A-05A		
	Status		*Validated*			*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]
4-ethyltoluene	TO15-U	ug/m^3	**2.2 J**	**a**	[1.2, 4.9, 2.01]	**3.6 J**	**a**	[1.5, 6.3, 2.58]
n-heptane	TO15-U	ug/m^3	**6.4**		[1.8, 4.1, 2.01]	**2.8 J**	**a**	[2.4, 5.3, 2.58]
hexachlorobutadiene	TO15-U	ug/m^3	NDD		[6.6, 43, 2.01]	NDD		[8.5, 55, 2.58]
n-hexane	TO15-U	ug/m^3	**6.2**		[0.40, 3.5, 2.01]	NDV 1.6 J	**UJ 1,a**	[0.52, 4.5, 2.58]
2-hexanone	TO15-U	ug/m^3	NDD		[2.3, 16, 2.01]	NDD		[3.0, 21, 2.58]
isopropanol	TO15-U	ug/m^3	**30**		[1.6, 9.9, 2.01]	NDV 6.4 J	**UJ 1,a**	[2.1, 13, 2.58]
isopropylbenzene	TO15-U	ug/m^3	**1.3 J**	**a**	[0.80, 4.9, 2.01]	NDD		[1.0, 6.3, 2.58]
p-isopropyltoluene	TO15-U	ug/m^3	NDD		[22, 22, 2.01]	NDD		[28, 28, 2.58]
methyl tert-butyl ether (MTBE)	TO15-U	ug/m^3	NDD		[0.27, 3.6, 2.01]	NDD		[0.35, 4.6, 2.58]
4-methyl-2-pentanone (MIBK)	TO15-U	ug/m^3	**9.0**		[1.2, 4.1, 2.01]	NDD		[1.6, 5.3, 2.58]
methylene chloride	TO15-U	ug/m^3	NDV 12 J	**UJ b,a**	[2.8, 35, 2.01]	NDD		[3.6, 45, 2.58]
naphthalene	TO15-U	ug/m^3	**0.49 J**	**J+ 8,a**	[0.48, 10, 2.01]	**0.81 J**	**J+ 8,a**	[0.61, 14, 2.58]
propene	TO15-U	ug/m^3	NDD		[2.2, 6.9, 2.01]	NDD		[2.9, 8.9, 2.58]
styrene	TO15-U	ug/m^3	**3.2 J**	**a**	[0.62, 4.3, 2.01]	NDD		[0.80, 5.5, 2.58]
1,1,1,2-tetrachloroethane	TO15-U	ug/m^3	NDD		[28, 28, 2.01]	NDD		[35, 35, 2.58]
1,1,2,2-tetrachloroethane	TO15-U	ug/m^3	NDD		[1.6, 6.9, 2.01]	NDD		[2.0, 8.8, 2.58]
tetrachloroethene (PCE)	TO15-U	ug/m^3	**13**		[1.2, 6.8, 2.01]	**10**		[1.5, 8.8, 2.58]
tetrahydrofuran	TO15-U	ug/m^3	NDD		[1.0, 3.0, 2.01]	NDD		[1.3, 3.8, 2.58]
toluene	TO15-U	ug/m^3	**77**		[0.46, 3.8, 2.01]	**5.6**		[0.58, 4.9, 2.58]
1,2,4-trichlorobenzene	TO15-U	ug/m^3	NDD		[5.0, 30, 2.01]	NDD		[6.5, 38, 2.58]
1,1,1-trichloroethane	TO15-U	ug/m^3	NDD		[1.1, 5.5, 2.01]	NDD		[1.4, 7.0, 2.58]
1,1,2-trichloroethane	TO15-U	ug/m^3	NDD		[1.8, 5.5, 2.01]	NDD		[2.3, 7.0, 2.58]
trichloroethene (TCE)	TO15-U	ug/m^3	**70**		[1.5, 5.4, 2.01]	**65**		[1.9, 6.9, 2.58]
trichlorofluoromethane	TO15-U	ug/m^3	**2.2 J**	**a**	[0.94, 5.6, 2.01]	**2.9 J**	**a**	[1.2, 7.2, 2.58]
1,1,2-trichlorotrifluoroethane	TO15-U	ug/m^3	NDD		[0.99, 7.7, 2.01]	NDD		[1.3, 9.9, 2.58]
1,2,4-trimethylbenzene	TO15-U	ug/m^3	**2.9 J**	**a**	[1.7, 4.9, 2.01]	**3.9 J**	**a**	[2.2, 6.3, 2.58]
1,3,5-trimethylbenzene	TO15-U	ug/m^3	NDD		[2.4, 4.9, 2.01]	NDD		[3.1, 6.3, 2.58]
vinyl chloride	TO15-U	ug/m^3	NDD		[0.56, 2.6, 2.01]	NDD		[0.72, 3.3, 2.58]
m- & p-xylene	TO15-U	ug/m^3	**19**		[0.83, 4.4, 2.01]	**7.3**		[1.1, 5.6, 2.58]
o-xylene	TO15-U	ug/m^3	**9.2**		[0.93, 4.4, 2.01]	**2.5 J**	**a**	[1.2, 5.6, 2.58]

Notes:

Qualifier definitions are presented in the QASR in Appendix D.

[(a)] See Table 2 for details.

% v/v percent volume/volume

QASR Quality Assurance Summary Report

ug/m3 micrograms per cubic meter

APPENDIX D-2 SUB-SLAB VAPOR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4807)

	Base		EDWRD			EDWRD			EDWRD		
	Site		AOC N3			AOC N3			AOC N3		
	Point		N3-4807SS1			N3-4807SS2			N3-4807SS3		
	Sampling Date		02/04/2016 10:22			02/04/2016 10:50			02/04/2016 12:55		
	Sample Depth		-			-			-		
	Sample Type		N1			N1			N1		
	Field Sample		N3-4807SS1-VS3			N3-4807SS2-VS3			N3-4807SS3-VS3		
	Lab Sample		1602168A-06A			1602168A-07A			1602168A-08A		
	Status		*Validated*			*Validated*			*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]
helium	D1946	% v/v	**0.44**		[0.0048, 0.12, 2.49]	**0.026 J**	**a**	[0.0049, 0.13, 2.52]	NDD		[0.0053, 0.14, 2.7]
acetone	TO15-U	ug/m3	NDV 7.8 J	**UJ b,a**	[4.0, 29, 2.48]	NDV 18 J	**UJ b,a**	[4.1, 30, 2.52]	NDV 9.0 J	**UJ b,a**	[4.4, 32, 2.7]
acrylonitrile	TO15-U	ug/m3	NDD		[11, 11, 2.48]	NDD		[11, 11, 2.52]	NDD		[12, 12, 2.7]
benzene	TO15-U	ug/m3	NDD		[0.85, 4.0, 2.48]	**7.7**		[0.86, 4.0, 2.52]	**1.1 J**	**a**	[0.92, 4.3, 2.7]
benzyl chloride	TO15-U	ug/m3	NDD		[1.9, 6.4, 2.48]	NDD		[1.9, 6.5, 2.52]	NDD		[2.1, 7.0, 2.7]
bromodichloromethane	TO15-U	ug/m3	NDD		[1.4, 8.3, 2.48]	NDD		[1.4, 8.4, 2.52]	NDD		[1.5, 9.0, 2.7]
bromoform	TO15-U	ug/m3	NDD		[1.7, 13, 2.48]	NDD		[1.8, 13, 2.52]	NDD		[1.9, 14, 2.7]
bromomethane	TO15-U	ug/m3	NDD		[12, 48, 2.48]	NDD		[12, 49, 2.52]	NDD		[13, 52, 2.7]
1,3-butadiene	TO15-U	ug/m3	NDD		[1.1, 2.7, 2.48]	NDD		[1.1, 2.8, 2.52]	NDD		[1.2, 3.0, 2.7]
2-butanone (MEK)	TO15-U	ug/m3	NDD		[4.1, 15, 2.48]	NDD		[4.2, 15, 2.52]	NDD		[4.5, 16, 2.7]
n-butylbenzene	TO15-U	ug/m3	NDD		[27, 27, 2.48]	NDD		[28, 28, 2.52]	NDD		[30, 30, 2.7]
sec-butylbenzene	TO15-U	ug/m3	NDD		[27, 27, 2.48]	NDD		[28, 28, 2.52]	NDD		[30, 30, 2.7]
carbon disulfide	TO15-U	ug/m3	NDD		[2.7, 15, 2.48]	NDD		[2.7, 16, 2.52]	**3.5 J**	**a**	[2.9, 17, 2.7]
carbon tetrachloride	TO15-U	ug/m3	NDD		[1.8, 7.8, 2.48]	NDD		[1.9, 7.9, 2.52]	NDD		[2.0, 8.5, 2.7]
chlorobenzene	TO15-U	ug/m3	NDD		[0.71, 5.7, 2.48]	NDD		[0.72, 5.8, 2.52]	NDD		[0.77, 6.2, 2.7]
chloroethane	TO15-U	ug/m3	NDD		[2.6, 13, 2.48]	NDD		[2.7, 13, 2.52]	NDD		[2.8, 14, 2.7]
chloroform	TO15-U	ug/m3	NDD		[1.0, 6.0, 2.48]	**1.2 J**	**a**	[1.1, 6.2, 2.52]	NDD		[1.1, 6.6, 2.7]
chloromethane	TO15-U	ug/m3	NDD		[5.0, 26, 2.48]	NDD		[5.0, 26, 2.52]	NDD		[5.4, 28, 2.7]
cyclohexane	TO15-U	ug/m3	**1.4 J**	**a**	[0.65, 4.3, 2.48]	NDD		[0.66, 4.3, 2.52]	NDD		[0.71, 4.6, 2.7]
dibromochloromethane	TO15-U	ug/m3	NDD		[1.7, 10, 2.48]	NDD		[1.7, 11, 2.52]	NDD		[1.8, 12, 2.7]
1,2-dichlorobenzene	TO15-U	ug/m3	NDD		[1.0, 7.4, 2.48]	NDD		[1.0, 7.6, 2.52]	NDD		[1.1, 8.1, 2.7]
1,3-dichlorobenzene	TO15-U	ug/m3	NDD		[1.4, 7.4, 2.48]	NDD		[1.4, 7.6, 2.52]	NDD		[1.5, 8.1, 2.7]
1,4-dichlorobenzene	TO15-U	ug/m3	NDD		[1.6, 7.4, 2.48]	NDD		[1.6, 7.6, 2.52]	NDD		[1.7, 8.1, 2.7]
dichlorodifluoromethane	TO15-U	ug/m3	**2.9 J**	**a**	[1.3, 6.1, 2.48]	**5.9 J**	**a**	[1.4, 6.2, 2.52]	**4.5 J**	**a**	[1.4, 6.7, 2.7]
1,1-dichloroethane	TO15-U	ug/m3	NDD		[0.69, 5.0, 2.48]	NDD		[0.70, 5.1, 2.52]	NDD		[0.75, 5.5, 2.7]
1,2-dichloroethane	TO15-U	ug/m3	NDD		[0.84, 5.0, 2.48]	NDD		[0.86, 5.1, 2.52]	NDD		[0.92, 5.5, 2.7]
1,1-dichloroethene	TO15-U	ug/m3	NDD		[2.2, 4.9, 2.48]	NDD		[2.2, 5.0, 2.52]	NDD		[2.4, 5.4, 2.7]
cis-1,2-dichloroethene	TO15-U	ug/m3	NDD		[1.2, 4.9, 2.48]	NDD		[1.2, 5.0, 2.52]	NDD		[1.3, 5.4, 2.7]
trans-1,2-dichloroethene	TO15-U	ug/m3	NDD		[0.72, 4.9, 2.48]	NDD		[0.73, 5.0, 2.52]	NDD		[0.79, 5.4, 2.7]
1,2-dichloropropane	TO15-U	ug/m3	NDD		[1.3, 5.7, 2.48]	NDD		[1.3, 5.8, 2.52]	NDD		[1.4, 6.2, 2.7]
cis-1,3-dichloropropene	TO15-U	ug/m3	NDD		[0.91, 5.6, 2.48]	NDD		[0.93, 5.7, 2.52]	NDD		[1.0, 6.1, 2.7]
trans-1,3-dichloropropene	TO15-U	ug/m3	NDD		[0.99, 5.6, 2.48]	NDD		[1.0, 5.7, 2.52]	NDD		[1.1, 6.1, 2.7]
1,2-dichlorotetrafluoroethane	TO15-U	ug/m3	NDD		[1.6, 8.7, 2.48]	NDD		[1.6, 8.8, 2.52]	NDD		[1.7, 9.4, 2.7]
1,4-dioxane	TO15-U	ug/m3	NDD		[3.4, 18, 2.48]	NDD		[3.5, 18, 2.52]	NDD		[3.7, 19, 2.7]
ethanol	TO15-U	ug/m3	**2.4 J**	**a**	[2.0, 9.3, 2.48]	**4.4 J**	**a**	[2.0, 9.5, 2.52]	**7.4 J**	**a**	[2.2, 10, 2.7]
ethyl acetate	TO15-U	ug/m3	NDD		[18, 18, 2.48]	NDD		[18, 18, 2.52]	NDD		[19, 19, 2.7]
ethylbenzene	TO15-U	ug/m3	NDD		[1.4, 5.4, 2.48]	NDD		[1.4, 5.5, 2.52]	NDD		[1.5, 5.9, 2.7]
ethylene dibromide (EDB)	TO15-U	ug/m3	NDD		[1.8, 9.5, 2.48]	NDD		[1.9, 9.7, 2.52]	NDD		[2.0, 10, 2.7]

APPENDIX D-2 SUB-SLAB VAPOR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4807)

	Base		EDWRD			EDWRD			EDWRD		
	Site		AOC N3			AOC N3			AOC N3		
	Point		N3-4807SS1			N3-4807SS2			N3-4807SS3		
	Sampling Date		02/04/2016 10:22			02/04/2016 10:50			02/04/2016 12:55		
	Sample Depth		-			-			-		
	Sample Type		N1			N1			N1		
	Field Sample		N3-4807SS1-VS3			N3-4807SS2-VS3			N3-4807SS3-VS3		
	Lab Sample		1602168A-06A			1602168A-07A			1602168A-08A		
	Status		*Validated*			*Validated*			*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]
4-ethyltoluene	TO15-U	ug/m3	**3.2 J**	**a**	[1.5, 6.1, 2.48]	**2.1 J**	**a**	[1.5, 6.2, 2.52]	NDD		[1.6, 6.6, 2.7]
n-heptane	TO15-U	ug/m3	**2.7 J**	**a**	[2.3, 5.1, 2.48]	**2.7 J**	**a**	[2.3, 5.2, 2.52]	NDD		[2.5, 5.5, 2.7]
hexachlorobutadiene	TO15-U	ug/m3	NDD		[8.1, 53, 2.48]	NDD		[8.3, 54, 2.52]	NDD		[8.9, 58, 2.7]
n-hexane	TO15-U	ug/m3	NDV 1.2 J	**UJ 1,a**	[0.50, 4.4, 2.48]	NDV 1.2 J	**UJ 1,a**	[0.50, 4.4, 2.52]	NDV 1.5 J	**UJ 1,a**	[0.54, 4.8, 2.7]
2-hexanone	TO15-U	ug/m3	NDD		[2.9, 20, 2.48]	NDD		[2.9, 21, 2.52]	NDD		[3.2, 22, 2.7]
isopropanol	TO15-U	ug/m3	NDV 7.3 J	**UJ 1,a**	[2.0, 12, 2.48]	NDV 5.8 J	**UJ 1,a**	[2.0, 12, 2.52]	NDV 6.4 J	**UJ 1,a**	[2.2, 13, 2.7]
isopropylbenzene	TO15-U	ug/m3	NDD		[0.99, 6.1, 2.48]	NDD		[1.0, 6.2, 2.52]	NDD		[1.1, 6.6, 2.7]
p-isopropyltoluene	TO15-U	ug/m3	NDD		[27, 27, 2.48]	NDD		[28, 28, 2.52]	NDD		[30, 30, 2.7]
methyl tert-butyl ether (MTBE)	TO15-U	ug/m3	NDD		[0.33, 4.5, 2.48]	NDD		[0.34, 4.5, 2.52]	NDD		[0.36, 4.9, 2.7]
4-methyl-2-pentanone (MIBK)	TO15-U	ug/m3	NDD		[1.5, 5.1, 2.48]	NDD		[1.6, 5.2, 2.52]	NDD		[1.7, 5.5, 2.7]
methylene chloride	TO15-U	ug/m3	NDD		[3.4, 43, 2.48]	NDD		[3.5, 44, 2.52]	NDD		[3.8, 47, 2.7]
naphthalene	TO15-U	ug/m3	NDD		[0.59, 13, 2.48]	NDD		[0.60, 13, 2.52]	NDD		[0.64, 14, 2.7]
propene	TO15-U	ug/m3	NDD		[2.8, 8.5, 2.48]	NDD		[2.8, 8.7, 2.52]	NDD		[3.0, 9.3, 2.7]
styrene	TO15-U	ug/m3	NDD		[0.77, 5.3, 2.48]	NDD		[0.78, 5.4, 2.52]	NDD		[0.83, 5.8, 2.7]
1,1,1,2-tetrachloroethane	TO15-U	ug/m3	NDD		[34, 34, 2.48]	NDD		[34, 34, 2.52]	NDD		[37, 37, 2.7]
1,1,2,2-tetrachloroethane	TO15-U	ug/m3	NDD		[2.0, 8.5, 2.48]	NDD		[2.0, 8.6, 2.52]	NDD		[2.1, 9.3, 2.7]
tetrachloroethene (PCE)	TO15-U	ug/m3	**1.6 J**	**a**	[1.5, 8.4, 2.48]	**1.6 J**	**a**	[1.5, 8.5, 2.52]	**3.0 J**	**a**	[1.6, 9.2, 2.7]
tetrahydrofuran	TO15-U	ug/m3	NDD		[1.2, 3.6, 2.48]	NDD		[1.3, 3.7, 2.52]	NDD		[1.4, 4.0, 2.7]
toluene	TO15-U	ug/m3	**4.4 J**	**a**	[0.56, 4.7, 2.48]	**3.6 J**	**a**	[0.57, 4.7, 2.52]	**2.8 J**	**a**	[0.61, 5.1, 2.7]
1,2,4-trichlorobenzene	TO15-U	ug/m3	NDD		[6.2, 37, 2.48]	NDD		[6.3, 37, 2.52]	NDD		[6.8, 40, 2.7]
1,1,1-trichloroethane	TO15-U	ug/m3	NDD		[1.3, 6.8, 2.48]	NDD		[1.3, 6.9, 2.52]	NDD		[1.4, 7.4, 2.7]
1,1,2-trichloroethane	TO15-U	ug/m3	NDD		[2.2, 6.8, 2.48]	NDD		[2.2, 6.9, 2.52]	NDD		[2.4, 7.4, 2.7]
trichloroethene (TCE)	TO15-U	ug/m3	NDD		[1.8, 6.7, 2.48]	**25**		[1.9, 6.8, 2.52]	**2.3 J**	**a**	[2.0, 7.2, 2.7]
trichlorofluoromethane	TO15-U	ug/m3	**1.6 J**	**a**	[1.2, 7.0, 2.48]	**1.2 J**	**a**	[1.2, 7.1, 2.52]	**3.1 J**	**a**	[1.3, 7.6, 2.7]
1,1,2-trichlorotrifluoroethane	TO15-U	ug/m3	NDD		[1.2, 9.5, 2.48]	NDD		[1.2, 9.6, 2.52]	NDD		[1.3, 10, 2.7]
1,2,4-trimethylbenzene	TO15-U	ug/m3	**3.8 J**	**a**	[2.2, 6.1, 2.48]	NDD		[2.2, 6.2, 2.52]	NDD		[2.3, 6.6, 2.7]
1,3,5-trimethylbenzene	TO15-U	ug/m3	NDD		[3.0, 6.1, 2.48]	NDD		[3.0, 6.2, 2.52]	NDD		[3.3, 6.6, 2.7]
vinyl chloride	TO15-U	ug/m3	NDD		[0.69, 3.2, 2.48]	NDD		[0.70, 3.2, 2.52]	NDD		[0.75, 3.4, 2.7]
m- & p-xylene	TO15-U	ug/m3	**7.1**		[1.0, 5.4, 2.48]	**3.4 J**	**a**	[1.0, 5.5, 2.52]	**2.3 J**	**a**	[1.1, 5.9, 2.7]
o-xylene	TO15-U	ug/m3	**2.4 J**	**a**	[1.2, 5.4, 2.48]	**1.4 J**	**a**	[1.2, 5.5, 2.52]	NDD		[1.2, 5.9, 2.7]

Notes:

Qualifier definitions are presented in the QASR in Appendix D.

[(a)] See Table 2 for details.

% v/v percent volume/volume

QASR Quality Assurance Summary Report

ug/m3 micrograms per cubic meter

APPENDIX D-2 SUB-SLAB VAPOR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4807)

	Base		EDWRD			EDWRD		
	Site		AOC N3			AOC N3		
	Point		N3-4807SS3			N3-4807SS4		
	Sampling Date		02/04/2016 12:55			02/04/2016 14:23		
	Sample Depth		-			-		
	Sample Type		FD1			N1		
	Field Sample		N3-4807SS3-VS203			N3-4807SS4-VS3		
	Lab Sample		1602168A-09A			1602168A-10A		
	Status		*Validated*			*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]
helium	D1946	% v/v	NDD		[0.0050, 0.13, 2.57]	**0.015 J**	**a**	[0.0040, 0.10, 2.08]
acetone	TO15-U	ug/m3	NDV 17 J	**UJ b,a**	[4.2, 30, 2.57]	NDV 17 J	**UJ b,a**	[3.4, 25, 2.08]
acrylonitrile	TO15-U	ug/m3	NDD		[11, 11, 2.57]	NDD		[9.0, 9.0, 2.08]
benzene	TO15-U	ug/m3	**1.2 J**	**a**	[0.88, 4.1, 2.57]	**2.4 J**	**a**	[0.71, 3.3, 2.08]
benzyl chloride	TO15-U	ug/m3	NDD		[2.0, 6.6, 2.57]	NDD		[1.6, 5.4, 2.08]
bromodichloromethane	TO15-U	ug/m3	NDD		[1.5, 8.6, 2.57]	NDD		[1.2, 7.0, 2.08]
bromoform	TO15-U	ug/m3	NDD		[1.8, 13, 2.57]	NDD		[1.5, 11, 2.08]
bromomethane	TO15-U	ug/m3	NDD		[13, 50, 2.57]	NDD		[10, 40, 2.08]
1,3-butadiene	TO15-U	ug/m3	NDD		[1.1, 2.8, 2.57]	NDD		[0.91, 2.3, 2.08]
2-butanone (MEK)	TO15-U	ug/m3	NDD		[4.3, 15, 2.57]	**4.3 J**	**a**	[3.4, 12, 2.08]
n-butylbenzene	TO15-U	ug/m3	NDD		[28, 28, 2.57]	NDD		[23, 23, 2.08]
sec-butylbenzene	TO15-U	ug/m3	NDD		[28, 28, 2.57]	NDD		[23, 23, 2.08]
carbon disulfide	TO15-U	ug/m3	NDD		[2.8, 16, 2.57]	**8.0 J**	**a**	[2.2, 13, 2.08]
carbon tetrachloride	TO15-U	ug/m3	NDD		[1.9, 8.1, 2.57]	NDD		[1.6, 6.5, 2.08]
chlorobenzene	TO15-U	ug/m3	NDD		[0.74, 5.9, 2.57]	NDD		[0.60, 4.8, 2.08]
chloroethane	TO15-U	ug/m3	NDD		[2.7, 14, 2.57]	NDD		[2.2, 11, 2.08]
chloroform	TO15-U	ug/m3	NDD		[1.1, 6.3, 2.57]	NDD		[0.88, 5.1, 2.08]
chloromethane	TO15-U	ug/m3	NDD		[5.2, 26, 2.57]	NDD		[4.2, 21, 2.08]
cyclohexane	TO15-U	ug/m3	NDD		[0.68, 4.4, 2.57]	NDD		[0.55, 3.6, 2.08]
dibromochloromethane	TO15-U	ug/m3	NDD		[1.8, 11, 2.57]	NDD		[1.4, 8.8, 2.08]
1,2-dichlorobenzene	TO15-U	ug/m3	NDD		[1.0, 7.7, 2.57]	NDD		[0.84, 6.2, 2.08]
1,3-dichlorobenzene	TO15-U	ug/m3	NDD		[1.4, 7.7, 2.57]	NDD		[1.1, 6.2, 2.08]
1,4-dichlorobenzene	TO15-U	ug/m3	NDD		[1.6, 7.7, 2.57]	NDD		[1.3, 6.2, 2.08]
dichlorodifluoromethane	TO15-U	ug/m3	**4.8 J**	**a**	[1.4, 6.4, 2.57]	**3.1 J**	**a**	[1.1, 5.1, 2.08]
1,1-dichloroethane	TO15-U	ug/m3	NDD		[0.71, 5.2, 2.57]	NDD		[0.58, 4.2, 2.08]
1,2-dichloroethane	TO15-U	ug/m3	NDD		[0.87, 5.2, 2.57]	NDD		[0.71, 4.2, 2.08]
1,1-dichloroethene	TO15-U	ug/m3	NDD		[2.3, 5.1, 2.57]	NDD		[1.8, 4.1, 2.08]
cis-1,2-dichloroethene	TO15-U	ug/m3	NDD		[1.2, 5.1, 2.57]	NDD		[1.0, 4.1, 2.08]
trans-1,2-dichloroethene	TO15-U	ug/m3	NDD		[0.75, 5.1, 2.57]	NDD		[0.61, 4.1, 2.08]
1,2-dichloropropane	TO15-U	ug/m3	NDD		[1.3, 5.9, 2.57]	NDD		[1.1, 4.8, 2.08]
cis-1,3-dichloropropene	TO15-U	ug/m3	NDD		[0.95, 5.8, 2.57]	NDD		[0.77, 4.7, 2.08]
trans-1,3-dichloropropene	TO15-U	ug/m3	NDD		[1.0, 5.8, 2.57]	NDD		[0.83, 4.7, 2.08]
1,2-dichlorotetrafluoroethane	TO15-U	ug/m3	NDD		[1.6, 9.0, 2.57]	NDD		[1.3, 7.3, 2.08]
1,4-dioxane	TO15-U	ug/m3	NDD		[3.5, 18, 2.57]	NDD		[2.8, 15, 2.08]
ethanol	TO15-U	ug/m3	**6.8 J**	**a**	[2.1, 9.7, 2.57]	**8.5**		[1.7, 7.8, 2.08]
ethyl acetate	TO15-U	ug/m3	NDD		[18, 18, 2.57]	NDD		[15, 15, 2.08]
ethylbenzene	TO15-U	ug/m3	NDD		[1.4, 5.6, 2.57]	NDD		[1.2, 4.5, 2.08]
ethylene dibromide (EDB)	TO15-U	ug/m3	NDD		[1.9, 9.9, 2.57]	NDD		[1.5, 8.0, 2.08]

APPENDIX D-2 SUB-SLAB VAPOR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4807)

	Base		EDWRD			EDWRD		
	Site		AOC N3			AOC N3		
	Point		N3-4807SS3			N3-4807SS4		
	Sampling Date		02/04/2016 12:55			02/04/2016 14:23		
	Sample Depth		-			-		
	Sample Type		FD1			N1		
	Field Sample		N3-4807SS3-VS203			N3-4807SS4-VS3		
	Lab Sample		1602168A-09A			1602168A-10A		
	Status		*Validated*			*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]
4-ethyltoluene	TO15-U	ug/m3	NDD		[1.5, 6.3, 2.57]	**1.8 J**	**a**	[1.2, 5.1, 2.08]
n-heptane	TO15-U	ug/m3	NDD		[2.3, 5.3, 2.57]	**2.6 J**	**a**	[1.9, 4.3, 2.08]
hexachlorobutadiene	TO15-U	ug/m3	NDD		[8.4, 55, 2.57]	NDD		[6.8, 44, 2.08]
n-hexane	TO15-U	ug/m3	NDV 1.6 J	**UJ 1,a**	[0.51, 4.5, 2.57]	NDV 1.5 J	**UJ 1,a**	[0.42, 3.7, 2.08]
2-hexanone	TO15-U	ug/m3	NDD		[3.0, 21, 2.57]	NDD		[2.4, 17, 2.08]
isopropanol	TO15-U	ug/m3	NDV 5.6 J	**UJ 1,a**	[2.1, 13, 2.57]	NDV 12	**UJ 1**	[1.7, 10, 2.08]
isopropylbenzene	TO15-U	ug/m3	NDD		[1.0, 6.3, 2.57]	NDD		[0.83, 5.1, 2.08]
p-isopropyltoluene	TO15-U	ug/m3	NDD		[28, 28, 2.57]	NDD		[23, 23, 2.08]
methyl tert-butyl ether (MTBE)	TO15-U	ug/m3	NDD		[0.34, 4.6, 2.57]	NDD		[0.28, 3.7, 2.08]
4-methyl-2-pentanone (MIBK)	TO15-U	ug/m3	NDD		[1.6, 5.3, 2.57]	NDD		[1.3, 4.3, 2.08]
methylene chloride	TO15-U	ug/m3	NDD		[3.6, 45, 2.57]	NDD		[2.9, 36, 2.08]
naphthalene	TO15-U	ug/m3	**0.65 J**	**J+ 8,a**	[0.61, 13, 2.57]	NDD		[0.49, 11, 2.08]
propene	TO15-U	ug/m3	NDD		[2.9, 8.8, 2.57]	NDD		[2.3, 7.2, 2.08]
styrene	TO15-U	ug/m3	NDD		[0.79, 5.5, 2.57]	NDD		[0.64, 4.4, 2.08]
1,1,1,2-tetrachloroethane	TO15-U	ug/m3	NDD		[35, 35, 2.57]	NDD		[28, 28, 2.08]
1,1,2,2-tetrachloroethane	TO15-U	ug/m3	NDD		[2.0, 8.8, 2.57]	NDD		[1.6, 7.1, 2.08]
tetrachloroethene (PCE)	TO15-U	ug/m3	**2.4 J**	**a**	[1.5, 8.7, 2.57]	**2.1 J**	**a**	[1.2, 7.0, 2.08]
tetrahydrofuran	TO15-U	ug/m3	NDD		[1.3, 3.8, 2.57]	NDD		[1.0, 3.1, 2.08]
toluene	TO15-U	ug/m3	**2.6 J**	**a**	[0.58, 4.8, 2.57]	**3.2 J**	**a**	[0.47, 3.9, 2.08]
1,2,4-trichlorobenzene	TO15-U	ug/m3	NDD		[6.4, 38, 2.57]	NDD		[5.2, 31, 2.08]
1,1,1-trichloroethane	TO15-U	ug/m3	NDD		[1.4, 7.0, 2.57]	NDD		[1.1, 5.7, 2.08]
1,1,2-trichloroethane	TO15-U	ug/m3	NDD		[2.3, 7.0, 2.57]	NDD		[1.8, 5.7, 2.08]
trichloroethene (TCE)	TO15-U	ug/m3	**2.2 J**	**a**	[1.9, 6.9, 2.57]	NDD		[1.5, 5.6, 2.08]
trichlorofluoromethane	TO15-U	ug/m3	**2.8 J**	**a**	[1.2, 7.2, 2.57]	**2.5 J**	**a**	[0.97, 5.8, 2.08]
1,1,2-trichlorotrifluoroethane	TO15-U	ug/m3	NDD		[1.3, 9.8, 2.57]	NDD		[1.0, 8.0, 2.08]
1,2,4-trimethylbenzene	TO15-U	ug/m3	NDD		[2.2, 6.3, 2.57]	**2.0 J**	**a**	[1.8, 5.1, 2.08]
1,3,5-trimethylbenzene	TO15-U	ug/m3	NDD		[3.1, 6.3, 2.57]	NDD		[2.5, 5.1, 2.08]
vinyl chloride	TO15-U	ug/m3	NDD		[0.71, 3.3, 2.57]	NDD		[0.58, 2.6, 2.08]
m- & p-xylene	TO15-U	ug/m3	**2.6 J**	**a**	[1.1, 5.6, 2.57]	**3.1 J**	**a**	[0.86, 4.5, 2.08]
o-xylene	TO15-U	ug/m3	NDD		[1.2, 5.6, 2.57]	**1.0 J**	**a**	[0.96, 4.5, 2.08]

Notes:

Qualifier definitions are presented in the QASR in Appendix D.

[(a)] See Table 2 for details.

% v/v percent volume/volume

QASR Quality Assurance Summary Report

ug/m3 micrograms per cubic meter

APPENDIX D-3 INDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4806)

	Base		EDWRD			EDWRD			EDWRD		
	Site		AOC N3			AOC N3			AOC N3		
	Point		N3-4806IA1			N3-4806IA2			N3-4806IA3		
	Sampling Date		02/03/2016 09:30			02/03/2016 09:05			02/03/2016 09:15		
	Sample Depth		-			-			-		
	Sample Type		N1			N1			N1		
	Field Sample		N3-4806IA1-VS3			N3-4806IA2-VS3			N3-4806IA3-VS3		
	Lab Sample		1602166-01A			1602166-02B			1602166-03A		
	Status		*Validated*			*Validated*			*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]
helium	D1946	% v/v	-			-			-		
acetone	TO15-U	ug/m3	**18**		[0.27, 2.0, 1.68]	**37**		[0.28, 2.0, 1.71]	**40**		[0.26, 1.9, 1.64]
acrylonitrile	TO15-U	ug/m3	NDD		[1.8, 1.8, 1.68]	NDD		[1.8, 1.8, 1.71]	NDD		[1.8, 1.8, 1.64]
benzene	TO15-U	ug/m3	**0.44 J**	**a**	[0.17, 0.54, 1.68]	**0.44 J**	**a**	[0.17, 0.55, 1.71]	**0.54**		[0.17, 0.52, 1.64]
benzyl chloride	TO15-U	ug/m3	NDD		[0.18, 0.87, 1.68]	NDD		[0.19, 0.88, 1.71]	NDD		[0.18, 0.85, 1.64]
bromodichloromethane	TO15-U	ug/m3	NDD		[0.17, 1.1, 1.68]	NDD		[0.18, 1.1, 1.71]	NDD		[0.17, 1.1, 1.64]
bromoform	TO15-U	ug/m3	NDD		[0.32, 1.7, 1.68]	NDD		[0.33, 1.8, 1.71]	NDD		[0.31, 1.7, 1.64]
bromomethane	TO15-U	ug/m3	NDD		[1.0, 3.3, 1.68]	NDD		[1.0, 3.3, 1.71]	NDD		[0.98, 3.2, 1.64]
1,3-butadiene	TO15-U	ug/m3	NDD		[0.054, 0.37, 1.68]	NDD		[0.055, 0.38, 1.71]	NDD		[0.053, 0.36, 1.64]
2-butanone (MEK)	TO15-U	ug/m3	**0.88 J**	**a**	[0.18, 2.5, 1.68]	**4.6**		[0.18, 2.5, 1.71]	**1.2 J**	**a**	[0.17, 2.4, 1.64]
n-butylbenzene	TO15-U	ug/m3	NDD		[4.6, 4.6, 1.68]	NDD		[4.7, 4.7, 1.71]	NDD		[4.5, 4.5, 1.64]
sec-butylbenzene	TO15-U	ug/m3	NDD		[4.6, 4.6, 1.68]	NDD		[4.7, 4.7, 1.71]	NDD		[4.5, 4.5, 1.64]
carbon disulfide	TO15-U	ug/m3	NDD		[0.21, 2.6, 1.68]	NDD		[0.21, 2.7, 1.71]	NDD		[0.20, 2.6, 1.64]
carbon tetrachloride	TO15-U	ug/m3	**0.38 J**	**a**	[0.098, 1.0, 1.68]	**0.37 J**	**a**	[0.10, 1.1, 1.71]	**0.29 J**	**a**	[0.096, 1.0, 1.64]
chlorobenzene	TO15-U	ug/m3	NDD		[0.19, 0.77, 1.68]	NDD		[0.20, 0.79, 1.71]	NDD		[0.19, 0.76, 1.64]
chloroethane	TO15-U	ug/m3	NDD		[0.35, 2.2, 1.68]	NDD		[0.36, 2.2, 1.71]	NDD		[0.34, 2.2, 1.64]
chloroform	TO15-U	ug/m3	**0.31 J**	**a**	[0.16, 0.82, 1.68]	**0.39 J**	**a**	[0.17, 0.83, 1.71]	**0.65 J**	**a**	[0.16, 0.80, 1.64]
chloromethane	TO15-U	ug/m3	**1.1 J**	**a**	[0.42, 1.7, 1.68]	**1.3 J**	**a**	[0.43, 1.8, 1.71]	**1.2 J**	**a**	[0.41, 1.7, 1.64]
cyclohexane	TO15-U	ug/m3	NDD		[0.098, 0.58, 1.68]	NDD		[0.099, 0.59, 1.71]	**0.10 J**	**a**	[0.095, 0.56, 1.64]
dibromochloromethane	TO15-U	ug/m3	NDD		[0.24, 1.4, 1.68]	NDD		[0.24, 1.4, 1.71]	NDD		[0.23, 1.4, 1.64]
1,2-dichlorobenzene	TO15-U	ug/m3	NDD		[0.31, 1.0, 1.68]	NDD		[0.32, 1.0, 1.71]	NDD		[0.30, 0.99, 1.64]
1,3-dichlorobenzene	TO15-U	ug/m3	NDD		[0.13, 1.0, 1.68]	NDD		[0.13, 1.0, 1.71]	NDD		[0.13, 0.99, 1.64]
1,4-dichlorobenzene	TO15-U	ug/m3	NDD		[0.14, 1.0, 1.68]	NDD		[0.14, 1.0, 1.71]	NDD		[0.14, 0.99, 1.64]
dichlorodifluoromethane	TO15-U	ug/m3	**2.4**		[0.12, 0.83, 1.68]	**2.5**		[0.13, 0.84, 1.71]	**2.4**		[0.12, 0.81, 1.64]
1,1-dichloroethane	TO15-U	ug/m3	NDD		[0.087, 0.68, 1.68]	NDD		[0.088, 0.69, 1.71]	NDD		[0.085, 0.66, 1.64]
1,2-dichloroethane	TO15-U	ug/m3	NDD		[0.23, 0.68, 1.68]	NDD		[0.23, 0.69, 1.71]	NDD		[0.22, 0.66, 1.64]
1,1-dichloroethene	TO15-U	ug/m3	NDD		[0.13, 0.67, 1.68]	NDD		[0.14, 0.68, 1.71]	NDD		[0.13, 0.65, 1.64]
cis-1,2-dichloroethene	TO15-U	ug/m3	NDD		[0.19, 0.67, 1.68]	NDD		[0.19, 0.68, 1.71]	NDD		[0.19, 0.65, 1.64]
trans-1,2-dichloroethene	TO15-U	ug/m3	NDD		[0.20, 0.67, 1.68]	NDD		[0.20, 0.68, 1.71]	NDD		[0.19, 0.65, 1.64]
1,2-dichloropropane	TO15-U	ug/m3	NDD		[0.17, 0.78, 1.68]	NDD		[0.17, 0.79, 1.71]	NDD		[0.16, 0.76, 1.64]
cis-1,3-dichloropropene	TO15-U	ug/m3	NDD		[0.16, 0.76, 1.68]	NDD		[0.16, 0.78, 1.71]	NDD		[0.16, 0.74, 1.64]
trans-1,3-dichloropropene	TO15-U	ug/m3	NDD		[0.16, 0.76, 1.68]	NDD		[0.17, 0.78, 1.71]	NDD		[0.16, 0.74, 1.64]
1,2-dichlorotetrafluoroethane	TO15-U	ug/m3	NDD		[0.22, 1.2, 1.68]	NDD		[0.22, 1.2, 1.71]	NDD		[0.21, 1.1, 1.64]
1,4-dioxane	TO15-U	ug/m3	NDD		[0.18, 0.60, 1.68]	NDD		[0.18, 0.62, 1.71]	NDD		[0.18, 0.59, 1.64]
ethanol	TO15-U	ug/m3	**5.0**		[0.34, 1.6, 1.68]	**140**		[0.69, 3.2, 3.42]	**7.5**	**J+ 1**	[0.33, 1.5, 1.64]
ethyl acetate	TO15-U	ug/m3	NDD		[3.0, 3.0, 1.68]	**6.7**		[3.1, 3.1, 1.71]	NDD		[3.0, 3.0, 1.64]
ethylbenzene	TO15-U	ug/m3	NDD		[0.21, 0.73, 1.68]	NDD		[0.21, 0.74, 1.71]	**0.24 J**	**a**	[0.20, 0.71, 1.64]
ethylene dibromide (EDB)	TO15-U	ug/m3	NDD		[0.22, 1.3, 1.68]	NDD		[0.22, 1.3, 1.71]	NDD		[0.22, 1.3, 1.64]

APPENDIX D-3 INDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4806)

	Base		EDWRD			EDWRD			EDWRD		
	Site		AOC N3			AOC N3			AOC N3		
	Point		N3-4806IA1			N3-4806IA2			N3-4806IA3		
	Sampling Date		02/03/2016 09:30			02/03/2016 09:05			02/03/2016 09:15		
	Sample Depth		-			-			-		
	Sample Type		N1			N1			N1		
	Field Sample		N3-4806IA1-VS3			N3-4806IA2-VS3			N3-4806IA3-VS3		
	Lab Sample		1602166-01A			1602166-02B			1602166-03A		
	Status		*Validated*			*Validated*			*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]
4-ethyltoluene	TO15-U	ug/m3	**0.20 J**	**a**	[0.17, 0.82, 1.68]	**0.18 J**	**a**	[0.18, 0.84, 1.71]	**0.28 J**	**a**	[0.17, 0.81, 1.64]
n-heptane	TO15-U	ug/m3	**0.25 J**	**a**	[0.16, 0.69, 1.68]	**0.30 J**	**a**	[0.16, 0.70, 1.71]	**0.35 J**	**a**	[0.15, 0.67, 1.64]
hexachlorobutadiene	TO15-U	ug/m3	NDD		[0.45, 9.0, 1.68]	NDD		[0.46, 9.1, 1.71]	NDD		[0.44, 8.7, 1.64]
n-hexane	TO15-U	ug/m3	**0.31 J**	**a**	[0.12, 0.59, 1.68]	**0.22 J**	**a**	[0.12, 0.60, 1.71]	**0.36 J**	**a**	[0.12, 0.58, 1.64]
2-hexanone	TO15-U	ug/m3	NDD		[0.36, 3.4, 1.68]	**0.60 J**	**a**	[0.37, 3.5, 1.71]	NDD		[0.35, 3.4, 1.64]
isopropanol	TO15-U	ug/m3	**0.63 J**	**a**	[0.16, 2.1, 1.68]	**7.8**		[0.16, 2.1, 1.71]	**0.90 J**	**a**	[0.15, 2.0, 1.64]
isopropylbenzene	TO15-U	ug/m3	NDD		[0.13, 0.82, 1.68]	NDD		[0.13, 0.84, 1.71]	NDD		[0.13, 0.81, 1.64]
p-isopropyltoluene	TO15-U	ug/m3	NDD		[4.6, 4.6, 1.68]	NDD		[4.7, 4.7, 1.71]	NDD		[4.5, 4.5, 1.64]
methyl tert-butyl ether (MTBE)	TO15-U	ug/m3	NDD		[0.080, 0.60, 1.68]	NDD		[0.082, 0.62, 1.71]	NDD		[0.078, 0.59, 1.64]
4-methyl-2-pentanone (MIBK)	TO15-U	ug/m3	NDD		[0.12, 0.69, 1.68]	**0.25 J**	**a**	[0.13, 0.70, 1.71]	NDD		[0.12, 0.67, 1.64]
methylene chloride	TO15-U	ug/m3	NDV 0.29 J	**UJ 1,a**	[0.088, 1.2, 1.68]	NDV 0.31 J	**UJ 1,a**	[0.090, 1.2, 1.71]	NDV 0.31 J	**UJ 1,a**	[0.086, 1.1, 1.64]
naphthalene	TO15-U	ug/m3	NDD		[0.098, 4.4, 1.68]	**0.13 J**	**a**	[0.099, 4.5, 1.71]	**0.12 J**	**a**	[0.095, 4.3, 1.64]
propene	TO15-U	ug/m3	NDD		[0.38, 1.4, 1.68]	NDD		[0.39, 1.5, 1.71]	NDD		[0.38, 1.4, 1.64]
styrene	TO15-U	ug/m3	NDD		[0.073, 0.72, 1.68]	**0.10 J**	**a**	[0.074, 0.73, 1.71]	**0.14 J**	**a**	[0.071, 0.70, 1.64]
1,1,1,2-tetrachloroethane	TO15-U	ug/m3	NDD		[5.8, 5.8, 1.68]	NDD		[5.9, 5.9, 1.71]	NDD		[5.6, 5.6, 1.64]
1,1,2,2-tetrachloroethane	TO15-U	ug/m3	NDD		[0.12, 1.2, 1.68]	NDD		[0.12, 1.2, 1.71]	NDD		[0.11, 1.1, 1.64]
tetrachloroethene (PCE)	TO15-U	ug/m3	NDD		[0.31, 1.1, 1.68]	NDD		[0.32, 1.2, 1.71]	NDD		[0.30, 1.1, 1.64]
tetrahydrofuran	TO15-U	ug/m3	NDD		[0.42, 2.5, 1.68]	NDD		[0.43, 2.5, 1.71]	NDD		[0.42, 2.4, 1.64]
toluene	TO15-U	ug/m3	**8.0**		[0.077, 0.63, 1.68]	**12**		[0.078, 0.64, 1.71]	**20**		[0.075, 0.62, 1.64]
1,2,4-trichlorobenzene	TO15-U	ug/m3	NDD		[0.25, 6.2, 1.68]	NDD		[0.26, 6.3, 1.71]	NDD		[0.24, 6.1, 1.64]
1,1,1-trichloroethane	TO15-U	ug/m3	NDD		[0.22, 0.92, 1.68]	NDD		[0.22, 0.93, 1.71]	NDD		[0.21, 0.89, 1.64]
1,1,2-trichloroethane	TO15-U	ug/m3	NDD		[0.46, 0.92, 1.68]	NDD		[0.47, 0.93, 1.71]	NDD		[0.45, 0.89, 1.64]
trichloroethene (TCE)	TO15-U	ug/m3	NDD		[0.27, 0.90, 1.68]	NDD		[0.27, 0.92, 1.71]	NDD		[0.26, 0.88, 1.64]
trichlorofluoromethane	TO15-U	ug/m3	**2.2**		[0.12, 0.94, 1.68]	**1.4**		[0.12, 0.96, 1.71]	**1.5**		[0.12, 0.92, 1.64]
1,1,2-trichlorotrifluoroethane	TO15-U	ug/m3	**0.48 J**	**a**	[0.36, 1.3, 1.68]	**0.54 J**	**a**	[0.37, 1.3, 1.71]	**0.55 J**	**a**	[0.35, 1.2, 1.64]
1,2,4-trimethylbenzene	TO15-U	ug/m3	**0.25 J**	**a**	[0.16, 0.82, 1.68]	**0.18 J**	**a**	[0.16, 0.84, 1.71]	**0.32 J**	**a**	[0.16, 0.81, 1.64]
1,3,5-trimethylbenzene	TO15-U	ug/m3	NDD		[0.14, 0.82, 1.68]	NDD		[0.15, 0.84, 1.71]	NDD		[0.14, 0.81, 1.64]
vinyl chloride	TO15-U	ug/m3	NDD		[0.095, 0.43, 1.68]	NDD		[0.097, 0.44, 1.71]	NDD		[0.093, 0.42, 1.64]
m- & p-xylene	TO15-U	ug/m3	**0.38 J**	**a**	[0.13, 0.73, 1.68]	**0.50 J**	**a**	[0.13, 0.74, 1.71]	**0.66 J**	**a**	[0.12, 0.71, 1.64]
o-xylene	TO15-U	ug/m3	NDD		[0.18, 0.73, 1.68]	**0.25 J**	**a**	[0.18, 0.74, 1.71]	**0.37 J**	**a**	[0.17, 0.71, 1.64]

Notes:

Qualifier definitions are presented in the QASR in Appendix D.

[(a)] See Table 2 for details.

% v/v percent volume/volume

QASR Quality Assurance Summary Report

ug/m3 micrograms per cubic meter

APPENDIX D-3 INDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4806)

	Base		EDWRD			EDWRD		
	Site		AOC N3			AOC N3		
	Point		N3-4806IA4			N3-4806IA5		
	Sampling Date		02/03/2016 09:40			02/03/2016 09:45		
	Sample Depth		-			-		
	Sample Type		N1			N1		
	Field Sample		N3-4806IA4-VS3			N3-4806IA5-VS3		
	Lab Sample		1602165-01A			1602165-02A		
	Status		*Validated*			*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]
helium	D1946	% v/v	-			-		
acetone	TO15-U	ug/m3	**71**		[0.30, 2.2, 1.83]	**58**		[0.32, 2.3, 1.96]
acrylonitrile	TO15-U	ug/m3	NDD		[2.0, 2.0, 1.83]	NDD		[2.1, 2.1, 1.96]
benzene	TO15-U	ug/m3	**0.80**		[0.19, 0.58, 1.83]	**0.54 J**	**a**	[0.20, 0.63, 1.96]
benzyl chloride	TO15-U	ug/m3	NDD		[0.20, 0.95, 1.83]	NDD		[0.21, 1.0, 1.96]
bromodichloromethane	TO15-U	ug/m3	NDD		[0.19, 1.2, 1.83]	NDD		[0.20, 1.3, 1.96]
bromoform	TO15-U	ug/m3	NDD		[0.35, 1.9, 1.83]	NDD		[0.38, 2.0, 1.96]
bromomethane	TO15-U	ug/m3	NDD		[1.1, 3.6, 1.83]	NDD		[1.2, 3.8, 1.96]
1,3-butadiene	TO15-U	ug/m3	NDD		[0.059, 0.40, 1.83]	NDD		[0.063, 0.43, 1.96]
2-butanone (MEK)	TO15-U	ug/m3	**3.3**		[0.19, 2.7, 1.83]	**0.81 J**	**a**	[0.21, 2.9, 1.96]
n-butylbenzene	TO15-U	ug/m3	NDD		[5.0, 5.0, 1.83]	NDD		[5.4, 5.4, 1.96]
sec-butylbenzene	TO15-U	ug/m3	NDD		[5.0, 5.0, 1.83]	NDD		[5.4, 5.4, 1.96]
carbon disulfide	TO15-U	ug/m3	NDD		[0.23, 2.8, 1.83]	NDD		[0.24, 3.0, 1.96]
carbon tetrachloride	TO15-U	ug/m3	**0.36 J**	**a**	[0.11, 1.2, 1.83]	**0.32 J**	**a**	[0.11, 1.2, 1.96]
chlorobenzene	TO15-U	ug/m3	NDD		[0.21, 0.84, 1.83]	NDD		[0.23, 0.90, 1.96]
chloroethane	TO15-U	ug/m3	NDD		[0.38, 2.4, 1.83]	NDD		[0.41, 2.6, 1.96]
chloroform	TO15-U	ug/m3	**1.5**		[0.18, 0.89, 1.83]	**5.0**		[0.19, 0.96, 1.96]
chloromethane	TO15-U	ug/m3	**1.2 J**	**a**	[0.46, 1.9, 1.83]	**1.2 J**	**a**	[0.49, 2.0, 1.96]
cyclohexane	TO15-U	ug/m3	**0.16 J**	**a**	[0.11, 0.63, 1.83]	**0.16 J**	**a**	[0.11, 0.67, 1.96]
dibromochloromethane	TO15-U	ug/m3	NDD		[0.26, 1.6, 1.83]	NDD		[0.28, 1.7, 1.96]
1,2-dichlorobenzene	TO15-U	ug/m3	NDD		[0.34, 1.1, 1.83]	NDD		[0.36, 1.2, 1.96]
1,3-dichlorobenzene	TO15-U	ug/m3	NDD		[0.14, 1.1, 1.83]	NDD		[0.15, 1.2, 1.96]
1,4-dichlorobenzene	TO15-U	ug/m3	NDD		[0.15, 1.1, 1.83]	NDD		[0.16, 1.2, 1.96]
dichlorodifluoromethane	TO15-U	ug/m3	**3.7**		[0.14, 0.90, 1.83]	**2.4**		[0.15, 0.97, 1.96]
1,1-dichloroethane	TO15-U	ug/m3	NDD		[0.094, 0.74, 1.83]	NDD		[0.10, 0.79, 1.96]
1,2-dichloroethane	TO15-U	ug/m3	NDD		[0.25, 0.74, 1.83]	NDD		[0.26, 0.79, 1.96]
1,1-dichloroethene	TO15-U	ug/m3	NDD		[0.14, 0.72, 1.83]	NDD		[0.16, 0.78, 1.96]
cis-1,2-dichloroethene	TO15-U	ug/m3	NDD		[0.21, 0.72, 1.83]	NDD		[0.22, 0.78, 1.96]
trans-1,2-dichloroethene	TO15-U	ug/m3	NDD		[0.22, 0.72, 1.83]	NDD		[0.23, 0.78, 1.96]
1,2-dichloropropane	TO15-U	ug/m3	NDD		[0.18, 0.84, 1.83]	NDD		[0.20, 0.90, 1.96]
cis-1,3-dichloropropene	TO15-U	ug/m3	NDD		[0.18, 0.83, 1.83]	NDD		[0.19, 0.89, 1.96]
trans-1,3-dichloropropene	TO15-U	ug/m3	NDD		[0.18, 0.83, 1.83]	NDD		[0.19, 0.89, 1.96]
1,2-dichlorotetrafluoroethane	TO15-U	ug/m3	NDD		[0.24, 1.3, 1.83]	NDD		[0.25, 1.4, 1.96]
1,4-dioxane	TO15-U	ug/m3	NDD		[0.20, 0.66, 1.83]	NDD		[0.21, 0.71, 1.96]
ethanol	TO15-U	ug/m3	**19**		[0.37, 1.7, 1.83]	**3.9**		[0.40, 1.8, 1.96]
ethyl acetate	TO15-U	ug/m3	NDD		[3.3, 3.3, 1.83]	NDD		[3.5, 3.5, 1.96]
ethylbenzene	TO15-U	ug/m3	**0.34 J**	**a**	[0.22, 0.79, 1.83]	**0.34 J**	**a**	[0.24, 0.85, 1.96]
ethylene dibromide (EDB)	TO15-U	ug/m3	NDD		[0.24, 1.4, 1.83]	NDD		[0.26, 1.5, 1.96]

APPENDIX D-3 INDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4806)

	Base		EDWRD			EDWRD		
	Site		AOC N3			AOC N3		
	Point		N3-4806IA4			N3-4806IA5		
	Sampling Date		02/03/2016 09:40			02/03/2016 09:45		
	Sample Depth		-			-		
	Sample Type		N1			N1		
	Field Sample		N3-4806IA4-VS3			N3-4806IA5-VS3		
	Lab Sample		1602165-01A			1602165-02A		
	Status		*Validated*			*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]
4-ethyltoluene	TO15-U	ug/m3	**0.21 J**	**a**	[0.19, 0.90, 1.83]	**0.39 J**	**a**	[0.20, 0.96, 1.96]
n-heptane	TO15-U	ug/m3	**0.50 J**	**a**	[0.17, 0.75, 1.83]	**0.39 J**	**a**	[0.18, 0.80, 1.96]
hexachlorobutadiene	TO15-U	ug/m3	NDD		[0.49, 9.8, 1.83]	NDD		[0.52, 10, 1.96]
n-hexane	TO15-U	ug/m3	**0.44 J**	**a**	[0.13, 0.64, 1.83]	**0.41 J**	**a**	[0.14, 0.69, 1.96]
2-hexanone	TO15-U	ug/m3	NDD		[0.39, 3.7, 1.83]	NDD		[0.42, 4.0, 1.96]
isopropanol	TO15-U	ug/m3	**9.4**		[0.17, 2.2, 1.83]	**1.8 J**	**a**	[0.18, 2.4, 1.96]
isopropylbenzene	TO15-U	ug/m3	NDD		[0.14, 0.90, 1.83]	NDD		[0.15, 0.96, 1.96]
p-isopropyltoluene	TO15-U	ug/m3	NDD		[5.0, 5.0, 1.83]	NDD		[5.4, 5.4, 1.96]
methyl tert-butyl ether (MTBE)	TO15-U	ug/m3	NDD		[0.087, 0.66, 1.83]	NDD		[0.094, 0.71, 1.96]
4-methyl-2-pentanone (MIBK)	TO15-U	ug/m3	**0.29 J**	**a**	[0.14, 0.75, 1.83]	NDD		[0.15, 0.80, 1.96]
methylene chloride	TO15-U	ug/m3	NDV 0.26 J	**UJ 1,a**	[0.096, 1.3, 1.83]	NDV 0.27 J	**UJ 1,a**	[0.10, 1.4, 1.96]
naphthalene	TO15-U	ug/m3	NDD		[0.11, 4.8, 1.83]	NDD		[0.11, 5.1, 1.96]
propene	TO15-U	ug/m3	NDD		[0.42, 1.6, 1.83]	NDD		[0.45, 1.7, 1.96]
styrene	TO15-U	ug/m3	**0.083 J**	**a**	[0.079, 0.78, 1.83]	**0.18 J**	**a**	[0.085, 0.83, 1.96]
1,1,1,2-tetrachloroethane	TO15-U	ug/m3	NDD		[6.3, 6.3, 1.83]	NDD		[6.7, 6.7, 1.96]
1,1,2,2-tetrachloroethane	TO15-U	ug/m3	NDD		[0.13, 1.2, 1.83]	NDD		[0.14, 1.3, 1.96]
tetrachloroethene (PCE)	TO15-U	ug/m3	NDD		[0.34, 1.2, 1.83]	NDD		[0.36, 1.3, 1.96]
tetrahydrofuran	TO15-U	ug/m3	**0.82 J**	**a**	[0.46, 2.7, 1.83]	NDD		[0.50, 2.9, 1.96]
toluene	TO15-U	ug/m3	**26**		[0.084, 0.69, 1.83]	**30**		[0.090, 0.74, 1.96]
1,2,4-trichlorobenzene	TO15-U	ug/m3	NDD		[0.27, 6.8, 1.83]	NDD		[0.29, 7.3, 1.96]
1,1,1-trichloroethane	TO15-U	ug/m3	NDD		[0.24, 1.0, 1.83]	NDD		[0.25, 1.1, 1.96]
1,1,2-trichloroethane	TO15-U	ug/m3	NDD		[0.50, 1.0, 1.83]	NDD		[0.53, 1.1, 1.96]
trichloroethene (TCE)	TO15-U	ug/m3	NDD		[0.29, 0.98, 1.83]	NDD		[0.31, 1.0, 1.96]
trichlorofluoromethane	TO15-U	ug/m3	**1.5**		[0.13, 1.0, 1.83]	**1.4**		[0.14, 1.1, 1.96]
1,1,2-trichlorotrifluoroethane	TO15-U	ug/m3	**0.57 J**	**a**	[0.39, 1.4, 1.83]	**0.53 J**	**a**	[0.42, 1.5, 1.96]
1,2,4-trimethylbenzene	TO15-U	ug/m3	**0.24 J**	**a**	[0.18, 0.90, 1.83]	**0.47 J**	**a**	[0.19, 0.96, 1.96]
1,3,5-trimethylbenzene	TO15-U	ug/m3	NDD		[0.16, 0.90, 1.83]	NDD		[0.17, 0.96, 1.96]
vinyl chloride	TO15-U	ug/m3	NDD		[0.10, 0.47, 1.83]	NDD		[0.11, 0.50, 1.96]
m- & p-xylene	TO15-U	ug/m3	**0.85**		[0.14, 0.79, 1.83]	**1.1**		[0.15, 0.85, 1.96]
o-xylene	TO15-U	ug/m3	**0.35 J**	**a**	[0.19, 0.79, 1.83]	**0.36 J**	**a**	[0.21, 0.85, 1.96]

Notes:

Qualifier definitions are presented in the QASR in Appendix D.

[a] See Table 2 for details.

% v/v percent volume/volume

QASR Quality Assurance Summary Report

ug/m3 micrograms per cubic meter

APPENDIX D-4 INDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4807)

	Base		EDWRD			EDWRD			EDWRD		
	Site		AOC N3			AOC N3			AOC N3		
	Point		N3-4807IA1			N3-4807IA2			N3-4807IA3		
	Sampling Date		02/03/2016 08:40			02/03/2016 08:40			02/03/2016 08:35		
	Sample Depth		-			-			-		
	Sample Type		N1			N1			N1		
	Field Sample		N3-4807IA1-VS3			N3-4807IA2-VS3			N3-4807IA3-VS3		
	Lab Sample		1602167-01A/B			1602167-02A			1602167-03A		
	Status		*Validated*			*Validated*			*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]
helium	D1946	% v/v	-			-			-		
acetone	TO15-U	ug/m3	**44**		[0.26, 1.9, 1.62]	**23**		[0.27, 2.0, 1.7]	**59**		[0.23, 1.7, 1.45]
acrylonitrile	TO15-U	ug/m3	NDD		[1.8, 1.8, 1.62]	NDD		[1.8, 1.8, 1.7]	NDD		[1.6, 1.6, 1.45]
benzene	TO15-U	ug/m3	**1.1**		[0.16, 0.52, 1.62]	**0.69**		[0.17, 0.54, 1.7]	**2.0**		[0.15, 0.46, 1.45]
benzyl chloride	TO15-U	ug/m3	NDD		[0.18, 0.84, 1.62]	NDD		[0.18, 0.88, 1.7]	NDD		[0.16, 0.75, 1.45]
bromodichloromethane	TO15-U	ug/m3	NDD		[0.17, 1.1, 1.62]	NDD		[0.17, 1.1, 1.7]	NDD		[0.15, 0.97, 1.45]
bromoform	TO15-U	ug/m3	NDD		[0.31, 1.7, 1.62]	NDD		[0.32, 1.8, 1.7]	NDD		[0.28, 1.5, 1.45]
bromomethane	TO15-U	ug/m3	NDD		[0.97, 3.1, 1.62]	NDD		[1.0, 3.3, 1.7]	NDD		[0.87, 2.8, 1.45]
1,3-butadiene	TO15-U	ug/m3	**0.12 J**	**a**	[0.052, 0.36, 1.62]	NDD		[0.055, 0.38, 1.7]	**0.055 J**	**a**	[0.047, 0.32, 1.45]
2-butanone (MEK)	TO15-U	ug/m3	**14**		[0.17, 2.4, 1.62]	**0.54 J**	**a**	[0.18, 2.5, 1.7]	**3.1**		[0.15, 2.1, 1.45]
n-butylbenzene	TO15-U	ug/m3	NDD		[4.4, 4.4, 1.62]	NDD		[4.7, 4.7, 1.7]	NDD		[4.0, 4.0, 1.45]
sec-butylbenzene	TO15-U	ug/m3	NDD		[4.4, 4.4, 1.62]	NDD		[4.7, 4.7, 1.7]	NDD		[4.0, 4.0, 1.45]
carbon disulfide	TO15-U	ug/m3	NDV 0.67 J	**UJ B,a**	[0.20, 2.5, 1.62]	NDD		[0.21, 2.6, 1.7]	NDD		[0.18, 2.2, 1.45]
carbon tetrachloride	TO15-U	ug/m3	**0.39 J**	**a**	[0.095, 1.0, 1.62]	**0.36 J**	**a**	[0.099, 1.1, 1.7]	**0.43 J**	**a**	[0.085, 0.91, 1.45]
chlorobenzene	TO15-U	ug/m3	NDD		[0.19, 0.74, 1.62]	NDD		[0.20, 0.78, 1.7]	NDD		[0.17, 0.67, 1.45]
chloroethane	TO15-U	ug/m3	NDD		[0.34, 2.1, 1.62]	NDD		[0.36, 2.2, 1.7]	NDD		[0.30, 1.9, 1.45]
chloroform	TO15-U	ug/m3	**0.46 J**	**a**	[0.16, 0.79, 1.62]	**0.30 J**	**a**	[0.17, 0.83, 1.7]	**0.77**		[0.14, 0.71, 1.45]
chloromethane	TO15-U	ug/m3	**1.2 J**	**a**	[0.41, 1.7, 1.62]	**1.2 J**	**a**	[0.43, 1.8, 1.7]	**1.1 J**	**a**	[0.36, 1.5, 1.45]
cyclohexane	TO15-U	ug/m3	**1.5**		[0.094, 0.56, 1.62]	**0.24 J**	**a**	[0.099, 0.58, 1.7]	**1.4**		[0.084, 0.50, 1.45]
dibromochloromethane	TO15-U	ug/m3	NDD		[0.23, 1.4, 1.62]	NDD		[0.24, 1.4, 1.7]	NDD		[0.20, 1.2, 1.45]
1,2-dichlorobenzene	TO15-U	ug/m3	NDD		[0.30, 0.97, 1.62]	NDD		[0.32, 1.0, 1.7]	NDD		[0.27, 0.87, 1.45]
1,3-dichlorobenzene	TO15-U	ug/m3	NDD		[0.13, 0.97, 1.62]	NDD		[0.13, 1.0, 1.7]	NDD		[0.11, 0.87, 1.45]
1,4-dichlorobenzene	TO15-U	ug/m3	NDD		[0.14, 0.97, 1.62]	NDD		[0.14, 1.0, 1.7]	NDD		[0.12, 0.87, 1.45]
dichlorodifluoromethane	TO15-U	ug/m3	**4.5**		[0.12, 0.80, 1.62]	**2.9**		[0.13, 0.84, 1.7]	**2.2**		[0.11, 0.72, 1.45]
1,1-dichloroethane	TO15-U	ug/m3	**1.4**		[0.084, 0.66, 1.62]	NDD		[0.088, 0.69, 1.7]	NDD		[0.075, 0.59, 1.45]
1,2-dichloroethane	TO15-U	ug/m3	**0.29 J**	**a**	[0.22, 0.66, 1.62]	NDD		[0.23, 0.69, 1.7]	NDD		[0.20, 0.59, 1.45]
1,1-dichloroethene	TO15-U	ug/m3	NDD		[0.13, 0.64, 1.62]	NDD		[0.13, 0.67, 1.7]	NDD		[0.12, 0.57, 1.45]
cis-1,2-dichloroethene	TO15-U	ug/m3	NDD		[0.18, 0.64, 1.62]	NDD		[0.19, 0.67, 1.7]	NDD		[0.16, 0.57, 1.45]
trans-1,2-dichloroethene	TO15-U	ug/m3	NDD		[0.19, 0.64, 1.62]	NDD		[0.20, 0.67, 1.7]	NDD		[0.17, 0.57, 1.45]
1,2-dichloropropane	TO15-U	ug/m3	**1.9**		[0.16, 0.75, 1.62]	NDD		[0.17, 0.78, 1.7]	NDD		[0.15, 0.67, 1.45]
cis-1,3-dichloropropene	TO15-U	ug/m3	NDD		[0.16, 0.74, 1.62]	NDD		[0.16, 0.77, 1.7]	NDD		[0.14, 0.66, 1.45]
trans-1,3-dichloropropene	TO15-U	ug/m3	NDD		[0.16, 0.74, 1.62]	NDD		[0.16, 0.77, 1.7]	NDD		[0.14, 0.66, 1.45]
1,2-dichlorotetrafluoroethane	TO15-U	ug/m3	NDD		[0.21, 1.1, 1.62]	NDD		[0.22, 1.2, 1.7]	NDD		[0.19, 1.0, 1.45]
1,4-dioxane	TO15-U	ug/m3	NDD		[0.17, 0.58, 1.62]	NDD		[0.18, 0.61, 1.7]	NDD		[0.16, 0.52, 1.45]
ethanol	TO15-U	ug/m3	**66**		[0.33, 1.5, 1.62]	**11**		[0.34, 1.6, 1.7]	**25**		[0.29, 1.4, 1.45]
ethyl acetate	TO15-U	ug/m3	**38**		[5.8, 5.8, 3.24]	NDD		[3.1, 3.1, 1.7]	**2.8**		[2.6, 2.6, 1.45]
ethylbenzene	TO15-U	ug/m3	**2.2**		[0.20, 0.70, 1.62]	**0.23 J**	**a**	[0.21, 0.74, 1.7]	**1.8**		[0.18, 0.63, 1.45]
ethylene dibromide (EDB)	TO15-U	ug/m3	NDD		[0.21, 1.2, 1.62]	NDD		[0.22, 1.3, 1.7]	NDD		[0.19, 1.1, 1.45]

APPENDIX D-4 INDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4807)

	Base		EDWRD			EDWRD			EDWRD		
	Site		AOC N3			AOC N3			AOC N3		
	Point		N3-4807IA1			N3-4807IA2			N3-4807IA3		
	Sampling Date		02/03/2016 08:40			02/03/2016 08:40			02/03/2016 08:35		
	Sample Depth		-			-			-		
	Sample Type		N1			N1			N1		
	Field Sample		N3-4807IA1-VS3			N3-4807IA2-VS3			N3-4807IA3-VS3		
	Lab Sample		1602167-01A/B			1602167-02A			1602167-03A		
	Status		*Validated*			*Validated*			*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]
4-ethyltoluene	TO15-U	ug/m3	**0.68 J**	**a**	[0.17, 0.80, 1.62]	**0.36 J**	**a**	[0.18, 0.84, 1.7]	**1.6**		[0.15, 0.71, 1.45]
n-heptane	TO15-U	ug/m3	**2.0**		[0.15, 0.66, 1.62]	**0.76**		[0.16, 0.70, 1.7]	**2.8**		[0.13, 0.59, 1.45]
hexachlorobutadiene	TO15-U	ug/m3	NDD		[0.43, 8.6, 1.62]	NDD		[0.46, 9.1, 1.7]	NDD		[0.39, 7.7, 1.45]
n-hexane	TO15-U	ug/m3	**2.3**		[0.12, 0.57, 1.62]	**0.66**		[0.12, 0.60, 1.7]	**3.6**		[0.10, 0.51, 1.45]
2-hexanone	TO15-U	ug/m3	NDD		[0.35, 3.3, 1.62]	NDD		[0.37, 3.5, 1.7]	**0.36 J**	**a**	[0.31, 3.0, 1.45]
isopropanol	TO15-U	ug/m3	**8.0**		[0.15, 2.0, 1.62]	**0.93 J**	**a**	[0.16, 2.1, 1.7]	**1.7 J**	**a**	[0.14, 1.8, 1.45]
isopropylbenzene	TO15-U	ug/m3	**0.21 J**	**a**	[0.13, 0.80, 1.62]	NDD		[0.13, 0.84, 1.7]	NDD		[0.11, 0.71, 1.45]
p-isopropyltoluene	TO15-U	ug/m3	NDD		[4.4, 4.4, 1.62]	NDD		[4.7, 4.7, 1.7]	NDD		[4.0, 4.0, 1.45]
methyl tert-butyl ether (MTBE)	TO15-U	ug/m3	NDD		[0.077, 0.58, 1.62]	NDD		[0.081, 0.61, 1.7]	**0.16 J**	**a**	[0.069, 0.52, 1.45]
4-methyl-2-pentanone (MIBK)	TO15-U	ug/m3	**3.0**		[0.12, 0.66, 1.62]	NDD		[0.13, 0.70, 1.7]	**0.36 J**	**a**	[0.11, 0.59, 1.45]
methylene chloride	TO15-U	ug/m3	**2.7**	**J+ b**	[0.085, 1.1, 1.62]	NDV 0.30 J	**UJ 1,a**	[0.089, 1.2, 1.7]	NDV 0.42 J	**UJ 1,a**	[0.076, 1.0, 1.45]
naphthalene	TO15-U	ug/m3	**0.095 J**	**a**	[0.094, 4.2, 1.62]	NDD		[0.099, 4.4, 1.7]	**0.21 J**	**a**	[0.084, 3.8, 1.45]
propene	TO15-U	ug/m3	NDD		[0.37, 1.4, 1.62]	NDD		[0.39, 1.5, 1.7]	NDD		[0.33, 1.2, 1.45]
styrene	TO15-U	ug/m3	**0.99**		[0.070, 0.69, 1.62]	**0.088 J**	**a**	[0.074, 0.72, 1.7]	**0.15 J**	**a**	[0.063, 0.62, 1.45]
1,1,1,2-tetrachloroethane	TO15-U	ug/m3	NDD		[5.6, 5.6, 1.62]	NDD		[5.8, 5.8, 1.7]	NDD		[5.0, 5.0, 1.45]
1,1,2,2-tetrachloroethane	TO15-U	ug/m3	NDD		[0.11, 1.1, 1.62]	NDD		[0.12, 1.2, 1.7]	NDD		[0.10, 1.0, 1.45]
tetrachloroethene (PCE)	TO15-U	ug/m3	**2.1**		[0.30, 1.1, 1.62]	NDD		[0.32, 1.2, 1.7]	NDD		[0.27, 0.98, 1.45]
tetrahydrofuran	TO15-U	ug/m3	**0.58 J**	**a**	[0.41, 2.4, 1.62]	NDD		[0.43, 2.5, 1.7]	NDD		[0.37, 2.1, 1.45]
toluene	TO15-U	ug/m3	**32**		[0.074, 0.61, 1.62]	**12**		[0.078, 0.64, 1.7]	**37**		[0.066, 0.55, 1.45]
1,2,4-trichlorobenzene	TO15-U	ug/m3	NDD		[0.24, 6.0, 1.62]	NDD		[0.25, 6.3, 1.7]	NDD		[0.22, 5.4, 1.45]
1,1,1-trichloroethane	TO15-U	ug/m3	NDD		[0.21, 0.88, 1.62]	NDD		[0.22, 0.93, 1.7]	NDD		[0.19, 0.79, 1.45]
1,1,2-trichloroethane	TO15-U	ug/m3	NDD		[0.44, 0.88, 1.62]	NDD		[0.46, 0.93, 1.7]	NDD		[0.40, 0.79, 1.45]
trichloroethene (TCE)	TO15-U	ug/m3	NDD		[0.26, 0.87, 1.62]	NDD		[0.27, 0.91, 1.7]	NDD		[0.23, 0.78, 1.45]
trichlorofluoromethane	TO15-U	ug/m3	**2.4**		[0.12, 0.91, 1.62]	**3.0**		[0.12, 0.96, 1.7]	**3.1**		[0.10, 0.81, 1.45]
1,1,2-trichlorotrifluoroethane	TO15-U	ug/m3	**0.52 J**	**a**	[0.35, 1.2, 1.62]	**0.51 J**	**a**	[0.36, 1.3, 1.7]	**0.59 J**	**a**	[0.31, 1.1, 1.45]
1,2,4-trimethylbenzene	TO15-U	ug/m3	**0.65 J**	**a**	[0.16, 0.80, 1.62]	**0.40 J**	**a**	[0.16, 0.84, 1.7]	**1.9**		[0.14, 0.71, 1.45]
1,3,5-trimethylbenzene	TO15-U	ug/m3	**0.22 J**	**a**	[0.14, 0.80, 1.62]	**0.15 J**	**a**	[0.14, 0.84, 1.7]	**0.64 J**	**a**	[0.12, 0.71, 1.45]
vinyl chloride	TO15-U	ug/m3	NDD		[0.092, 0.41, 1.62]	NDD		[0.097, 0.43, 1.7]	NDD		[0.082, 0.37, 1.45]
m- & p-xylene	TO15-U	ug/m3	**6.0**		[0.12, 0.70, 1.62]	**1.0**		[0.13, 0.74, 1.7]	**6.4**		[0.11, 0.63, 1.45]
o-xylene	TO15-U	ug/m3	**3.0**		[0.17, 0.70, 1.62]	**0.31 J**	**a**	[0.18, 0.74, 1.7]	**2.4**		[0.15, 0.63, 1.45]

Notes:

Qualifier definitions are presented in the QASR in Appendix D.

[(a)] See Table 2 for details.

% v/v percent volume/volume

QASR Quality Assurance Summary Report

ug/m3 micrograms per cubic meter

APPENDIX D-4 INDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4807)

	Base		EDWRD			EDWRD		
	Site		AOC N3			AOC N3		
	Point		N3-4807IA3			N3-4807IA4		
	Sampling Date		02/03/2016 08:35			02/03/2016 09:05		
	Sample Depth		-			-		
	Sample Type		FD1			N1		
	Field Sample		N3-4807IA3-VS203			N3-4807IA4-VS3		
	Lab Sample		1602166-04A			1602167-04A		
	Status		*Validated*			*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]
helium	D1946	% v/v	-			-		
acetone	TO15-U	ug/m3	**52**		[0.26, 1.9, 1.61]	**37**		[0.28, 2.1, 1.75]
acrylonitrile	TO15-U	ug/m3	NDD		[1.7, 1.7, 1.61]	NDD		[1.9, 1.9, 1.75]
benzene	TO15-U	ug/m3	**2.0**		[0.16, 0.51, 1.61]	**0.58**		[0.18, 0.56, 1.75]
benzyl chloride	TO15-U	ug/m3	NDD		[0.18, 0.83, 1.61]	NDD		[0.19, 0.90, 1.75]
bromodichloromethane	TO15-U	ug/m3	NDD		[0.16, 1.1, 1.61]	NDD		[0.18, 1.2, 1.75]
bromoform	TO15-U	ug/m3	NDD		[0.31, 1.7, 1.61]	NDD		[0.34, 1.8, 1.75]
bromomethane	TO15-U	ug/m3	NDD		[0.96, 3.1, 1.61]	NDD		[1.0, 3.4, 1.75]
1,3-butadiene	TO15-U	ug/m3	NDD		[0.052, 0.36, 1.61]	NDD		[0.056, 0.39, 1.75]
2-butanone (MEK)	TO15-U	ug/m3	**0.76 J**	**a**	[0.17, 2.4, 1.61]	**0.82 J**	**a**	[0.18, 2.6, 1.75]
n-butylbenzene	TO15-U	ug/m3	NDD		[4.4, 4.4, 1.61]	NDD		[4.8, 4.8, 1.75]
sec-butylbenzene	TO15-U	ug/m3	NDD		[4.4, 4.4, 1.61]	NDD		[4.8, 4.8, 1.75]
carbon disulfide	TO15-U	ug/m3	NDD		[0.20, 2.5, 1.61]	NDD		[0.22, 2.7, 1.75]
carbon tetrachloride	TO15-U	ug/m3	**0.41 J**	**a**	[0.094, 1.0, 1.61]	**0.40 J**	**a**	[0.10, 1.1, 1.75]
chlorobenzene	TO15-U	ug/m3	NDD		[0.18, 0.74, 1.61]	NDD		[0.20, 0.80, 1.75]
chloroethane	TO15-U	ug/m3	NDD		[0.34, 2.1, 1.61]	NDD		[0.36, 2.3, 1.75]
chloroform	TO15-U	ug/m3	**0.82**		[0.16, 0.79, 1.61]	**0.56 J**	**a**	[0.17, 0.85, 1.75]
chloromethane	TO15-U	ug/m3	**1.2 J**	**a**	[0.41, 1.7, 1.61]	**1.2 J**	**a**	[0.44, 1.8, 1.75]
cyclohexane	TO15-U	ug/m3	**1.4**		[0.094, 0.55, 1.61]	**0.14 J**	**a**	[0.10, 0.60, 1.75]
dibromochloromethane	TO15-U	ug/m3	NDD		[0.23, 1.4, 1.61]	NDD		[0.24, 1.5, 1.75]
1,2-dichlorobenzene	TO15-U	ug/m3	NDD		[0.30, 0.97, 1.61]	NDD		[0.32, 1.0, 1.75]
1,3-dichlorobenzene	TO15-U	ug/m3	NDD		[0.13, 0.97, 1.61]	NDD		[0.14, 1.0, 1.75]
1,4-dichlorobenzene	TO15-U	ug/m3	NDD		[0.14, 0.97, 1.61]	NDD		[0.15, 1.0, 1.75]
dichlorodifluoromethane	TO15-U	ug/m3	**2.4**		[0.12, 0.80, 1.61]	**2.4**		[0.13, 0.86, 1.75]
1,1-dichloroethane	TO15-U	ug/m3	NDD		[0.083, 0.65, 1.61]	NDD		[0.090, 0.71, 1.75]
1,2-dichloroethane	TO15-U	ug/m3	NDD		[0.22, 0.65, 1.61]	NDD		[0.24, 0.71, 1.75]
1,1-dichloroethene	TO15-U	ug/m3	NDD		[0.13, 0.64, 1.61]	NDD		[0.14, 0.69, 1.75]
cis-1,2-dichloroethene	TO15-U	ug/m3	NDD		[0.18, 0.64, 1.61]	NDD		[0.20, 0.69, 1.75]
trans-1,2-dichloroethene	TO15-U	ug/m3	NDD		[0.19, 0.64, 1.61]	NDD		[0.21, 0.69, 1.75]
1,2-dichloropropane	TO15-U	ug/m3	NDD		[0.16, 0.74, 1.61]	NDD		[0.18, 0.81, 1.75]
cis-1,3-dichloropropene	TO15-U	ug/m3	NDD		[0.15, 0.73, 1.61]	NDD		[0.17, 0.79, 1.75]
trans-1,3-dichloropropene	TO15-U	ug/m3	NDD		[0.16, 0.73, 1.61]	NDD		[0.17, 0.79, 1.75]
1,2-dichlorotetrafluoroethane	TO15-U	ug/m3	NDD		[0.21, 1.1, 1.61]	NDD		[0.22, 1.2, 1.75]
1,4-dioxane	TO15-U	ug/m3	NDD		[0.17, 0.58, 1.61]	NDD		[0.19, 0.63, 1.75]
ethanol	TO15-U	ug/m3	**19**		[0.32, 1.5, 1.61]	**5.6**		[0.35, 1.6, 1.75]
ethyl acetate	TO15-U	ug/m3	NDD		[2.9, 2.9, 1.61]	NDD		[3.2, 3.2, 1.75]
ethylbenzene	TO15-U	ug/m3	**1.8**		[0.20, 0.70, 1.61]	**0.35 J**	**a**	[0.22, 0.76, 1.75]
ethylene dibromide (EDB)	TO15-U	ug/m3	NDD		[0.21, 1.2, 1.61]	NDD		[0.23, 1.3, 1.75]

APPENDIX D-4 INDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4807)

	Base		EDWRD			EDWRD		
	Site		AOC N3			AOC N3		
	Point		N3-4807IA3			N3-4807IA4		
	Sampling Date		02/03/2016 08:35			02/03/2016 09:05		
	Sample Depth		-			-		
	Sample Type		FD1			N1		
	Field Sample		N3-4807IA3-VS203			N3-4807IA4-VS3		
	Lab Sample		1602166-04A			1602167-04A		
	Status		*Validated*			*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]
4-ethyltoluene	TO15-U	ug/m3	**1.6**		[0.17, 0.79, 1.61]	**0.37 J**	**a**	[0.18, 0.86, 1.75]
n-heptane	TO15-U	ug/m3	**2.1**		[0.15, 0.66, 1.61]	**0.54 J**	**a**	[0.16, 0.72, 1.75]
hexachlorobutadiene	TO15-U	ug/m3	NDD		[0.43, 8.6, 1.61]	NDD		[0.47, 9.3, 1.75]
n-hexane	TO15-U	ug/m3	**3.8**		[0.12, 0.57, 1.61]	**0.35 J**	**a**	[0.13, 0.62, 1.75]
2-hexanone	TO15-U	ug/m3	NDD		[0.35, 3.3, 1.61]	NDD		[0.38, 3.6, 1.75]
isopropanol	TO15-U	ug/m3	**0.98 J**	**a**	[0.15, 2.0, 1.61]	**0.56 J**	**a**	[0.16, 2.2, 1.75]
isopropylbenzene	TO15-U	ug/m3	NDD		[0.12, 0.79, 1.61]	NDD		[0.14, 0.86, 1.75]
p-isopropyltoluene	TO15-U	ug/m3	NDD		[4.4, 4.4, 1.61]	NDD		[4.8, 4.8, 1.75]
methyl tert-butyl ether (MTBE)	TO15-U	ug/m3	**0.14 J**	**a**	[0.077, 0.58, 1.61]	NDD		[0.084, 0.63, 1.75]
4-methyl-2-pentanone (MIBK)	TO15-U	ug/m3	**0.15 J**	**a**	[0.12, 0.66, 1.61]	**0.14 J**	**a**	[0.13, 0.72, 1.75]
methylene chloride	TO15-U	ug/m3	NDV 0.44 J	**UJ 1,a**	[0.084, 1.1, 1.61]	NDV 0.35 J	**UJ 1,a**	[0.092, 1.2, 1.75]
naphthalene	TO15-U	ug/m3	**0.16 J**	**a**	[0.094, 4.2, 1.61]	NDD		[0.10, 4.6, 1.75]
propene	TO15-U	ug/m3	NDD		[0.37, 1.4, 1.61]	NDD		[0.40, 1.5, 1.75]
styrene	TO15-U	ug/m3	**0.24 J**	**a**	[0.070, 0.68, 1.61]	**0.15 J**	**a**	[0.076, 0.74, 1.75]
1,1,1,2-tetrachloroethane	TO15-U	ug/m3	NDD		[5.5, 5.5, 1.61]	NDD		[6.0, 6.0, 1.75]
1,1,2,2-tetrachloroethane	TO15-U	ug/m3	NDD		[0.11, 1.1, 1.61]	NDD		[0.12, 1.2, 1.75]
tetrachloroethene (PCE)	TO15-U	ug/m3	NDD		[0.30, 1.1, 1.61]	NDD		[0.32, 1.2, 1.75]
tetrahydrofuran	TO15-U	ug/m3	NDD		[0.41, 2.4, 1.61]	NDD		[0.44, 2.6, 1.75]
toluene	TO15-U	ug/m3	**40**		[0.074, 0.61, 1.61]	**20**		[0.080, 0.66, 1.75]
1,2,4-trichlorobenzene	TO15-U	ug/m3	NDD		[0.24, 6.0, 1.61]	NDD		[0.26, 6.5, 1.75]
1,1,1-trichloroethane	TO15-U	ug/m3	NDD		[0.21, 0.88, 1.61]	NDD		[0.23, 0.95, 1.75]
1,1,2-trichloroethane	TO15-U	ug/m3	NDD		[0.44, 0.88, 1.61]	NDD		[0.48, 0.95, 1.75]
trichloroethene (TCE)	TO15-U	ug/m3	NDD		[0.26, 0.86, 1.61]	NDD		[0.28, 0.94, 1.75]
trichlorofluoromethane	TO15-U	ug/m3	**3.0**		[0.12, 0.90, 1.61]	**2.1**		[0.12, 0.98, 1.75]
1,1,2-trichlorotrifluoroethane	TO15-U	ug/m3	**0.54 J**	**a**	[0.35, 1.2, 1.61]	**0.63 J**	**a**	[0.38, 1.3, 1.75]
1,2,4-trimethylbenzene	TO15-U	ug/m3	**1.7**		[0.16, 0.79, 1.61]	**0.35 J**	**a**	[0.17, 0.86, 1.75]
1,3,5-trimethylbenzene	TO15-U	ug/m3	**0.50 J**	**a**	[0.14, 0.79, 1.61]	NDD		[0.15, 0.86, 1.75]
vinyl chloride	TO15-U	ug/m3	NDD		[0.091, 0.41, 1.61]	NDD		[0.099, 0.45, 1.75]
m- & p-xylene	TO15-U	ug/m3	**6.6**		[0.12, 0.70, 1.61]	**0.87**		[0.13, 0.76, 1.75]
o-xylene	TO15-U	ug/m3	**2.2**		[0.17, 0.70, 1.61]	**0.47 J**	**a**	[0.18, 0.76, 1.75]

Notes:

Qualifier definitions are presented in the QASR in Appendix D.

[(a)] See Table 2 for details.

% v/v percent volume/volume

QASR Quality Assurance Summary Report

ug/m3 micrograms per cubic meter

APPENDIX D-5 OUTDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4806)

	Base		EDWRD			EDWRD			EDWRD		
	Site		AOC N3			AOC N3			AOC N3		
	Point		N3-4806OA1			N3-4806OA2			N3-4806OA3		
	Sampling Date		02/03/2016 07:15			02/03/2016 07:35			02/03/2016 07:45		
	Sample Depth		-			-			-		
	Sample Type		N1			N1			N1		
	Field Sample		N3-4806OA1-VS3			N3-4806OA2-VS3			N3-4806OA3-VS3		
	Lab Sample		1602169-01A			1602169-02A			1602169-03A		
	Status		*Validated*			*Validated*			*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]
helium	D1946	% v/v	-			-			-		
acetone	TO15-U	ug/m3	**2.5**	**J+ 1**	[0.26, 1.9, 1.64]	**5.6**	**J+ 1**	[0.29, 2.1, 1.79]	**11**		[0.28, 2.0, 1.71]
acrylonitrile	TO15-U	ug/m3	NDD		[1.8, 1.8, 1.64]	NDD		[1.9, 1.9, 1.79]	NDD		[1.8, 1.8, 1.71]
benzene	TO15-U	ug/m3	**0.49 J**	**a**	[0.17, 0.52, 1.64]	**0.42 J**	**a**	[0.18, 0.57, 1.79]	**0.37 J**	**a**	[0.17, 0.55, 1.71]
benzyl chloride	TO15-U	ug/m3	NDD		[0.18, 0.85, 1.64]	NDD		[0.20, 0.93, 1.79]	NDD		[0.19, 0.88, 1.71]
bromodichloromethane	TO15-U	ug/m3	NDD		[0.17, 1.1, 1.64]	NDD		[0.18, 1.2, 1.79]	NDD		[0.18, 1.1, 1.71]
bromoform	TO15-U	ug/m3	NDD		[0.31, 1.7, 1.64]	NDD		[0.34, 1.8, 1.79]	NDD		[0.33, 1.8, 1.71]
bromomethane	TO15-U	ug/m3	NDD		[0.98, 3.2, 1.64]	NDD		[1.1, 3.5, 1.79]	NDD		[1.0, 3.3, 1.71]
1,3-butadiene	TO15-U	ug/m3	NDD		[0.053, 0.36, 1.64]	NDD		[0.058, 0.40, 1.79]	NDD		[0.055, 0.38, 1.71]
2-butanone (MEK)	TO15-U	ug/m3	**0.34 J**	**a**	[0.17, 2.4, 1.64]	**1.3 J**	**a**	[0.19, 2.6, 1.79]	**3.0**		[0.18, 2.5, 1.71]
n-butylbenzene	TO15-U	ug/m3	NDD		[4.5, 4.5, 1.64]	NDD		[4.9, 4.9, 1.79]	NDD		[4.7, 4.7, 1.71]
sec-butylbenzene	TO15-U	ug/m3	NDD		[4.5, 4.5, 1.64]	NDD		[4.9, 4.9, 1.79]	NDD		[4.7, 4.7, 1.71]
carbon disulfide	TO15-U	ug/m3	NDD		[0.20, 2.6, 1.64]	NDD		[0.22, 2.8, 1.79]	NDD		[0.21, 2.7, 1.71]
carbon tetrachloride	TO15-U	ug/m3	**0.38 J**	**a**	[0.096, 1.0, 1.64]	NDD		[0.10, 1.1, 1.79]	**0.46 J**	**a**	[0.10, 1.1, 1.71]
chlorobenzene	TO15-U	ug/m3	NDD		[0.19, 0.76, 1.64]	NDD		[0.21, 0.82, 1.79]	NDD		[0.20, 0.79, 1.71]
chloroethane	TO15-U	ug/m3	NDD		[0.34, 2.2, 1.64]	NDD		[0.37, 2.4, 1.79]	NDD		[0.36, 2.2, 1.71]
chloroform	TO15-U	ug/m3	NDD		[0.16, 0.80, 1.64]	NDD		[0.18, 0.87, 1.79]	NDD		[0.17, 0.83, 1.71]
chloromethane	TO15-U	ug/m3	**1.1 J**	**a**	[0.41, 1.7, 1.64]	**1.1 J**	**a**	[0.45, 1.8, 1.79]	**1.2 J**	**a**	[0.43, 1.8, 1.71]
cyclohexane	TO15-U	ug/m3	NDD		[0.095, 0.56, 1.64]	**0.24 J**	**a**	[0.10, 0.62, 1.79]	NDD		[0.099, 0.59, 1.71]
dibromochloromethane	TO15-U	ug/m3	NDD		[0.23, 1.4, 1.64]	NDD		[0.25, 1.5, 1.79]	NDD		[0.24, 1.4, 1.71]
1,2-dichlorobenzene	TO15-U	ug/m3	NDD		[0.30, 0.99, 1.64]	NDD		[0.33, 1.1, 1.79]	NDD		[0.32, 1.0, 1.71]
1,3-dichlorobenzene	TO15-U	ug/m3	NDD		[0.13, 0.99, 1.64]	NDD		[0.14, 1.1, 1.79]	NDD		[0.13, 1.0, 1.71]
1,4-dichlorobenzene	TO15-U	ug/m3	NDD		[0.14, 0.99, 1.64]	NDD		[0.15, 1.1, 1.79]	NDD		[0.14, 1.0, 1.71]
dichlorodifluoromethane	TO15-U	ug/m3	**2.6**		[0.12, 0.81, 1.64]	**2.6**		[0.13, 0.88, 1.79]	**2.4**		[0.13, 0.84, 1.71]
1,1-dichloroethane	TO15-U	ug/m3	NDD		[0.085, 0.66, 1.64]	NDD		[0.092, 0.72, 1.79]	NDD		[0.088, 0.69, 1.71]
1,2-dichloroethane	TO15-U	ug/m3	NDD		[0.22, 0.66, 1.64]	NDD		[0.24, 0.72, 1.79]	NDD		[0.23, 0.69, 1.71]
1,1-dichloroethene	TO15-U	ug/m3	NDD		[0.13, 0.65, 1.64]	NDD		[0.14, 0.71, 1.79]	NDD		[0.14, 0.68, 1.71]
cis-1,2-dichloroethene	TO15-U	ug/m3	NDD		[0.19, 0.65, 1.64]	NDD		[0.20, 0.71, 1.79]	NDD		[0.19, 0.68, 1.71]
trans-1,2-dichloroethene	TO15-U	ug/m3	NDD		[0.19, 0.65, 1.64]	NDD		[0.21, 0.71, 1.79]	NDD		[0.20, 0.68, 1.71]
1,2-dichloropropane	TO15-U	ug/m3	NDD		[0.16, 0.76, 1.64]	NDD		[0.18, 0.83, 1.79]	NDD		[0.17, 0.79, 1.71]
cis-1,3-dichloropropene	TO15-U	ug/m3	NDD		[0.16, 0.74, 1.64]	NDD		[0.17, 0.81, 1.79]	NDD		[0.16, 0.78, 1.71]
trans-1,3-dichloropropene	TO15-U	ug/m3	NDD		[0.16, 0.74, 1.64]	NDD		[0.17, 0.81, 1.79]	NDD		[0.17, 0.78, 1.71]
1,2-dichlorotetrafluoroethane	TO15-U	ug/m3	NDD		[0.21, 1.1, 1.64]	NDD		[0.23, 1.2, 1.79]	NDD		[0.22, 1.2, 1.71]
1,4-dioxane	TO15-U	ug/m3	NDD		[0.18, 0.59, 1.64]	NDD		[0.19, 0.64, 1.79]	NDD		[0.18, 0.62, 1.71]
ethanol	TO15-U	ug/m3	**4.6**		[0.33, 1.5, 1.64]	**13**		[0.36, 1.7, 1.79]	**5.5**		[0.34, 1.6, 1.71]
ethyl acetate	TO15-U	ug/m3	NDD		[3.0, 3.0, 1.64]	NDD		[3.2, 3.2, 1.79]	NDD		[3.1, 3.1, 1.71]
ethylbenzene	TO15-U	ug/m3	NDD		[0.20, 0.71, 1.64]	**0.27 J**	**a**	[0.22, 0.78, 1.79]	NDD		[0.21, 0.74, 1.71]
ethylene dibromide (EDB)	TO15-U	ug/m3	NDD		[0.22, 1.3, 1.64]	NDD		[0.24, 1.4, 1.79]	NDD		[0.22, 1.3, 1.71]

APPENDIX D-5 OUTDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4806)

	Base		EDWRD			EDWRD			EDWRD		
	Site		AOC N3			AOC N3			AOC N3		
	Point		N3-4806OA1			N3-4806OA2			N3-4806OA3		
	Sampling Date		02/03/2016 07:15			02/03/2016 07:35			02/03/2016 07:45		
	Sample Depth		-			-			-		
	Sample Type		N1			N1			N1		
	Field Sample		N3-4806OA1-VS3			N3-4806OA2-VS3			N3-4806OA3-VS3		
	Lab Sample		1602169-01A			1602169-02A			1602169-03A		
	Status		*Validated*			*Validated*			*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]	Result	QA	[MDL, RL, DF]
4-ethyltoluene	TO15-U	ug/m3	NDD		[0.17, 0.81, 1.64]	**0.20 J**	**a**	[0.18, 0.88, 1.79]	NDD		[0.18, 0.84, 1.71]
n-heptane	TO15-U	ug/m3	NDD		[0.15, 0.67, 1.64]	**0.47 J**	**a**	[0.17, 0.73, 1.79]	**0.27 J**	**a**	[0.16, 0.70, 1.71]
hexachlorobutadiene	TO15-U	ug/m3	NDD		[0.44, 8.7, 1.64]	NDD		[0.48, 9.5, 1.79]	NDD		[0.46, 9.1, 1.71]
n-hexane	TO15-U	ug/m3	**0.16 J**	**a**	[0.12, 0.58, 1.64]	**0.60 J**	**a**	[0.13, 0.63, 1.79]	**0.17 J**	**a**	[0.12, 0.60, 1.71]
2-hexanone	TO15-U	ug/m3	NDD		[0.35, 3.4, 1.64]	NDD		[0.38, 3.7, 1.79]	**0.46 J**	**a**	[0.37, 3.5, 1.71]
isopropanol	TO15-U	ug/m3	**0.26 J**	**a**	[0.15, 2.0, 1.64]	**0.88 J**	**a**	[0.17, 2.2, 1.79]	**0.48 J**	**a**	[0.16, 2.1, 1.71]
isopropylbenzene	TO15-U	ug/m3	NDD		[0.13, 0.81, 1.64]	NDD		[0.14, 0.88, 1.79]	NDD		[0.13, 0.84, 1.71]
p-isopropyltoluene	TO15-U	ug/m3	NDD		[4.5, 4.5, 1.64]	NDD		[4.9, 4.9, 1.79]	NDD		[4.7, 4.7, 1.71]
methyl tert-butyl ether (MTBE)	TO15-U	ug/m3	NDD		[0.078, 0.59, 1.64]	NDD		[0.086, 0.64, 1.79]	NDD		[0.082, 0.62, 1.71]
4-methyl-2-pentanone (MIBK)	TO15-U	ug/m3	NDD		[0.12, 0.67, 1.64]	**0.32 J**	**a**	[0.13, 0.73, 1.79]	**0.16 J**	**a**	[0.13, 0.70, 1.71]
methylene chloride	TO15-U	ug/m3	NDV 0.26 J	**UJ 1,a**	[0.086, 1.1, 1.64]	NDV 0.41 J	**UJ 1,a**	[0.094, 1.2, 1.79]	NDV 0.26 J	**UJ 1,a**	[0.090, 1.2, 1.71]
naphthalene	TO15-U	ug/m3	NDD		[0.095, 4.3, 1.64]	NDD		[0.10, 4.7, 1.79]	NDD		[0.099, 4.5, 1.71]
propene	TO15-U	ug/m3	NDD		[0.38, 1.4, 1.64]	NDD		[0.41, 1.5, 1.79]	NDD		[0.39, 1.5, 1.71]
styrene	TO15-U	ug/m3	NDD		[0.071, 0.70, 1.64]	**0.12 J**	**a**	[0.078, 0.76, 1.79]	NDD		[0.074, 0.73, 1.71]
1,1,1,2-tetrachloroethane	TO15-U	ug/m3	NDD		[5.6, 5.6, 1.64]	NDD		[6.1, 6.1, 1.79]	NDD		[5.9, 5.9, 1.71]
1,1,2,2-tetrachloroethane	TO15-U	ug/m3	NDD		[0.11, 1.1, 1.64]	NDD		[0.12, 1.2, 1.79]	NDD		[0.12, 1.2, 1.71]
tetrachloroethene (PCE)	TO15-U	ug/m3	NDD		[0.30, 1.1, 1.64]	NDD		[0.33, 1.2, 1.79]	NDD		[0.32, 1.2, 1.71]
tetrahydrofuran	TO15-U	ug/m3	NDD		[0.42, 2.4, 1.64]	NDD		[0.45, 2.6, 1.79]	NDD		[0.43, 2.5, 1.71]
toluene	TO15-U	ug/m3	**0.58 J**	**a**	[0.075, 0.62, 1.64]	**2.4**		[0.082, 0.67, 1.79]	**0.45 J**	**a**	[0.078, 0.64, 1.71]
1,2,4-trichlorobenzene	TO15-U	ug/m3	NDD		[0.24, 6.1, 1.64]	NDD		[0.27, 6.6, 1.79]	NDD		[0.26, 6.3, 1.71]
1,1,1-trichloroethane	TO15-U	ug/m3	NDD		[0.21, 0.89, 1.64]	NDD		[0.23, 0.98, 1.79]	NDD		[0.22, 0.93, 1.71]
1,1,2-trichloroethane	TO15-U	ug/m3	NDD		[0.45, 0.89, 1.64]	NDD		[0.49, 0.98, 1.79]	NDD		[0.47, 0.93, 1.71]
trichloroethene (TCE)	TO15-U	ug/m3	NDD		[0.26, 0.88, 1.64]	NDD		[0.29, 0.96, 1.79]	NDD		[0.27, 0.92, 1.71]
trichlorofluoromethane	TO15-U	ug/m3	**1.3**		[0.12, 0.92, 1.64]	**1.3**		[0.13, 1.0, 1.79]	**1.2**		[0.12, 0.96, 1.71]
1,1,2-trichlorotrifluoroethane	TO15-U	ug/m3	**0.51 J**	**a**	[0.35, 1.2, 1.64]	**0.72 J**	**a**	[0.38, 1.4, 1.79]	**0.64 J**	**a**	[0.37, 1.3, 1.71]
1,2,4-trimethylbenzene	TO15-U	ug/m3	NDD		[0.16, 0.81, 1.64]	**0.22 J**	**a**	[0.17, 0.88, 1.79]	NDD		[0.16, 0.84, 1.71]
1,3,5-trimethylbenzene	TO15-U	ug/m3	NDD		[0.14, 0.81, 1.64]	NDD		[0.15, 0.88, 1.79]	NDD		[0.15, 0.84, 1.71]
vinyl chloride	TO15-U	ug/m3	NDD		[0.093, 0.42, 1.64]	NDD		[0.10, 0.46, 1.79]	NDD		[0.097, 0.44, 1.71]
m- & p-xylene	TO15-U	ug/m3	**0.29 J**	**a**	[0.12, 0.71, 1.64]	**0.77 J**	**a**	[0.14, 0.78, 1.79]	**0.16 J**	**a**	[0.13, 0.74, 1.71]
o-xylene	TO15-U	ug/m3	NDD		[0.17, 0.71, 1.64]	**0.20 J**	**a**	[0.19, 0.78, 1.79]	NDD		[0.18, 0.74, 1.71]

Notes:

Qualifier definitions are presented in the QASR in Appendix D.

[(a)] See Table 2 for details.

% v/v percent volume/volume

QASR Quality Assurance Summary Report

ug/m3 micrograms per cubic meter

APPENDIX D-5 OUTDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4806)

	Base		EDWRD		
	Site		AOC N3		
	Point		N3-4806OA3		
	Sampling Date		02/03/2016 07:45		
	Sample Depth		-		
	Sample Type		FD1		
	Field Sample		N3-4806OA3-VS203		
	Lab Sample		1602169-04A		
	Status		*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]
helium	D1946	% v/v	-		
acetone	TO15-U	ug/m3	**20**		[0.27, 2.0, 1.68]
acrylonitrile	TO15-U	ug/m3	NDD		[1.8, 1.8, 1.68]
benzene	TO15-U	ug/m3	**0.84**		[0.17, 0.54, 1.68]
benzyl chloride	TO15-U	ug/m3	NDD		[0.18, 0.87, 1.68]
bromodichloromethane	TO15-U	ug/m3	NDD		[0.17, 1.1, 1.68]
bromoform	TO15-U	ug/m3	NDD		[0.32, 1.7, 1.68]
bromomethane	TO15-U	ug/m3	NDD		[1.0, 3.3, 1.68]
1,3-butadiene	TO15-U	ug/m3	NDD		[0.054, 0.37, 1.68]
2-butanone (MEK)	TO15-U	ug/m3	**8.2**		[0.18, 2.5, 1.68]
n-butylbenzene	TO15-U	ug/m3	NDD		[4.6, 4.6, 1.68]
sec-butylbenzene	TO15-U	ug/m3	NDD		[4.6, 4.6, 1.68]
carbon disulfide	TO15-U	ug/m3	NDV 0.46 J	**UJ B,a**	[0.21, 2.6, 1.68]
carbon tetrachloride	TO15-U	ug/m3	**0.40 J**	**a**	[0.098, 1.0, 1.68]
chlorobenzene	TO15-U	ug/m3	NDD		[0.19, 0.77, 1.68]
chloroethane	TO15-U	ug/m3	NDD		[0.35, 2.2, 1.68]
chloroform	TO15-U	ug/m3	**0.21 J**	**a**	[0.16, 0.82, 1.68]
chloromethane	TO15-U	ug/m3	**1.4 J**	**a**	[0.42, 1.7, 1.68]
cyclohexane	TO15-U	ug/m3	**1.2**		[0.098, 0.58, 1.68]
dibromochloromethane	TO15-U	ug/m3	NDD		[0.24, 1.4, 1.68]
1,2-dichlorobenzene	TO15-U	ug/m3	NDD		[0.31, 1.0, 1.68]
1,3-dichlorobenzene	TO15-U	ug/m3	NDD		[0.13, 1.0, 1.68]
1,4-dichlorobenzene	TO15-U	ug/m3	NDD		[0.14, 1.0, 1.68]
dichlorodifluoromethane	TO15-U	ug/m3	**2.6**		[0.12, 0.83, 1.68]
1,1-dichloroethane	TO15-U	ug/m3	**0.75**		[0.087, 0.68, 1.68]
1,2-dichloroethane	TO15-U	ug/m3	**0.23 J**	**a**	[0.23, 0.68, 1.68]
1,1-dichloroethene	TO15-U	ug/m3	NDD		[0.13, 0.67, 1.68]
cis-1,2-dichloroethene	TO15-U	ug/m3	NDD		[0.19, 0.67, 1.68]
trans-1,2-dichloroethene	TO15-U	ug/m3	NDD		[0.20, 0.67, 1.68]
1,2-dichloropropane	TO15-U	ug/m3	**1.0**		[0.17, 0.78, 1.68]
cis-1,3-dichloropropene	TO15-U	ug/m3	NDD		[0.16, 0.76, 1.68]
trans-1,3-dichloropropene	TO15-U	ug/m3	NDD		[0.16, 0.76, 1.68]
1,2-dichlorotetrafluoroethane	TO15-U	ug/m3	NDD		[0.22, 1.2, 1.68]
1,4-dioxane	TO15-U	ug/m3	NDD		[0.18, 0.60, 1.68]
ethanol	TO15-U	ug/m3	**44**		[0.34, 1.6, 1.68]
ethyl acetate	TO15-U	ug/m3	**29**		[3.0, 3.0, 1.68]
ethylbenzene	TO15-U	ug/m3	**1.1**		[0.21, 0.73, 1.68]
ethylene dibromide (EDB)	TO15-U	ug/m3	NDD		[0.22, 1.3, 1.68]

APPENDIX D-5 OUTDOOR AIR ANALYTICAL RESULTS - FEBRUARY 2016
(BUILDING 4806)

	Base		EDWRD		
	Site		AOC N3		
	Point		N3-4806OA3		
	Sampling Date		02/03/2016 07:45		
	Sample Depth		-		
	Sample Type		FD1		
	Field Sample		N3-4806OA3-VS203		
	Lab Sample		1602169-04A		
	Status		*Validated*		
Analyte	Method	Units	Result	QA	[MDL, RL, DF]
4-ethyltoluene	TO15-U	ug/m3	**0.37 J**	**a**	[0.17, 0.82, 1.68]
n-heptane	TO15-U	ug/m3	**1.1**		[0.16, 0.69, 1.68]
hexachlorobutadiene	TO15-U	ug/m3	NDD		[0.45, 9.0, 1.68]
n-hexane	TO15-U	ug/m3	**1.3**		[0.12, 0.59, 1.68]
2-hexanone	TO15-U	ug/m3	NDD		[0.36, 3.4, 1.68]
isopropanol	TO15-U	ug/m3	**4.3**		[0.16, 2.1, 1.68]
isopropylbenzene	TO15-U	ug/m3	**0.13 J**	**a**	[0.13, 0.82, 1.68]
p-isopropyltoluene	TO15-U	ug/m3	NDD		[4.6, 4.6, 1.68]
methyl tert-butyl ether (MTBE)	TO15-U	ug/m3	NDD		[0.080, 0.60, 1.68]
4-methyl-2-pentanone (MIBK)	TO15-U	ug/m3	**1.9**		[0.12, 0.69, 1.68]
methylene chloride	TO15-U	ug/m3	NDV 1.9	**UJ 1**	[0.088, 1.2, 1.68]
naphthalene	TO15-U	ug/m3	NDD		[0.098, 4.4, 1.68]
propene	TO15-U	ug/m3	NDD		[0.38, 1.4, 1.68]
styrene	TO15-U	ug/m3	**0.41 J**	**a**	[0.073, 0.72, 1.68]
1,1,1,2-tetrachloroethane	TO15-U	ug/m3	NDD		[5.8, 5.8, 1.68]
1,1,2,2-tetrachloroethane	TO15-U	ug/m3	NDD		[0.12, 1.2, 1.68]
tetrachloroethene (PCE)	TO15-U	ug/m3	**1.2**		[0.31, 1.1, 1.68]
tetrahydrofuran	TO15-U	ug/m3	NDD		[0.42, 2.5, 1.68]
toluene	TO15-U	ug/m3	**15**		[0.077, 0.63, 1.68]
1,2,4-trichlorobenzene	TO15-U	ug/m3	NDD		[0.25, 6.2, 1.68]
1,1,1-trichloroethane	TO15-U	ug/m3	NDD		[0.22, 0.92, 1.68]
1,1,2-trichloroethane	TO15-U	ug/m3	NDD		[0.46, 0.92, 1.68]
trichloroethene (TCE)	TO15-U	ug/m3	NDD		[0.27, 0.90, 1.68]
trichlorofluoromethane	TO15-U	ug/m3	**1.4**		[0.12, 0.94, 1.68]
1,1,2-trichlorotrifluoroethane	TO15-U	ug/m3	**0.67 J**	**a**	[0.36, 1.3, 1.68]
1,2,4-trimethylbenzene	TO15-U	ug/m3	**0.47 J**	**a**	[0.16, 0.82, 1.68]
1,3,5-trimethylbenzene	TO15-U	ug/m3	**0.18 J**	**a**	[0.14, 0.82, 1.68]
vinyl chloride	TO15-U	ug/m3	NDD		[0.095, 0.43, 1.68]
m- & p-xylene	TO15-U	ug/m3	**3.3**		[0.13, 0.73, 1.68]
o-xylene	TO15-U	ug/m3	**1.8**		[0.18, 0.73, 1.68]

Notes:

Qualifier definitions are presented in the QASR in Appendix D.

[(a)] See Table 2 for details.

% v/v percent volume/volume

QASR Quality Assurance Summary Report

ug/m3 micrograms per cubic meter

APPENDIX E

2013 ANALYTICAL RESULTS AND INDOOR AIR RISKS AND HAZARDS (COMBINED ON CD WITH APPENDICES A AND B FOR RESOURCE CONSERVATION - SEE VIIR ADDENDUM APPENDIX A)

SUB-SLAB VAPOR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806SS1	N3-4806SS2	N3-4806SS3	N3-4806SS3	N3-4806SS4	N3-4806SS5
1,1,1,2-tetrachloroethane		< 14 (U)	< 14 (UJ- q)	< 16 (U)	< 16 (U)	< 15 (U)	< 16 (U)
1,1,1-trichloroethane		< 11 (U)	< 11 (UJ- q)	< 13 (U)	< 13 (U)	< 12 (U)	< 13 (U)
1,1,2,2-tetrachloroethane		< 28 (U)	< 28 (UJ- q)	< 32 (U)	< 32 (U)	< 30 (U)	< 32 (U)
1,1,2-trichloroethane		< 11 (U)	< 11 (UJ- q)	< 13 (U)	< 13 (U)	< 12 (U)	< 13 (U)
1,1,2-trichlorotrifluoroethane		< 15 (U)	< 16 (UJ- q)	< 18 (U)	< 18 (U)	< 17 (U)	< 18 (U)
1,1-dichloroethane		< 8.2 (U)	< 8.3 (UJ- q)	< 9.3 (U)	< 9.3 (U)	< 8.9 (U)	< 9.3 (U)
1,1-dichloroethene		< 8.0 (U)	< 8.2 (UJ- q)	< 9.1 (U)	< 9.1 (U)	< 8.7 (U)	< 9.1 (U)
1,2,4-trichlorobenzene		< 30 (U)	< 31 (UJ- q)	< 34 (U)	< 34 (U)	< 33 (U)	< 34 (U)
1,2,4-trimethylbenzene		4.3 (J a)	3.7 (J- qa)	1.5 (J a)	2.6 (J a)	2.5 (J a)	2.4 (J a)
1,2-dichlorobenzene		< 12 (U)	< 12 (UJ- q)	< 14 (U)	< 14 (U)	< 13 (U)	< 14 (U)
1,2-dichloroethane		< 8.2 (U)	< 8.3 (UJ- q)	< 9.3 (U)	< 9.3 (U)	< 8.9 (U)	< 9.3 (U)
1,2-dichloropropane		< 9.3 (U)	< 9.5 (UJ- q)	< 11 (U)	< 11 (U)	< 10 (U)	< 11 (U)
1,2-dichlorotetrafluoroethane		< 14 (U)	< 14 (UJ- q)	< 16 (U)	< 16 (U)	< 15 (U)	< 16 (U)
1,3,5-trimethylbenzene		1.7 (J a)	< 20 (UJ- q)	< 23 (U)	< 23 (U)	< 22 (U)	< 23 (U)
1,3-butadiene		< 22 (U)	< 23 (UJ- q)	< 25 (U)	< 25 (U)	< 24 (U)	< 25 (U)
1,3-dichlorobenzene		< 12 (U)	< 12 (UJ- q)	< 14 (U)	< 14 (U)	< 13 (U)	< 14 (U)
1,4-dichlorobenzene		< 12 (U)	< 12 (UJ- q)	< 14 (U)	< 14 (U)	< 13 (U)	< 14 (U)
2-butanone (MEK)		9.1	16 (J- q)	4.7 (J a)	7.8	30	33
2-hexanone		< 8.3 (U)	< 8.5 (UJ- q)	< 9.4 (U)	< 9.4 (U)	< 9.0 (U)	8.3 (J a)
4-ethyltoluene		2.9 (J a)	2.4 (J- qa)	< 11 (U)	1.9 (J a)	2.3 (J a)	1.5 (J a)
4-methyl-2-pentanone (MIBK)		< 8.3 (U)	< 8.5 (UJ- q)	< 9.4 (U)	< 9.4 (U)	< 9.0 (U)	24
acetone		110	100 (J- q)	40	68	200	130
acrylonitrile		< 22 (U)	< 22 (UJ- q)	< 25 (U)	< 25 (U)	< 24 (U)	< 25 (U)
benzene		3.8 (J a)	6.5 (J- qa)	1.7 (J a)	2.8 (J a)	33	2.6 (J a)
benzyl chloride		< 10 (UJ- cf)	< 11 (UJ- qcf)	< 12 (UJ- cf)	< 12 (UJ- cf)	< 11 (UJ- cf)	< 12 (UJ- cf)
bromodichloromethane		< 14 (U)	< 14 (UJ- q)	< 15 (U)	< 15 (U)	< 15 (U)	< 15 (U)
bromoform		< 21 (U)	< 21 (UJ- q)	< 24 (U)	< 24 (U)	< 23 (U)	< 24 (U)
bromomethane		< 7.9 (UJ c)	< 8.0 (UJ- cq)	< 8.9 (UJ c)	< 8.9 (UJ c)	< 8.5 (UJ c)	< 8.9 (UJ c)
carbon disulfide		< 3.5 (UJ 1a)	< 8.4 (UJ 1qa)	< 9.8 (UJ 1a)	< 6.0 (UJ 1a)	< 7.4 (UJ 1a)	< 3.1 (UJ 1a)
carbon tetrachloride		< 13 (U)	< 13 (UJ- q)	< 14 (U)	< 14 (U)	< 14 (U)	< 14 (U)
chlorobenzene		< 9.3 (U)	< 9.5 (UJ- q)	< 11 (U)	< 11 (U)	< 10 (U)	< 11 (U)

SUB-SLAB VAPOR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806SS1	N3-4806SS2	N3-4806SS3	N3-4806SS3	N3-4806SS4	N3-4806SS5
chloroethane		<5.3 (U)	<5.4 (UJ- q)	<6.1 (U)	<6.1 (U)	<5.8 (U)	<6.1 (U)
chloroform		<9.9 (U)	<10 (UJ- q)	<11 (U)	<11 (U)	19	4.4 (J a)
chloromethane		<8.4 (U)	<8.5 (UJ- q)	<9.5 (U)	<9.5 (U)	<9.1 (U)	<9.5 (U)
cis-1,2-dichloroethene		<8.0 (U)	<8.2 (UJ- q)	<9.1 (U)	<9.1 (U)	<8.7 (U)	<9.1 (U)
cis-1,3-dichloropropene		<9.2 (U)	<9.4 (UJ- q)	<10 (U)	<10 (U)	<10 (U)	<10 (U)
cyclohexane		3.5 (J a)	5.0 (J- qa)	<40 (U)	4.0 (J a)	4.2 (J a)	3.1 (J a)
dibromochloromethane		<17 (U)	<18 (UJ- q)	<20 (U)	<20 (U)	<19 (U)	<20 (U)
dichlorodifluoromethane		2.9 (J a)	3.2 (J- qa)	3.2 (J a)	3.4 (J a)	3.4 (J a)	5.0 (J a)
ethanol		36	120 (J- q)	46	55	69	69
ethyl acetate		<36 (U)	<37 (UJ- q)	<41 (U)	<41 (U)	<40 (U)	<41 (U)
ethylbenzene		2.6 (J a)	4.0 (J- qa)	<10 (U)	1.8 (J a)	3.4 (J a)	1.6 (J a)
ethylene dibromide (EDB)		<16 (U)	<16 (UJ- q)	<18 (U)	<18 (U)	<17 (U)	<18 (U)
hexachlorobutadiene		<22 (U)	<22 (UJ- q)	<25 (U)	<25 (U)	<23 (U)	<25 (U)
isopropanol		8.7 (J a)	20 (J- qa)	<28 (U)	15 (J a)	22 (J a)	32
isopropylbenzene		<9.9 (U)	2.5 (J- qa)	<11 (U)	<11 (U)	2.5 (J a)	<11 (U)
m- & p-xylene		12	18 (J- q)	4.7 (J a)	9.2 (J a)	11	7.2 (J a)
methyl tert-butyl ether (MTBE)		<7.3 (U)	<7.4 (UJ- q)	<8.3 (U)	<8.3 (U)	<7.9 (U)	<8.3 (U)
methylene chloride		<7.0 (U)	<7.2 (UJ- q)	<8.0 (U)	<8.0 (U)	<7.6 (U)	<8.0 (U)
naphthalene		<53 (U)	<54 (UJ- q)	<60 (U)	<60 (U)	<58 (U)	<60 (U)
n-butylbenzene		<11 (U)	<11 (UJ- q)	<13 (U)	<13 (U)	<12 (U)	<13 (U)
n-heptane		<41 (U)	<42 (UJ- q)	<47 (U)	<47 (U)	250	4.2 (J a)
n-hexane		<36 (U)	150 (J- q)	<40 (U)	<40 (U)	310	2.0 (J a)
o-xylene		3.9 (J a)	6.0 (J- qa)	1.8 (J a)	3.3 (J a)	4.0 (J a)	2.4 (J a)
p-isopropyltoluene		2.5 (J a)	2.0 (J- qa)	<13 (U)	<13 (U)	2.0 (J a)	<13 (U)
propene		<17 (U)	<18 (UJ- q)	<20 (U)	<20 (U)	<19 (U)	<20 (U)
sec-butylbenzene		<11 (U)	<11 (UJ- q)	<13 (U)	<13 (U)	<12 (U)	<13 (U)
styrene		<8.6 (U)	<8.8 (UJ- q)	<9.8 (U)	<9.8 (U)	<9.4 (U)	<9.8 (U)
tetrachloroethene (PCE)		4.0 (J a)	16 (J- q)	16	11 (J a)	3.9 (J a)	8.8 (J a)
tetrahydrofuran		<30 (U)	<30 (UJ- q)	<34 (U)	<34 (U)	1.5 (J a)	<34 (U)
toluene		16	16 (J- q)	5.3 (J a)	9.1	14	8.6 (J a)
trans-1,2-dichloroethene		<8.0 (U)	<8.2 (UJ- q)	<9.1 (U)	<9.1 (U)	<8.7 (U)	<9.1 (U)

SUB-SLAB VAPOR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806SS1	N3-4806SS2	N3-4806SS3	N3-4806SS3	N3-4806SS4	N3-4806SS5
trans-1,3-dichloropropene		< 9.2 (U)	< 9.4 (UJ- q)	< 10 (U)	< 10 (U)	< 10 (U)	< 10 (U)
trichloroethene (TCE)		1.8 (J a)	< 11 (UJ- q)	< 12 (U)	< 12 (U)	94	79
trichlorofluoromethane		< 11 (U)	< 12 (UJ- q)	< 13 (U)	< 13 (U)	< 12 (U)	< 13 (U)
vinyl chloride		< 5.2 (U)	< 5.3 (UJ- q)	< 5.9 (U)	< 5.9 (U)	< 5.6 (U)	< 5.9 (U)

Notes:

Qualifier definitions are presented in Appendix E.

All concentrations are presented in in micrograms per cubic meter.

SUB-SLAB VAPOR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806SS1	N3-4806SS2	N3-4806SS3	N3-4806SS3	N3-4806SS4	N3-4806SS5
1,1,1,2-tetrachloroethane		< 13 (U)	< 13 (UJ- q)	< 14 (U)	< 14 (U)	< 14 (U)	< 13 (U)
1,1,1-trichloroethane		< 10 (U)	< 11 (UJ- q)	< 11 (U)	< 11 (U)	< 11 (U)	< 11 (U)
1,1,2,2-tetrachloroethane		< 26 (U)	< 27 (UJ- q)	< 27 (U)	< 27 (U)	< 29 (U)	< 27 (U)
1,1,2-trichloroethane		< 10 (U)	< 11 (UJ- q)	< 11 (U)	< 11 (U)	< 11 (U)	< 11 (U)
1,1,2-trichlorotrifluoroethane		< 14 (U)	< 15 (UJ- q)	< 15 (U)	< 15 (U)	< 16 (U)	< 15 (U)
1,1-dichloroethane		< 7.6 (U)	< 7.9 (UJ- q)	< 8.0 (U)	< 8.0 (U)	< 8.5 (U)	< 7.9 (U)
1,1-dichloroethene		< 7.4 (U)	< 7.7 (UJ- q)	< 7.9 (U)	< 7.9 (U)	< 8.4 (U)	< 7.7 (U)
1,2,4-trichlorobenzene		< 28 (U)	< 29 (UJ- q)	< 29 (U)	< 29 (U)	< 31 (U)	< 29 (U)
1,2,4-trimethylbenzene		3.1 (J a)	4.4 (J- qa)	1.2 (J a)	1.3 (J a)	4.5 (J a)	2.5 (J a)
1,2-dichlorobenzene		< 11 (U)	< 12 (UJ- q)	< 12 (U)	< 12 (U)	< 13 (U)	< 12 (U)
1,2-dichloroethane		< 7.6 (U)	< 7.9 (UJ- q)	< 8.0 (U)	< 8.0 (U)	< 8.5 (U)	< 7.9 (U)
1,2-dichloropropane		< 8.7 (U)	< 9.0 (UJ- q)	< 9.2 (U)	< 9.2 (U)	< 9.7 (U)	< 9.0 (U)
1,2-dichlorotetrafluoroethane		< 13 (U)	< 14 (UJ- q)	< 14 (U)	< 14 (U)	< 15 (U)	< 14 (U)
1,3,5-trimethylbenzene		< 18 (U)	< 19 (UJ- q)	< 19 (U)	< 19 (U)	1.8 (J a)	< 19 (U)
1,3-butadiene		< 21 (U)	< 22 (UJ- q)	< 22 (U)	< 22 (U)	< 23 (U)	< 22 (U)
1,3-dichlorobenzene		< 11 (U)	< 12 (UJ- q)	< 12 (U)	< 12 (U)	< 13 (U)	< 12 (U)
1,4-dichlorobenzene		< 11 (U)	< 12 (UJ- q)	< 12 (U)	< 12 (U)	< 13 (U)	< 12 (U)
2-butanone (MEK)		23	26 (J- q)	17	19	8.1	27
2-hexanone		< 7.7 (U)	< 8.0 (UJ- q)	< 8.1 (U)	< 8.1 (U)	< 8.6 (U)	< 8.0 (U)
4-ethyltoluene		2.1 (J a)	3.0 (J- qa)	< 9.7 (U)	< 9.7 (U)	4.0 (J a)	1.8 (J a)
4-methyl-2-pentanone (MIBK)		< 7.7 (U)	< 8.0 (UJ- q)	< 8.1 (U)	< 8.1 (U)	< 8.6 (U)	< 8.0 (U)
acetone		140	150 (J- q)	75	86	82	140
acrylonitrile		< 20 (U)	< 21 (UJ- q)	< 22 (U)	< 22 (U)	< 23 (U)	< 21 (U)
benzene		4.9 (J ca)	13 (J- cq)	8.2 (J c)	8.2 (J c)	9.2 (J c)	9.8 (J c)
benzyl chloride		< 9.7 (UJ- f)	< 10 (UJ- fq)	< 10 (UJ- f)	< 10 (UJ- f)	< 11 (UJ- f)	< 10 (UJ- f)
bromodichloromethane		< 13 (U)	< 13 (UJ- q)	< 13 (U)	< 13 (U)	< 14 (U)	< 13 (U)
bromoform		< 19 (U)	< 20 (UJ- q)	< 20 (U)	< 20 (U)	< 22 (U)	< 20 (U)
bromomethane		< 7.3 (U)	< 7.5 (UJ- q)	< 7.7 (U)	< 7.7 (U)	< 8.2 (U)	< 7.5 (U)
carbon disulfide		64	40 (J- q)	97	130	85	240
carbon tetrachloride		< 12 (U)	< 12 (UJ- q)	< 12 (U)	< 12 (U)	< 13 (U)	< 12 (U)
chlorobenzene		< 8.6 (U)	< 8.9 (UJ- q)	< 9.1 (U)	< 9.1 (U)	< 9.7 (U)	< 8.9 (U)

SUB-SLAB VAPOR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806SS1	N3-4806SS2	N3-4806SS3	N3-4806SS3	N3-4806SS4	N3-4806SS5
chloroethane		<4.9 (U)	<5.1 (UJ- q)	<5.2 (U)	<5.2 (U)	<5.6 (U)	<5.1 (U)
chloroform		<9.1 (U)	<9.5 (UJ- q)	<9.7 (U)	<9.7 (U)	9.4 (J a)	3.4 (J a)
chloromethane		2.5 (J a)	3.9 (J- qa)	<8.2 (U)	2.3 (J a)	1.8 (J a)	1.7 (J a)
cis-1,2-dichloroethene		<7.4 (U)	<7.7 (UJ- q)	<7.9 (U)	<7.9 (U)	<8.4 (U)	<7.7 (U)
cis-1,3-dichloropropene		<8.5 (U)	<8.8 (UJ- q)	<9.0 (U)	<9.0 (U)	<9.6 (U)	<8.8 (U)
cyclohexane		3.2 (J a)	5.2 (J- qa)	<34 (U)	<34 (U)	<36 (U)	3.3 (J a)
dibromochloromethane		<16 (U)	<17 (UJ- q)	<17 (U)	<17 (U)	<18 (U)	<17 (U)
dichlorodifluoromethane		4.2 (J a)	5.8 (J- qa)	5.3 (J a)	5.5 (J a)	3.3 (J a)	4.0 (J a)
ethanol		90 (J c)	100 (J- cq)	110 (J c)	91 (J c)	27 (J c)	36 (J c)
ethyl acetate		<34 (U)	<35 (UJ- q)	<36 (U)	<36 (U)	<38 (U)	<35 (U)
ethylbenzene		1.9 (J a)	2.6 (J- qa)	<8.6 (U)	<8.6 (U)	2.5 (J a)	1.8 (J a)
ethylene dibromide (EDB)		<14 (U)	<15 (UJ- q)	<15 (U)	<15 (U)	<16 (U)	<15 (U)
hexachlorobutadiene		<20 (U)	<21 (UJ- q)	<21 (U)	<21 (U)	<22 (U)	<21 (U)
isopropanol		16 (J a)	15 (J- qa)	15 (J a)	13 (J a)	<26 (U)	10 (J a)
isopropylbenzene		<9.2 (U)	<9.6 (UJ- q)	<9.7 (U)	<9.7 (U)	<10 (U)	<9.6 (U)
m- & p-xylene		5.3 (J a)	8.2 (J- qa)	3.1 (J a)	3.5 (J a)	8.1 (J a)	5.8 (J a)
methyl tert-butyl ether (MTBE)		1.4 (J a)	1.2 (J- qa)	<7.1 (U)	<7.1 (U)	<7.6 (U)	1.3 (J a)
methylene chloride		<5.4 (UJ ba)	7.7 (J bq)	<4.2 (UJ ba)	<5.0 (UJ ba)	<6.4 (UJ ba)	7.4 (J+ b)
naphthalene		4.7 (J a)	1.4 (J- qa)	1.2 (J a)	1.6 (J a)	<55 (U)	4.3 (J a)
n-butylbenzene		<10 (U)	<11 (UJ- q)	<11 (U)	<11 (U)	<12 (U)	<11 (U)
n-heptane		<38 (U)	<40 (UJ- q)	<41 (U)	<41 (U)	<43 (U)	<40 (U)
n-hexane		<33 (U)	<34 (UJ- q)	1.9 (J a)	2.4 (J a)	<37 (U)	<34 (U)
o-xylene		2.1 (J a)	3.2 (J- qa)	1.3 (J a)	1.2 (J a)	3.4 (J a)	2.0 (J a)
p-isopropyltoluene		<10 (U)	<11 (UJ- q)	<11 (U)	<11 (U)	7.6 (J a)	2.2 (J a)
propene		<16 (U)	<17 (UJ- q)	<17 (U)	<17 (U)	<18 (U)	<17 (U)
sec-butylbenzene		<10 (U)	<11 (UJ- q)	<11 (U)	<11 (U)	<12 (U)	<11 (U)
styrene		<8.0 (U)	<8.3 (UJ- q)	<8.4 (U)	<8.4 (U)	<9.0 (U)	<8.3 (U)
tetrachloroethene (PCE)		12 (J a)	19 (J- q)	11 (J a)	11 (J a)	4.1 (J a)	12 (J a)
tetrahydrofuran		<28 (U)	4.8 (J- qa)	1.5 (J a)	3.1 (J a)	<31 (U)	1.8 (J a)
toluene		7.0 (J a)	9.5 (J- q)	4.5 (J a)	4.9 (J a)	5.4 (J a)	8.2
trans-1,2-dichloroethene		<7.4 (U)	<7.7 (UJ- q)	<7.9 (U)	<7.9 (U)	<8.4 (U)	<7.7 (U)

SUB-SLAB VAPOR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806SS1	N3-4806SS2	N3-4806SS3	N3-4806SS3	N3-4806SS4	N3-4806SS5
trans-1,3-dichloropropene		<8.5 (U)	<8.8 (UJ- q)	<9.0 (U)	<9.0 (U)	<9.6 (U)	<8.8 (U)
trichloroethene (TCE)		4.3 (J a)	1.3 (J- qa)	<11 (U)	<11 (U)	110	120
trichlorofluoromethane		3.6 (J a)	2.8 (J- qa)	<11 (U)	<11 (U)	<12 (U)	<11 (U)
vinyl chloride		<4.8 (U)	<5.0 (UJ- q)	<5.1 (U)	<5.1 (U)	<5.4 (U)	<5.0 (U)

Notes:

Qualifier definitions are presented in Appendix E.

All concentrations are presented in in micrograms per cubic meter.

SUB-SLAB VAPOR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4807)

Analyte	Sample ID	N3-4807SS1	N3-4807SS2	N3-4807SS3	N3-4807SS4
1,1,1,2-tetrachloroethane		<13 (U)	<12 (U)	<15 (UJ- q)	<15 (U)
1,1,1-trichloroethane		<10 (U)	<9.2 (U)	<12 (UJ- q)	<12 (U)
1,1,2,2-tetrachloroethane		<26 (U)	<23 (U)	<30 (UJ- q)	<30 (U)
1,1,2-trichloroethane		<10 (U)	<9.2 (U)	<12 (UJ- q)	<12 (U)
1,1,2-trichlorotrifluoroethane		<14 (U)	<13 (U)	<17 (UJ- q)	<16 (U)
1,1-dichloroethane		<7.6 (U)	<6.8 (U)	<8.9 (UJ- q)	<8.7 (U)
1,1-dichloroethene		<7.4 (U)	<6.7 (U)	<8.7 (UJ- q)	<8.5 (U)
1,2,4-trichlorobenzene		<28 (U)	<25 (U)	<33 (UJ- q)	<32 (U)
1,2,4-trimethylbenzene		6.1 (J a)	2.5 (J a)	2.6 (J- qa)	2.2 (J a)
1,2-dichlorobenzene		<11 (U)	<10 (U)	<13 (UJ- q)	<13 (U)
1,2-dichloroethane		<7.6 (U)	<6.8 (U)	<8.9 (UJ- q)	<8.7 (U)
1,2-dichloropropane		<8.7 (U)	<7.8 (U)	<10 (UJ- q)	<9.9 (U)
1,2-dichlorotetrafluoroethane		<13 (U)	<12 (U)	<15 (UJ- q)	<15 (U)
1,3,5-trimethylbenzene		2.7 (J a)	<17 (U)	<22 (UJ- q)	<21 (U)
1,3-butadiene		<21 (U)	<19 (U)	<24 (UJ- q)	<24 (U)
1,3-dichlorobenzene		<11 (U)	<10 (U)	<13 (UJ- q)	<13 (U)
1,4-dichlorobenzene		<11 (U)	<10 (U)	<13 (UJ- q)	<13 (U)
2-butanone (MEK)		43	45	10 (J- q)	12
2-hexanone		3.2 (J a)	<6.9 (U)	<9.0 (UJ- q)	<8.8 (U)
4-ethyltoluene		5.0 (J a)	1.7 (J a)	1.9 (J- qa)	1.7 (J a)
4-methyl-2-pentanone (MIBK)		11	12	<9.0 (UJ- q)	<8.8 (U)
acetone		520	540	120 (J- q)	45
acrylonitrile		<20 (U)	<18 (U)	<24 (UJ- q)	<23 (U)
benzene		7.0	18	7.5 (J- q)	3.7 (J a)
benzyl chloride		<9.7 (UJ- cf)	<8.7 (UJ- cf)	<11 (UJ- qcf)	<11 (UJ c)
bromodichloromethane		<13 (U)	<11 (U)	<15 (UJ- q)	<14 (U)
bromoform		<19 (U)	<17 (U)	<23 (UJ- q)	<22 (U)
bromomethane		<7.3 (UJ c)	<6.5 (UJ c)	<8.5 (UJ- cq)	<8.4 (UJ c)
carbon disulfide		<6.5 (UJ 1a)	<5.4 (UJ 1a)	<5.6 (UJ- 1qa)	<8.9 (UJ 1a)
carbon tetrachloride		<12 (U)	<11 (U)	<14 (UJ- q)	<14 (U)
chlorobenzene		<8.6 (U)	<7.8 (U)	<10 (UJ- q)	<9.9 (U)

SUB-SLAB VAPOR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4807)

Analyte	Sample ID	N3-4807SS1	N3-4807SS2	N3-4807SS3	N3-4807SS4
chloroethane		<4.9 (U)	<4.4 (U)	<5.8 (UJ- q)	<5.7 (U)
chloroform		<9.1 (U)	<8.2 (U)	<11 (UJ- q)	<11 (U)
chloromethane		<7.7 (U)	<7.0 (U)	<9.1 (UJ- q)	<8.9 (U)
cis-1,2-dichloroethene		<7.4 (U)	<6.7 (U)	<8.7 (UJ- q)	<8.5 (U)
cis-1,3-dichloropropene		<8.5 (U)	<7.6 (U)	<10 (UJ- q)	<9.8 (U)
cyclohexane		6.4 (J a)	2.0 (J a)	3.1 (J- qa)	3.1 (J a)
dibromochloromethane		<16 (U)	<14 (U)	<19 (UJ- q)	<18 (U)
dichlorodifluoromethane		2.7 (J a)	3.8 (J a)	3.1 (J- qa)	3.7 (J a)
ethanol		71	69	44 (J- q)	27
ethyl acetate		<34 (U)	<30 (U)	<40 (UJ- q)	<39 (U)
ethylbenzene		6.7 (J a)	1.9 (J a)	2.6 (J- qa)	1.6 (J a)
ethylene dibromide (EDB)		<14 (U)	<13 (U)	<17 (UJ- q)	<17 (U)
hexachlorobutadiene		<20 (U)	<18 (U)	<23 (UJ- q)	<23 (U)
isopropanol		27	65	13 (J- qa)	<26 (U)
isopropylbenzene		<9.2 (U)	<8.3 (U)	<11 (UJ- q)	<11 (U)
m- & p-xylene		32	7.8	10 (J- q)	6.9 (J a)
methyl tert-butyl ether (MTBE)		<6.7 (U)	<6.1 (U)	<7.9 (UJ- q)	<7.8 (U)
methylene chloride		<6.5 (U)	<5.9 (U)	<7.6 (UJ- q)	<7.5 (U)
naphthalene		<49 (U)	<44 (U)	<58 (UJ- q)	<56 (U)
n-butylbenzene		<10 (U)	<9.2 (U)	<12 (UJ- q)	<12 (U)
n-heptane		2.1 (J a)	<35 (U)	1.8 (J- qa)	3.4 (J a)
n-hexane		<33 (U)	<30 (U)	2.9 (J- qa)	3.9 (J a)
o-xylene		8.5	2.4 (J a)	3.5 (J- qa)	2.4 (J a)
p-isopropyltoluene		4.0 (J a)	1.6 (J a)	2.5 (J- qa)	<12 (U)
propene		<16 (U)	<15 (U)	<19 (UJ- q)	<19 (U)
sec-butylbenzene		<10 (U)	<9.2 (U)	<12 (UJ- q)	<12 (U)
styrene		<8.0 (U)	<7.2 (U)	<9.4 (UJ- q)	<9.2 (U)
tetrachloroethene (PCE)		17	<11 (U)	<15 (UJ- q)	5.9 (J a)
tetrahydrofuran		2.2 (J a)	1.0 (J a)	2.5 (J- qa)	<32 (U)
toluene		40	12	18 (J- q)	14
trans-1,2-dichloroethene		<7.4 (U)	<6.7 (U)	<8.7 (UJ- q)	<8.5 (U)

SUB-SLAB VAPOR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4807)

Analyte	Sample ID	N3-4807SS1	N3-4807SS2	N3-4807SS3	N3-4807SS4
trans-1,3-dichloropropene		<8.5 (U)	<7.6 (U)	<10 (UJ- q)	<9.8 (U)
trichloroethene (TCE)		4.0 (J a)	48	2.5 (J- qa)	3.0 (J a)
trichlorofluoromethane		<11 (U)	<9.5 (U)	3.7 (J- qa)	2.7 (J a)
vinyl chloride		<4.8 (U)	<4.3 (U)	<5.6 (UJ- q)	<5.5 (U)

Notes:

Qualifier definitions are presented in Appendix E.

All concentrations are presented in in micrograms per cubic meter.

SUB-SLAB VAPOR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4807)

Analyte	Sample ID	N3-4807SS1	N3-4807SS2	N3-4807SS3	N3-4807SS4
1,1,1,2-tetrachloroethane		<13 (U)	<14 (U)	<13 (U)	<15 (U)
1,1,1-trichloroethane		<10 (U)	<11 (U)	<10 (U)	<12 (U)
1,1,2,2-tetrachloroethane		<26 (U)	<28 (U)	<25 (U)	<30 (U)
1,1,2-trichloroethane		<10 (U)	<11 (U)	<10 (U)	<12 (U)
1,1,2-trichlorotrifluoroethane		<14 (U)	<15 (U)	<14 (U)	<17 (U)
1,1-dichloroethane		<7.6 (U)	<8.2 (U)	<7.4 (U)	<8.9 (U)
1,1-dichloroethene		<7.4 (U)	<8.0 (U)	<7.3 (U)	<8.7 (U)
1,2,4-trichlorobenzene		<28 (U)	<30 (U)	<27 (U)	<33 (U)
1,2,4-trimethylbenzene		2.2 (J a)	1.9 (J a)	4.1 (J a)	3.5 (J a)
1,2-dichlorobenzene		<11 (U)	<12 (U)	<11 (U)	<13 (U)
1,2-dichloroethane		<7.6 (U)	<8.2 (U)	<7.4 (U)	<8.9 (U)
1,2-dichloropropane		<8.7 (U)	<9.3 (U)	<8.5 (U)	<10 (U)
1,2-dichlorotetrafluoroethane		<13 (U)	<14 (U)	<13 (U)	<15 (U)
1,3,5-trimethylbenzene		<18 (U)	<20 (U)	<18 (U)	<22 (U)
1,3-butadiene		<21 (U)	<22 (U)	<20 (U)	<24 (U)
1,3-dichlorobenzene		<11 (U)	<12 (U)	<11 (U)	<13 (U)
1,4-dichlorobenzene		<11 (U)	2.2 (J a)	<11 (U)	<13 (U)
2-butanone (MEK)		20	14	29	17
2-hexanone		<7.7 (U)	<8.3 (U)	<7.5 (U)	<9.0 (U)
4-ethyltoluene		1.6 (J a)	1.4 (J a)	3.2 (J a)	2.7 (J a)
4-methyl-2-pentanone (MIBK)		<7.7 (U)	7.2 (J a)	<7.5 (U)	<9.0 (U)
acetone		210	190	110	78
acrylonitrile		<20 (U)	<22 (U)	<20 (U)	<24 (U)
benzene		8.4 (J c)	14 (J c)	11 (J c)	8.2 (J c)
benzyl chloride		<9.7 (UJ- f)	<10 (UJ- f)	<9.5 (UJ- f)	<11 (UJ- f)
bromodichloromethane		<13 (U)	<14 (U)	<12 (U)	<15 (U)
bromoform		<19 (U)	<21 (U)	<19 (U)	<23 (U)
bromomethane		<7.3 (U)	<7.9 (U)	<7.1 (U)	<8.5 (U)
carbon disulfide		24 (J a)	51	29	28 (J a)
carbon tetrachloride		<12 (U)	<13 (U)	<12 (U)	<14 (U)
chlorobenzene		<8.6 (U)	<9.3 (U)	<8.5 (U)	<10 (U)

SUB-SLAB VAPOR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4807)

Analyte	Sample ID	N3-4807SS1	N3-4807SS2	N3-4807SS3	N3-4807SS4
chloroethane		<4.9 (U)	<5.3 (U)	<4.8 (U)	<5.8 (U)
chloroform		<9.1 (U)	1.9 (J a)	<9.0 (U)	<11 (U)
chloromethane		2.3 (J a)	<8.4 (U)	<7.6 (U)	<9.1 (U)
cis-1,2-dichloroethene		<7.4 (U)	<8.0 (U)	<7.3 (U)	<8.7 (U)
cis-1,3-dichloropropene		<8.5 (U)	<9.2 (U)	<8.3 (U)	<10 (U)
cyclohexane		6.3 (J a)	<35 (U)	<32 (U)	<38 (U)
dibromochloromethane		<16 (U)	<17 (U)	<16 (U)	<19 (U)
dichlorodifluoromethane		12	30	37	18
ethanol		96 (J c)	35 (J c)	140 (J c)	160 (J c)
ethyl acetate		<34 (U)	<36 (U)	<33 (U)	<40 (U)
ethylbenzene		1.3 (J a)	1.2 (J a)	2.3 (J a)	3.1 (J a)
ethylene dibromide (EDB)		<14 (U)	<16 (U)	<14 (U)	<17 (U)
hexachlorobutadiene		<20 (U)	<22 (U)	<20 (U)	<23 (U)
isopropanol		25	12 (J a)	31	26 (J a)
isopropylbenzene		<9.2 (U)	<9.9 (U)	<9.0 (U)	<11 (U)
m- & p-xylene		4.2 (J a)	4.0 (J a)	8.1	9.5
methyl tert-butyl ether (MTBE)		5.7 (J a)	1.5 (J a)	3.6 (J a)	<7.9 (U)
methylene chloride		10 (J+ b)	<6.5 (UJ ba)	<6.1 (UJ ba)	<3.1 (UJ ba)
naphthalene		1.3 (J a)	2.4 (J a)	2.6 (J a)	1.5 (J a)
n-butylbenzene		<10 (U)	<11 (U)	<10 (U)	<12 (U)
n-heptane		<38 (U)	<41 (U)	5.1 (J a)	<45 (U)
n-hexane		<33 (U)	<36 (U)	<32 (U)	3.5 (J a)
o-xylene		1.7 (J a)	1.4 (J a)	3.2 (J a)	3.3 (J a)
p-isopropyltoluene		<10 (U)	<11 (U)	<10 (U)	<12 (U)
propene		<16 (U)	<17 (U)	<16 (U)	<19 (U)
sec-butylbenzene		<10 (U)	<11 (U)	<10 (U)	<12 (U)
styrene		<8.0 (U)	<8.6 (U)	<7.8 (U)	<9.4 (U)
tetrachloroethene (PCE)		<13 (U)	<14 (U)	<12 (U)	<15 (U)
tetrahydrofuran		2.6 (J a)	<30 (U)	4.5 (J a)	<32 (U)
toluene		6.0 (J a)	6.5 (J a)	8.9	10
trans-1,2-dichloroethene		<7.4 (U)	<8.0 (U)	<7.3 (U)	<8.7 (U)

SUB-SLAB VAPOR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4807)

Analyte	Sample ID	N3-4807SS1	N3-4807SS2	N3-4807SS3	N3-4807SS4
trans-1,3-dichloropropene		<8.5 (U)	<9.2 (U)	<8.3 (U)	<10 (U)
trichloroethene (TCE)		8.2 (J a)	100	2.7 (J a)	<12 (U)
trichlorofluoromethane		3.6 (J a)	3.5 (J a)	3.7 (J a)	5.3 (J a)
vinyl chloride		<4.8 (U)	<5.2 (U)	<4.7 (U)	<5.6 (U)

Notes:

Qualifier definitions are presented in Appendix E.

All concentrations are presented in in micrograms per cubic meter.

INDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806IA1	N3-4806IA1[a]	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	IASL[b]	CA-IASL[c]
1,1,1,2-tetrachloroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	1.66	IASL
1,1,1-trichloroethane		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	22,000	4,400
1,1,2,2-tetrachloroethane		<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	0.21	IASL
1,1,2-trichloroethane		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.77	IASL
1,1,2-trichlorotrifluoroethane		0.54 (J a)	0.56 (J a)	0.60 (J a)	0.56 (J a)	0.57 (J a)	0.57 (J a)	130,000	IASL
1,1-dichloroethane		<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	7.66	IASL
1,1-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	880	IASL
1,2,4-trichlorobenzene		<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	8.8	1.2
1,2,4-trimethylbenzene		1.7 (J a)	1.5 (J a)	2.7	3.4	3.9	3.8	31	IASL
1,2-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,2-dichloroethane		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.47	IASL
1,2-dichloropropane		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	1.23	IASL
1,2-dichlorotetrafluoroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	130,000	IASL
1,3,5-trimethylbenzene		0.54 (J a)	0.46 (J a)	0.75 (J a)	0.92 (J a)	1.1 (J a)	1.0 (J a)	153	IASL
1,3-butadiene		<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	0.41	0.07
1,3-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,4-dichlorobenzene		0.14 (J a)	<0.089 (U)	<0.089 (U)	<0.089 (U)	<0.089 (U)	<0.089 (U)	1.11	IASL
2-butanone (MEK)		6.5	3.4	2.8	2.5	2.6	2.8	22,000	IASL
2-hexanone		<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	130	IASL
4-ethyltoluene		1.7	1.4	2.4	3.0	3.3	3.2	440	IASL
4-methyl-2-pentanone (MIBK)		<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	13,000	IASL
acetone		18	15	17	17	19	12	140,000	IASL
acrylonitrile		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	0.18	0.04
benzene		1.1	1.0	1.3	1.5	1.8	1.8	1.57	0.42
benzyl chloride		<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	0.25	IASL
bromodichloromethane		<0.069 (U)	<0.069 (U)	<0.069 (U)	<0.069 (U)	<0.069 (U)	<0.069 (U)	0.33	IASL
bromoform		<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	11.15	IASL
bromomethane		0.12 (J ca)	0.17 (J ca)	0.19 (J ca)	0.18 (J ca)	0.22 (J ca)	0.21 (J ca)	22	IASL
carbon disulfide		2.2 (J a)	1.2 (J a)	0.69 (J a)	0.46 (J a)	0.28 (J a)	1.5 (J a)	3,100	IASL
carbon tetrachloride		0.46 (J a)	0.44 (J a)	0.42 (J a)	0.43 (J a)	0.44 (J a)	0.41 (J a)	2.04	0.29
chlorobenzene		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	220	IASL

INDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806IA1	N3-4806IA1[a]	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	IASL[b]	CA-IASL[c]
chloroethane		<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	44,000	IASL
chloroform		<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	20	<0.14 (U)	0.53	IASL
chloromethane		1.3	1.2	1.3	1.3	1.4	1.2	390	IASL
cis-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	150
cis-1,3-dichloropropene		0.28 (J a)	0.11 (J a)	0.077 (J a)	0.060 (J a)	0.071 (J a)	<0.053 (U)	3.07	0.77
cyclohexane		0.64 (J a)	0.78 (J a)	1.2 (J a)	1.4 (J a)	1.6 (J a)	1.3 (J a)	26,000	IASL
dibromochloromethane		<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	0.45	IASL
dichlorodifluoromethane		2.5	2.5	2.7	2.7	2.8	2.8	440	IASL
ethanol		16	37	21	23	30	27	31,000	IASL
ethyl acetate		<3.6 (U)	0.63 (J a)	0.69 (J a)	0.90 (J a)	0.90 (J a)	1.1 (J a)	31,000	IASL
ethylbenzene		1.9	1.2	1.6	2.0	2.2	2.0	4.9	IASL
ethylene dibromide (EDB)		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.02	IASL
hexachlorobutadiene		<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	0.56	IASL
isopropanol		2.3 (J a)	4.0	2.0 (J a)	2.6	11	3.9	31,000	IASL
isopropylbenzene		0.56 (J a)	0.20 (J a)	<0.98 (U)	0.14 (J a)	0.17 (J a)	0.14 (J a)	1,800	IASL
m- & p-xylene		5.1	4.3	6.7	8.1	9.0	8.7	440	IASL
methyl tert-butyl ether (MTBE)		<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	47	IASL
methylene chloride		<0.40 (UJ ba)	<0.45 (UJ ba)	<0.43 (UJ ba)	<0.42 (UJ ba)	<0.42 (UJ ba)	<0.41 (UJ ba)	1,200	12
naphthalene		<0.095 (U)	<0.095 (U)	0.63 (J a)	0.83 (J a)	0.94 (J a)	0.89 (J a)	0.36	IASL
n-butylbenzene		0.36 (J a)	0.20 (J a)	0.35 (J a)	0.45 (J a)	0.72 (J a)	0.52 (J a)	1,800	IASL
n-heptane		1.1 (J a)	1.2 (J a)	1.8 (J a)	2.0 (J a)	2.1 (J a)	2.0 (J a)	3,100	IASL
n-hexane		2.1 (J a)	1.5 (J a)	4.0	5.4	8.2	10	3,100	IASL
o-xylene		1.9	1.6	2.5	3.0	3.3	3.1	440	IASL
p-isopropyltoluene		0.87 (J a)	0.65 (J a)	<1.1 (U)	0.55 (J a)	0.16 (J a)	0.42 (J a)	1,800	IASL
propene		<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	13,000	IASL
sec-butylbenzene		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	1,800	IASL
styrene		0.22 (J a)	0.22 (J a)	0.15 (J a)	0.15 (J a)	0.19 (J a)	0.21 (J a)	4,400	3,900
tetrachloroethene (PCE)		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	47.15	2.1
tetrahydrofuran		0.25 (J a)	0.56 (J a)	0.28 (J a)	0.18 (J a)	0.19 (J a)	0.53 (J a)	8,800	IASL
toluene		5.5	6.0	8.5	9.3	10	10	22,000	1,300
trans-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	IASL

INDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806IA1	N3-4806IA1[a]	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	IASL[b]	CA-IASL[c]
trans-1,3-dichloropropene		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	3.07	0.77
trichloroethene (TCE)		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	2.99	IASL
trichlorofluoromethane		2.5	2.5	1.7	1.8	1.5	1.3	3,100	IASL
vinyl chloride		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	2.79	0.16

Notes:

Qualifier definitions are presented in Appendix E.

Shaded cell indicates sample concentration exceeds IASL or CA-IASL.

All concentrations are presented in in micrograms per cubic meter.

[a] Duplicate sample.

[b] See Table 2 for details.

[c] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level
IASL Indoor air screening level

INDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806IA1	N3-4806IA1[a]	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	IASL[b]	CA-IASL[c]
1,1,1,2-tetrachloroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	1.66	IASL
1,1,1-trichloroethane		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	22,000	4,400
1,1,2,2-tetrachloroethane		<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	0.21	IASL
1,1,2-trichloroethane		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.77	IASL
1,1,2-trichlorotrifluoroethane		0.59 (J a)	0.56 (J a)	0.60 (J a)	0.56 (J a)	0.58 (J a)	0.59 (J a)	130,000	IASL
1,1-dichloroethane		<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	7.66	IASL
1,1-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	880	IASL
1,2,4-trichlorobenzene		<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	8.8	1.2
1,2,4-trimethylbenzene		2.6	2.7	0.38 (J a)	0.35 (J a)	0.51 (J a)	0.61 (J a)	31	IASL
1,2-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,2-dichloroethane		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.47	IASL
1,2-dichloropropane		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	1.23	IASL
1,2-dichlorotetrafluoroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	130,000	IASL
1,3,5-trimethylbenzene		0.68 (J a)	0.71 (J a)	<2.0 (U)	<2.0 (U)	<2.0 (U)	0.23 (J a)	153	IASL
1,3-butadiene		<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	0.41	0.07
1,3-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,4-dichlorobenzene		<0.089 (U)	<0.089 (U)	0.15 (J a)	<0.089 (U)	<0.089 (U)	<0.089 (U)	1.11	IASL
2-butanone (MEK)		4.5	3.8	5.0	1.8	2.6	6.4	22,000	IASL
2-hexanone		<0.82 (U)	<0.82 (U)	<0.82 (U)	0.28 (J a)	<0.82 (U)	<0.82 (U)	130	IASL
4-ethyltoluene		2.2	2.2	0.27 (J a)	0.21 (J a)	0.36 (J a)	0.55 (J a)	440	IASL
4-methyl-2-pentanone (MIBK)		<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	13,000	IASL
acetone		110	110	21	14	12	20	140,000	IASL
acrylonitrile		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	0.18	0.04
benzene		1.2 (J+ 1c)	0.85 (J+ 1c)	0.91 (J+ 1c)	0.93 (J+ 1c)	0.77 (J+ 1c)	0.94 (J+ 1c)	1.57	0.42
benzyl chloride		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.24 (J a)	0.25	IASL
bromodichloromethane		<0.069 (U)	<0.069 (U)	0.49 (J a)	0.15 (J a)	<0.069 (U)	<0.069 (U)	0.33	IASL
bromoform		<2.1 (U)	<2.1 (U)	<2.1 (U)	0.34 (J a)	<2.1 (U)	<2.1 (U)	11.15	IASL
bromomethane		<0.78 (U)	<0.78 (U)	<0.78 (U)	<0.78 (U)	<0.78 (U)	<0.78 (U)	22	IASL
carbon disulfide		8.1	4.1	0.72 (J a)	0.41 (J a)	2.2 (J a)	140	3,100	IASL
carbon tetrachloride		0.43 (J a)	0.42 (J a)	0.48 (J a)	0.46 (J a)	0.39 (J a)	0.43 (J a)	2.04	0.29
chlorobenzene		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	220	IASL

INDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806IA1	N3-4806IA1[a]	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	IASL[b]	CA-IASL[c]
chloroethane		<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	44,000	IASL
chloroform		<0.14 (U)	<0.14 (U)	0.21 (J a)	0.14 (J a)	7.9	1.1	0.53	IASL
chloromethane		1.4	1.2	1.6	1.3	1.2	1.6	390	IASL
cis-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	150
cis-1,3-dichloropropene		<0.053 (U)	<0.053 (U)	<0.053 (U)	<0.053 (U)	<0.053 (U)	0.097 (J a)	3.07	0.77
cyclohexane		0.67 (J a)	0.66 (J a)	<3.4 (U)	<3.4 (U)	<3.4 (U)	1.1 (J a)	26,000	IASL
dibromochloromethane		<0.20 (U)	<0.20 (U)	<0.20 (U)	0.42 (J a)	<0.20 (U)	<0.20 (U)	0.45	IASL
dichlorodifluoromethane		8.6	8.8	10	13	3.1	3.9	440	IASL
ethanol		20 (J c)	14 (J c)	28 (J c)	5.4 (J c)	20 (J c)	14 (J c)	31,000	IASL
ethyl acetate		<3.6 (U)	<3.6 (U)	<3.6 (U)	<3.6 (U)	<3.6 (U)	<3.6 (U)	31,000	IASL
ethylbenzene		1.5	1.5	0.29 (J a)	0.15 (J a)	0.22 (J a)	0.29 (J a)	4.9	IASL
ethylene dibromide (EDB)		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.02	IASL
hexachlorobutadiene		<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	0.56	IASL
isopropanol		3.0	2.1 (J a)	24	1.9 (J a)	5.3	64	31,000	IASL
isopropylbenzene		<0.98 (U)	<0.98 (U)	<0.98 (U)	<0.98 (U)	<0.98 (U)	<0.98 (U)	1,800	IASL
m- & p-xylene		6.8	7.1	0.99	0.77 (J a)	0.87	1.2	440	IASL
methyl tert-butyl ether (MTBE)		<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	47	IASL
methylene chloride		<0.52 (UJ ba)	<0.46 (UJ ba)	<0.69 (U)	<0.69 (U)	<0.18 (UJ ba)	<0.69 (U)	1,200	12
naphthalene		0.42 (J a)	0.46 (J a)	0.72 (J a)	0.22 (J a)	0.26 (J a)	1.0 (J a)	0.36	IASL
n-butylbenzene		0.39 (J a)	0.30 (J a)	0.77 (J a)	0.25 (J a)	0.33 (J a)	<1.1 (U)	1,800	IASL
n-heptane		0.97 (J a)	0.84 (J a)	<4.1 (U)	<4.1 (U)	<4.1 (U)	<4.1 (U)	3,100	IASL
n-hexane		9.4	9.3	2.8 (J a)	2.3 (J a)	5.7	220	3,100	IASL
o-xylene		2.3	2.4	0.35 (J a)	0.21 (J a)	0.32 (J a)	1.2	440	IASL
p-isopropyltoluene		0.64 (J a)	0.24 (J a)	0.41 (J a)	<1.1 (U)	0.38 (J a)	3.3	1,800	IASL
propene		<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	13,000	IASL
sec-butylbenzene		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	1,800	IASL
styrene		0.51 (J a)	0.42 (J a)	0.16 (J a)	<0.85 (U)	<0.85 (U)	0.13 (J a)	4,400	3,900
tetrachloroethene (PCE)		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	47.15	2.1
tetrahydrofuran		<2.9 (U)	<2.9 (U)	0.52 (J a)	<2.9 (U)	<2.9 (U)	0.36 (J a)	8,800	IASL
toluene		79	83	3.0	2.2	1.3	1.6	22,000	1,300
trans-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	IASL

INDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806IA1	N3-4806IA1[a]	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	IASL[b]	CA-IASL[c]
trans-1,3-dichloropropene		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	3.07	0.77
trichloroethene (TCE)		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	2.99	IASL
trichlorofluoromethane		6.3	6.4	2.3	2.6	1.4	1.9	3,100	IASL
vinyl chloride		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	2.79	0.16

Notes:

Qualifier definitions are presented in Appendix E.

Shaded cell indicates sample concentration exceeds IASL or CA-IASL.

All concentrations are presented in in micrograms per cubic meter.

[a] Duplicate sample.

[b] See Table 2 for details.

[c] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level
IASL Indoor air screening level

INDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4807)

Analyte	Sample ID	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA4	IASL[a]	CA-IASL[b]
1,1,1,2-tetrachloroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	1.66	IASL
1,1,1-trichloroethane		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	22,000	4,400
1,1,2,2-tetrachloroethane		<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	0.21	IASL
1,1,2-trichloroethane		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.77	IASL
1,1,2-trichlorotrifluoroethane		0.64 (J a)	0.59 (J a)	0.56 (J a)	0.60 (J a)	130,000	IASL
1,1-dichloroethane		<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	7.66	IASL
1,1-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	880	IASL
1,2,4-trichlorobenzene		<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	8.8	1.2
1,2,4-trimethylbenzene		2.0	2.4	13	8.2	31	IASL
1,2-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,2-dichloroethane		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.47	IASL
1,2-dichloropropane		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	1.23	IASL
1,2-dichlorotetrafluoroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	130,000	IASL
1,3,5-trimethylbenzene		0.59 (J a)	0.70 (J a)	3.9	2.5	153	IASL
1,3-butadiene		<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	0.41	0.07
1,3-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,4-dichlorobenzene		<0.089 (U)	<0.089 (U)	<0.089 (U)	<0.089 (U)	1.11	IASL
2-butanone (MEK)		3.0	2.3	6.1	2.6	22,000	IASL
2-hexanone		<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	130	IASL
4-ethyltoluene		1.7	2.1	11	6.5	440	IASL
4-methyl-2-pentanone (MIBK)		<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	13,000	IASL
acetone		18	16	30	19	140,000	IASL
acrylonitrile		<0.17 (U)	<0.17 (U)	1.3 (J a)	<0.17 (U)	0.18	0.04
benzene		1.7	2.0	8.3	4.8	1.57	0.42
benzyl chloride		<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	0.25	IASL
bromodichloromethane		<0.069 (U)	<0.069 (U)	<0.069 (U)	<0.069 (U)	0.33	IASL
bromoform		<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	11.15	IASL
bromomethane		0.20 (J ca)	0.21 (J ca)	0.28 (J ca)	0.17 (J ca)	22	IASL
carbon disulfide		0.75 (J a)	2.1 (J a)	1.6 (J a)	1.1 (J a)	3,100	IASL
carbon tetrachloride		0.42 (J a)	0.42 (J a)	0.42 (J a)	0.39 (J a)	2.04	0.29
chlorobenzene		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	220	IASL

INDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4807)

Analyte	Sample ID	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA4	IASL[a]	CA-IASL[b]
chloroethane		<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	44,000	IASL
chloroform		<0.14 (U)	<0.14 (U)	0.18 (J a)	<0.14 (U)	0.53	IASL
chloromethane		1.5	1.3	1.4	1.3	390	IASL
cis-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	150
cis-1,3-dichloropropene		0.11 (J a)	0.056 (J a)	0.16 (J a)	<0.053 (U)	3.07	0.77
cyclohexane		1.3 (J a)	1.6 (J a)	11	3.7	26,000	IASL
dibromochloromethane		<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	0.45	IASL
dichlorodifluoromethane		2.7	2.7	2.8	2.7	440	IASL
ethanol		25	23	150	47	31,000	IASL
ethyl acetate		1.2 (J a)	0.86 (J a)	7.3	1.9 (J a)	31,000	IASL
ethylbenzene		1.4	1.6	8.3	4.3	4.9	IASL
ethylene dibromide (EDB)		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.02	IASL
hexachlorobutadiene		<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	0.56	IASL
isopropanol		240	38	4.3	5.3	31,000	IASL
isopropylbenzene		<0.98 (U)	<0.98 (U)	0.63 (J a)	0.39 (J a)	1,800	IASL
m- & p-xylene		5.3	6.5	34	18	440	IASL
methyl tert-butyl ether (MTBE)		<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	47	IASL
methylene chloride		<0.44 (UJ ba)	<0.42 (UJ ba)	<0.69 (U)	<0.47 (UJ ba)	1,200	12
naphthalene		<0.095 (U)	<0.095 (U)	1.9 (J a)	1.5 (J a)	0.36	IASL
n-butylbenzene		0.33 (J a)	0.26 (J a)	1.4	1.4	1,800	IASL
n-heptane		1.8 (J a)	2.1 (J a)	11	4.9	3,100	IASL
n-hexane		3.7	4.3	34	11	3,100	IASL
o-xylene		1.9	2.4	12	6.4	440	IASL
p-isopropyltoluene		<1.1 (U)	0.17 (J a)	0.63 (J a)	0.61 (J a)	1,800	IASL
propene		<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	13,000	IASL
sec-butylbenzene		<1.1 (U)	<1.1 (U)	0.21 (J a)	0.35 (J a)	1,800	IASL
styrene		0.23 (J a)	0.26 (J a)	0.55 (J a)	0.62 (J a)	4,400	3,900
tetrachloroethene (PCE)		<1.4 (U)	<1.4 (U)	0.27 (J a)	<1.4 (U)	47.15	2.1
tetrahydrofuran		1.7 (J a)	<2.9 (U)	0.17 (J a)	0.24 (J a)	8,800	IASL
toluene		7.6	8.9	43	24	22,000	1,300
trans-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	IASL

INDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4807)

Analyte	Sample ID	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA4	IASL[a]	CA-IASL[b]
trans-1,3-dichloropropene		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	3.07	0.77
trichloroethene (TCE)		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	2.99	IASL
trichlorofluoromethane		2.8	3.4	5.0	3.2	3,100	IASL
vinyl chloride		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	2.79	0.16

Notes:

Qualifier definitions are presented in Appendix E.

Shaded cell indicates sample concentration exceeds IASL or CA-IASL.

All concentrations are presented in in micrograms per cubic meter.

[b] See Table 2 for details.

[c] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level
IASL Indoor air screening level

INDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4807)

Analyte	Sample ID	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA4	IASL[a]	CA-IASL[b]
1,1,1,2-tetrachloroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	1.66	IASL
1,1,1-trichloroethane		0.17 (J a)	<1.1 (U)	<1.1 (U)	<1.1 (U)	22,000	4,400
1,1,2,2-tetrachloroethane		<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	0.21	IASL
1,1,2-trichloroethane		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.77	IASL
1,1,2-trichlorotrifluoroethane		0.59 (J a)	0.58 (J a)	0.51 (J a)	0.53 (J a)	130,000	IASL
1,1-dichloroethane		<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	7.66	IASL
1,1-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	880	IASL
1,2,4-trichlorobenzene		<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	8.8	1.2
1,2,4-trimethylbenzene		3.6	5.1	33	1.1 (J a)	31	IASL
1,2-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,2-dichloroethane		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.47	IASL
1,2-dichloropropane		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	1.23	IASL
1,2-dichlorotetrafluoroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	130,000	IASL
1,3,5-trimethylbenzene		1.1 (J a)	1.5 (J a)	11	0.28 (J a)	153	IASL
1,3-butadiene		<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	0.41	0.07
1,3-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,4-dichlorobenzene		<0.089 (U)	<0.089 (U)	<0.089 (U)	0.14 (J a)	1.11	IASL
2-butanone (MEK)		2.9	3.0	170	3.6	22,000	IASL
2-hexanone		<0.82 (U)	<0.82 (U)	1.9	<0.82 (U)	130	IASL
4-ethyltoluene		3.2	4.5	32	0.84 (J a)	440	IASL
4-methyl-2-pentanone (MIBK)		<0.82 (U)	<0.82 (U)	<0.82 (U)	0.62 (J a)	13,000	IASL
acetone		17	19	72	19	140,000	IASL
acrylonitrile		<0.17 (U)	<0.17 (U)	2.0 (J a)	<0.17 (U)	0.18	0.04
benzene		1.6 (J+ 1c)	1.2 (J+ 1c)	7.4 (J c)	0.93 (J+ 1c)	1.57	0.42
benzyl chloride		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.25	IASL
bromodichloromethane		<0.069 (U)	0.14 (J a)	<0.069 (U)	<0.069 (U)	0.33	IASL
bromoform		<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	11.15	IASL
bromomethane		<0.78 (U)	<0.78 (U)	<0.78 (U)	<0.78 (U)	22	IASL
carbon disulfide		9.9	2.3 (J a)	13	2.7 (J a)	3,100	IASL
carbon tetrachloride		0.44 (J a)	0.41 (J a)	0.37 (J a)	0.43 (J a)	2.04	0.29
chlorobenzene		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	220	IASL

INDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4807)

Analyte	Sample ID	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA4	IASL[(a)]	CA-IASL[(b)]
chloroethane		<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	44,000	IASL
chloroform		0.24 (J a)	0.28 (J a)	<0.14 (U)	0.38 (J a)	0.53	IASL
chloromethane		0.70 (J a)	1.3	4.7	1.2	390	IASL
cis-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	150
cis-1,3-dichloropropene		0.057 (J a)	<0.053 (U)	<0.053 (U)	<0.053 (U)	3.07	0.77
cyclohexane		<3.4 (U)	1.4 (J a)	11	0.52 (J a)	26,000	IASL
dibromochloromethane		<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	0.45	IASL
dichlorodifluoromethane		0.24 (J a)	7.8	16	3.7	440	IASL
ethanol		25 (J c)	30 (J c)	430 (J c)	18 (J c)	31,000	IASL
ethyl acetate		<3.6 (U)	<3.6 (U)	<3.6 (U)	<3.6 (U)	31,000	IASL
ethylbenzene		1.9	2.4	18	0.60 (J a)	4.9	IASL
ethylene dibromide (EDB)		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.02	IASL
hexachlorobutadiene		<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	0.56	IASL
isopropanol		27	14	17	19	31,000	IASL
isopropylbenzene		0.17 (J a)	0.20 (J a)	1.3	<0.98 (U)	1,800	IASL
m- & p-xylene		7.8	10	74	2.3	440	IASL
methyl tert-butyl ether (MTBE)		<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	47	IASL
methylene chloride		<0.69 (U)	<0.39 (UJ ba)	<0.69 (U)	<0.25 (UJ ba)	1,200	12
naphthalene		0.56 (J a)	0.58 (J a)	1.7 (J a)	0.30 (J a)	0.36	IASL
n-butylbenzene		0.41 (J a)	0.82 (J a)	3.2	0.49 (J a)	1,800	IASL
n-heptane		1.5 (J a)	1.7 (J a)	14	0.52 (J a)	3,100	IASL
n-hexane		25	34	41	55	3,100	IASL
o-xylene		2.8	3.9	28	0.76 (J a)	440	IASL
p-isopropyltoluene		0.43 (J a)	0.39 (J a)	0.41 (J a)	0.38 (J a)	1,800	IASL
propene		<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	13,000	IASL
sec-butylbenzene		<1.1 (U)	<1.1 (U)	0.46 (J a)	<1.1 (U)	1,800	IASL
styrene		0.27 (J a)	0.27 (J a)	1.9	0.19 (J a)	4,400	3,900
tetrachloroethene (PCE)		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	47.15	2.1
tetrahydrofuran		1.0 (J a)	0.14 (J a)	<2.9 (U)	<2.9 (U)	8,800	IASL
toluene		11	11	58	4.5	22,000	1,300
trans-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	IASL

INDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4807)

Analyte	Sample ID	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA4	IASL[a]	CA-IASL[b]
trans-1,3-dichloropropene		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	3.07	0.77
trichloroethene (TCE)		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	2.99	IASL
trichlorofluoromethane		6.7	7.1	3.9	5.3	3,100	IASL
vinyl chloride		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	2.79	0.16

Notes:

Qualifier definitions are presented in Appendix E.

Shaded cell indicates sample concentration exceeds IASL or CA-IASL.

All concentrations are presented in in micrograms per cubic meter.

[b] See Table 2 for details.

[c] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level
IASL Indoor air screening level

OUTDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806OA1	N3-4806OA1[a]	N3-4806OA2	N3-4806OA3	IASL[b]	CA-IASL[c]
1,1,1,2-tetrachloroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	1.66	IASL
1,1,1-trichloroethane		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	22,000	4,400
1,1,2,2-tetrachloroethane		<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	0.21	IASL
1,1,2-trichloroethane		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.77	IASL
1,1,2-trichlorotrifluoroethane		0.62 (J a)	0.63 (J a)	0.56 (J a)	0.63 (J a)	130,000	IASL
1,1-dichloroethane		<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	7.66	IASL
1,1-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	880	IASL
1,2,4-trichlorobenzene		<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	8.8	1.2
1,2,4-trimethylbenzene		0.17 (J a)	0.17 (J a)	0.26 (J a)	0.61 (J a)	31	IASL
1,2-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,2-dichloroethane		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.47	IASL
1,2-dichloropropane		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	1.23	IASL
1,2-dichlorotetrafluoroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	130,000	IASL
1,3,5-trimethylbenzene		<2.0 (U)	<2.0 (U)	<2.0 (U)	0.18 (J a)	153	IASL
1,3-butadiene		<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	0.41	0.07
1,3-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,4-dichlorobenzene		<0.089 (U)	<0.089 (U)	<0.089 (U)	<0.089 (U)	1.11	IASL
2-butanone (MEK)		2.6	2.2	2.7	4.0	22,000	IASL
2-hexanone		<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	130	IASL
4-ethyltoluene		0.15 (J a)	0.14 (J a)	0.21 (J a)	0.54 (J a)	440	IASL
4-methyl-2-pentanone (MIBK)		<0.82 (U)	<0.82 (U)	<0.82 (U)	<0.82 (U)	13,000	IASL
acetone		15	14	15	12	140,000	IASL
acrylonitrile		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	0.18	0.04
benzene		0.43 (J a)	0.43 (J a)	0.48 (J a)	0.79	1.57	0.42
benzyl chloride		<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	<0.11 (UJ c)	0.25	IASL
bromodichloromethane		<0.069 (U)	<0.069 (U)	<0.069 (U)	<0.069 (U)	0.33	IASL
bromoform		<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	11.15	IASL
bromomethane		0.21 (J ca)	0.24 (J ca)	0.15 (J ca)	0.23 (J ca)	22	IASL
carbon disulfide		0.43 (J a)	0.41 (J a)	1.4 (J a)	2.2 (J a)	3,100	IASL
carbon tetrachloride		0.43 (J a)	0.44 (J a)	0.44 (J a)	0.46 (J a)	2.04	0.29
chlorobenzene		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	220	IASL

OUTDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806OA1	N3-4806OA1[a]	N3-4806OA2	N3-4806OA3	IASL[b]	CA-IASL[c]
chloroethane		<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	44,000	IASL
chloroform		<0.14 (U)	0.41 (J a)	<0.14 (U)	<0.14 (U)	0.53	IASL
chloromethane		1.5	1.4	1.4	1.4	390	IASL
cis-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	150
cis-1,3-dichloropropene		0.084 (J a)	<0.053 (U)	<0.053 (U)	<0.053 (U)	3.07	0.77
cyclohexane		0.15 (J a)	0.15 (J a)	0.21 (J a)	0.38 (J a)	26,000	IASL
dibromochloromethane		<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	0.45	IASL
dichlorodifluoromethane		2.5	2.6	2.6	2.8	440	IASL
ethanol		6.1	6.5	7.6	12	31,000	IASL
ethyl acetate		<3.6 (U)	<3.6 (U)	<3.6 (U)	<3.6 (U)	31,000	IASL
ethylbenzene		0.17 (J a)	0.17 (J a)	0.21 (J a)	0.46 (J a)	4.9	IASL
ethylene dibromide (EDB)		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.02	IASL
hexachlorobutadiene		<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	0.56	IASL
isopropanol		1.5 (J a)	0.84 (J a)	1.1 (J a)	1.3 (J a)	31,000	IASL
isopropylbenzene		<0.98 (U)	<0.98 (U)	<0.98 (U)	<0.98 (U)	1,800	IASL
m- & p-xylene		0.43 (J a)	0.42 (J a)	0.63 (J a)	1.6	440	IASL
methyl tert-butyl ether (MTBE)		<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	47	IASL
methylene chloride		<0.36 (UJ ba)	<0.40 (UJ ba)	<0.38 (UJ ba)	<0.40 (UJ ba)	1,200	12
naphthalene		<0.095 (U)	<0.095 (U)	<0.095 (U)	<0.095 (U)	0.36	IASL
n-butylbenzene		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	1,800	IASL
n-heptane		0.20 (J a)	0.19 (J a)	0.25 (J a)	0.62 (J a)	3,100	IASL
n-hexane		0.37 (J a)	0.36 (J a)	0.51 (J a)	1.2 (J a)	3,100	IASL
o-xylene		0.19 (J a)	0.18 (J a)	0.27 (J a)	0.62 (J a)	440	IASL
p-isopropyltoluene		0.43 (J a)	<1.1 (U)	1.3	<1.1 (U)	1,800	IASL
propene		<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	13,000	IASL
sec-butylbenzene		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	1,800	IASL
styrene		0.16 (J a)	<0.85 (U)	0.16 (J a)	0.16 (J a)	4,400	3,900
tetrachloroethene (PCE)		<1.4 (U)	0.93 (J a)	<1.4 (U)	<1.4 (U)	47.15	2.1
tetrahydrofuran		0.27 (J a)	0.21 (J a)	0.18 (J a)	0.41 (J a)	8,800	IASL
toluene		1.1	1.1	1.6	2.4	22,000	1,300
trans-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	IASL

OUTDOOR AIR ANALYTICAL RESULTS - MARCH 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806OA1	N3-4806OA1[a]	N3-4806OA2	N3-4806OA3	IASL[b]	CA-IASL[c]
trans-1,3-dichloropropene		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	3.07	0.77
trichloroethene (TCE)		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	2.99	IASL
trichlorofluoromethane		1.2	1.3	1.2	1.3	3,100	IASL
vinyl chloride		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	2.79	0.16

Notes:

Qualifier definitions are presented in Appendix E.

Shaded cell indicates sample concentration exceeds IASL or CA-IASL.

All concentrations are presented in in micrograms per cubic meter.

[a] Duplicate sample.

[b] See Table 2 for details.

[c] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level
IASL Indoor air screening level

OUTDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806OA1	N3-4806OA1[a]	N3-4806OA2	N3-4806OA3	IASL[b]	CA-IASL[c]
1,1,1,2-tetrachloroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	1.66	IASL
1,1,1-trichloroethane		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	22,000	4,400
1,1,2,2-tetrachloroethane		<.085 (U)	<.085 (U)	<.085 (U)	<.085 (U)	0.21	IASL
1,1,2-trichloroethane		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.77	IASL
1,1,2-trichlorotrifluoroethane		0.51 (J a)	0.57 (J a)	0.53 (J a)	0.53 (J a)	130,000	IASL
1,1-dichloroethane		<0.81 (U)	<0.81 (U)	<0.81 (U)	<0.81 (U)	7.66	IASL
1,1-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	880	IASL
1,2,4-trichlorobenzene		<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	8.8	1.2
1,2,4-trimethylbenzene		0.37 (J a)	0.72 (J a)	0.21 (J a)	0.35 (J a)	31	IASL
1,2-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,2-dichloroethane		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.47	IASL
1,2-dichloropropane		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	1.23	IASL
1,2-dichlorotetrafluoroethane		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	130,000	IASL
1,3,5-trimethylbenzene		<2.0 (U)	0.36 (J a)	<2.0 (U)	<2.0 (U)	153	IASL
1,3-butadiene		<0.13 (U)	<0.13 (U)	<0.13 (U)	<0.13 (U)	0.41	0.07
1,3-dichlorobenzene		<1.2 (U)	<1.2 (U)	<1.2 (U)	<1.2 (U)	880	IASL
1,4-dichlorobenzene		<0.089 (U)	<0.089 (U)	<0.089 (U)	<0.089 (U)	1.11	IASL
2-butanone (MEK)		3.5	8.3	4.6	3.2	22,000	IASL
2-hexanone		<0.82 (U)	1.7	<0.82 (U)	<0.82 (U)	130	IASL
4-ethyltoluene		0.19 (J a)	0.24 (J a)	0.15 (J a)	0.29 (J a)	440	IASL
4-methyl-2-pentanone (MIBK)		<0.82 (U)	0.89	<0.82 (U)	<0.82 (U)	13,000	IASL
acetone		13	20	8.5	10	140,000	IASL
acrylonitrile		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	0.18	0.04
benzene		<0.091 (UJ 1ca)	<0.091 (UJ 1ca)	0.80 (J+ 1c)	0.95 (J+ 1c)	1.57	0.42
benzyl chloride		<0.11 (U)	<0.11 (U)	<0.11 (U)	<0.11 (U)	0.25	IASL
bromodichloromethane		<0.069 (U)	<0.069 (U)	<0.069 (U)	<0.069 (U)	0.33	IASL
bromoform		<2.1 (U)	<2.1 (U)	<2.1 (U)	<2.1 (U)	11.15	IASL
bromomethane		<0.78 (U)	<0.78 (U)	<0.78 (U)	<0.78 (U)	22	IASL
carbon disulfide		3.4	2.3 (J a)	2.4 (J a)	3.1	3,100	IASL
carbon tetrachloride		0.41 (J a)	0.44 (J a)	0.40 (J a)	0.43 (J a)	2.04	0.29
chlorobenzene		<0.92 (U)	<0.92 (U)	<0.92 (U)	<0.92 (U)	220	IASL

OUTDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806OA1	N3-4806OA1[a]	N3-4806OA2	N3-4806OA3	IASL[b]	CA-IASL[c]
chloroethane		<0.53 (U)	<0.53 (U)	<0.53 (U)	<0.53 (U)	44,000	IASL
chloroform		<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	0.53	IASL
chloromethane		1.3	1.2	1.2	1.3	390	IASL
cis-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	150
cis-1,3-dichloropropene		<0.053 (U)	<0.053 (U)	<0.053 (U)	<0.053 (U)	3.07	0.77
cyclohexane		<3.4 (U)	<3.4 (U)	<3.4 (U)	<3.4 (U)	26,000	IASL
dibromochloromethane		<0.20 (U)	<0.20 (U)	<0.20 (U)	<0.20 (U)	0.45	IASL
dichlorodifluoromethane		2.3	2.4	2.4	2.4	440	IASL
ethanol		6.4 (J c)	9.4 (J c)	5.4 (J c)	6.6 (J c)	31,000	IASL
ethyl acetate		<3.6 (U)	<3.6 (U)	<3.6 (U)	<3.6 (U)	31,000	IASL
ethylbenzene		<0.87 (U)	0.13 (J a)	<0.87 (U)	0.23 (J a)	4.9	IASL
ethylene dibromide (EDB)		<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.02	IASL
hexachlorobutadiene		<0.25 (U)	<0.25 (U)	<0.25 (U)	<0.25 (U)	0.56	IASL
isopropanol		2.8	5.1	1.4 (J a)	0.94 (J a)	31,000	IASL
isopropylbenzene		<0.98 (U)	<0.98 (U)	<0.98 (U)	<0.98 (U)	1,800	IASL
m- & p-xylene		0.47 (J a)	0.47 (J a)	0.47 (J a)	0.97	440	IASL
methyl tert-butyl ether (MTBE)		<0.72 (U)	<0.72 (U)	<0.72 (U)	<0.72 (U)	47	IASL
methylene chloride		<0.69 (U)	<0.19 (UJ ba)	<0.69 (U)	<0.16 (UJ ba)	1,200	12
naphthalene		0.18 (J a)	0.23 (J a)	0.81 (J a)	0.30 (J a)	0.36	IASL
n-butylbenzene		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	1,800	IASL
n-heptane		<4.1 (U)	<4.1 (U)	<4.1 (U)	0.24 (J a)	3,100	IASL
n-hexane		0.58 (J a)	0.56 (J a)	2.8 (J a)	0.98 (J a)	3,100	IASL
o-xylene		0.15 (J a)	0.18 (J a)	0.14 (J a)	0.30 (J a)	440	IASL
p-isopropyltoluene		0.76 (J a)	0.67 (J a)	0.46 (J a)	1.1	1,800	IASL
propene		<1.7 (U)	<1.7 (U)	<1.7 (U)	<1.7 (U)	13,000	IASL
sec-butylbenzene		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	1,800	IASL
styrene		0.12 (J a)	<0.85 (U)	<0.85 (U)	0.14 (J a)	4,400	3,900
tetrachloroethene (PCE)		<1.4 (U)	<1.4 (U)	<1.4 (U)	<1.4 (U)	47.15	2.1
tetrahydrofuran		<2.9 (U)	0.17 (J a)	<2.9 (U)	0.12 (J a)	8,800	IASL
toluene		0.75	0.69 (J a)	0.76	1.4	22,000	1,300
trans-1,2-dichloroethene		<0.79 (U)	<0.79 (U)	<0.79 (U)	<0.79 (U)	260	IASL

OUTDOOR AIR ANALYTICAL RESULTS - AUGUST 2013
(BUILDING 4806)

Analyte	Sample ID	N3-4806OA1	N3-4806OA1[a]	N3-4806OA2	N3-4806OA3	IASL[b]	CA-IASL[c]
trans-1,3-dichloropropene		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	3.07	0.77
trichloroethene (TCE)		<1.1 (U)	<1.1 (U)	<1.1 (U)	<1.1 (U)	2.99	IASL
trichlorofluoromethane		1.2	1.2	1.2	1.2	3,100	IASL
vinyl chloride		<0.17 (U)	<0.17 (U)	<0.17 (U)	<0.17 (U)	2.79	0.16

Notes:

Qualifier definitions are presented in Appendix E.

Shaded cell indicates sample concentration exceeds IASL or CA-IASL.

All concentrations are presented in in micrograms per cubic meter.

[a] Duplicate sample.

[b] See Table 2 for details.

[c] Same as IASL except as indicated, see Table 2 for details.

CA-IASL California indoor air screening level
IASL Indoor air screening level

INDOOR AIR RISK CALCULATION BUILDING 4806 (USAF/CERCLA APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		22,000															
1,1,1,2-tetrachloroethane	1.66																
1,1,2,2-tetrachlorethane	0.21																
1,1,2-trichoroethane	0.77	1															
1,1,2-trichlorotrifluoroethane		130,000	0.56		<0.01	0.6		<0.01	0.56		<0.01	0.57		<0.01	0.57		<0.01
1,1-dichloroethane	7.66																
1,1-dichloroethene		880															
1,2,4-trichlorobenzene		8.8															
1,2,4-trimethylbenzene		31	1.7		0.06	2.7		0.09	3.4		0.1	3.9		0.1	3.8		0.1
1,2-dichlorobenzene		880															
1,2-dichloroethane	0.47	31															
1,2-dichloropropane	1.23	18															
1,2-dichlorotetrafluoroethane		130,000															
1,3,5-trimethylbenzene		153	0.54		<0.01	0.75		<0.01	0.92		<0.01	1.1		<0.01	1		<0.01
1,3-butadiene	0.41	9															
1,3-dichlorobenzene		880															
1,4-dichlorobenzene	1.11	3,504	0.14	1E-07	<0.01												
2-butanone (MEK)		22,000	6.5		<0.01	2.8		<0.01	2.5		<0.01	2.6		<0.01	2.8		<0.01
2-hexanone		130															
4-ethyltoluene		440	1.7		<0.01	2.4		<0.01	3.0		<0.01	3.3		<0.01	3.2		<0.01
4-methyl-2-pentanone (MIBK)		13,000															
acetone		140,000	18		<0.01	17		<0.01	17		<0.01	19		<0.01	12		<0.01
acrylonitrile	0.18	9															
benzene	1.57	131	1.1	7E-07	<0.01	1.3	8E-07	<0.01	1.5	1E-06	0.01	1.8	1E-06	0.01	1.8	1E-06	0.01
benzyl chloride	0.25	4															
bromodichloromethane	0.33																
bromoform	11.15																
bromomethane		22	0.17		<0.01	0.19		<0.01	0.18		<0.01	0.22		0.01	0.21		<0.01
carbon disulfide		3,100	2.2		<0.01	0.69		<0.01	0.46		<0.01	0.28		<0.01	1.5		<0.01
carbon tetrachloride	2.04	438	0.46	2E-07	<0.01	0.42	2E-07	<0.01	0.43	2E-07	<0.01	0.44	2E-07	<0.01	0.41	2E-07	<0.01
chlorobenzene		220															
chloroethane		44,000															
chloroform	0.53	1,314										20	4E-05	0.02			
chloromethane		390	1.3		<0.01	1.3		<0.01	1.3		<0.01	1.4		<0.01	1.2		<0.01
cis-1,2-dichloroethene		31															
cis-1,3-dichloropropene	3.07	88	0.28	9E-08	<0.01	0.077	3E-08	<0.01	0.06	2E-08	<0.01	0.071	2E-08	<0.01			
cyclohexane		26,000	0.64		<0.01	1.2		<0.01	1.4		<0.01	1.6		<0.01	1.3		<0.01
dibromochloromethane	0.45	310															
dichlorodifluoromethane		440	2.5		<0.01	2.7		<0.01	2.7		<0.01	2.8		<0.01	2.8		<0.01
ethanol		31,000	37		<0.01	21		<0.01	23		<0.01	30		<0.01	27		<0.01
ethyl acetate		31,000				0.69		<0.01	0.9			0.9			1.1		
ethylbenzene	4.9	4,380	1.9	4E-07	<0.01	1.6	3E-07	<0.01	2.0	4E-07	<0.01	2.2	4E-07	<0.01	2.0	4E-07	<0.01
ethylene dibromide (EDB)	0.02	39															
hexachlorobutadiene	0.56																
isopropanol		31,000	4		<0.01	2		<0.01	2.6			11			3.9		
isopropylbenzene		1,800	0.56		<0.01				0.14		<0.01	0.17		<0.01	0.14		<0.01
m- & p-xylene		440	5.1		0.01159	6.7		0.02	8.1		0.02	9.0		0.02	8.7		0.02

INDOOR AIR RISK CALCULATION BUILDING 4806 (USAF/CERCLA APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47.0	13,140															
methylene chloride	1,200	2,628															
naphthalene	0.36	13				0.63	2E-06	0.05	0.83	2E-06	0.06	0.94	3E-06	0.07	0.89	2E-06	0.07
n-butyl benzene		1,800	0.36		<0.01	0.35		<0.01	0.45		<0.01	0.72		<0.01	0.52		<0.01
n-heptane		3,100	1.2		<0.01	1.8		<0.01	2		<0.01	2.1		<0.01	2		<0.01
n-hexane		3,100	2.1		<0.01	4.0		<0.01	5.4		<0.01	8.2		<0.01	10		<0.01
o-xylene		440	1.9		<0.01	2.5		<0.01	3.0		<0.01	3.3		<0.01	3.1		<0.01
p-isopropyltoluene		1,800	0.87		<0.01				0.55		<0.01	0.16		<0.01	0.42		<0.01
propene		13,000															
sec-butyl benzene		1,800															
styrene		4,400	0.22		<0.01	0.15		<0.01	0.15		<0.01	0.19		<0.01	0.21		<0.01
tetrachloroethene (PCE)	47.2	175															
tetrahydrofuran		8,800	0.56		<0.01	0.28		<0.01	0.18		<0.01	0.19		<0.01	0.53		<0.01
toluene		22,000	6		<0.01	8.5		<0.01	9.3		<0.01	10		<0.01	10		<0.01
trans-1,2-dichloroethene		880															
trans-1,3-dichloropropene	3.07	88															
trichloroethene (TCE)	2.99	8.8															
trichlorofluoromethane		3,100	2.5		<0.01	1.7		<0.01	1.8		<0.01	1.5		<0.01	1.3		<0.01
vinyl chloride	2.79	438															
Cumulative Risks and Hazard Indices:				2E-06	0.1		3E-06	0.2		4E-06	0.2		4E-05	0.3		4E-06	0.3

Notes:

[a] Concentration in air corresponding to a cancer risk of 1×10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United State Air Force

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

INDOOR AIR RISK CALCULATION BUILDING 4806 (DTSC APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		4,400															
1,1,1,2-tetrachloroethane	1.66	482															
1,1,2,2-tetrachlorethane	0.21	310															
1,1,2-trichoroethane	0.77	1															
1,1,2-trichlorotrifluoroethane		130,000	0.56		<0.01	0.6		<0.01	0.56		<0.01	0.57		<0.01	0.57		<0.01
1,1-dichloroethane	7.66	3,100															
1,1-dichloroethene		310															
1,2,4-trichlorobenzene	1.23	8.8															
1,2,4-trimethylbenzene		31	1.7		0.06	2.7		0.09	3.4		0.1	3.9		0.1	3.8		0.1
1,2-dichlorobenzene		880															
1,2-dichloroethane	0.47	1,752															
1,2-dichloropropane	1.23	18															
1,2-dichlorotetrafluoroethane		130,000															
1,3,5-trimethylbenzene		153	0.54		<0.01	0.75		<0.01	0.92		<0.01	1.1		<0.01	1		<0.01
1,3-butadiene	0.07	9															
1,3-dichlorobenzene		880															
1,4-dichlorobenzene	1.11	3,504	0.14	1E-07	<0.01												
2-butanone (MEK)		21,900	6.5		<0.01	2.8		<0.01	2.5		<0.01	2.6		<0.01	2.8		<0.01
2-hexanone		130															
4-ethyltoluene		440	1.7		<0.01	2.4		<0.01	3.0		<0.01	3.3		<0.01	3.2		<0.01
4-methyl-2-pentanone (MIBK)		13,000															
acetone		140,000	18		<0.01	17		<0.01	17		<0.01	19		<0.01	12		<0.01
acrylonitrile	0.04	9															
benzene	0.42	13	1.1	3E-06	0.08	1.3	3E-06	0.1	1.5	4E-06	0.1	1.8	4E-06	0.1	1.8	4E-06	0.1
benzyl chloride	0.25	4															
bromodichloromethane	0.33	310															
bromoform	11.15																
bromomethane		22	0.17		<0.01	0.19		<0.01	0.18		<0.01	0.22		0.01	0.21		<0.01
carbon disulfide		3,100	2.2		<0.01	0.69		<0.01	0.46		<0.01	0.28		<0.01	1.5		<0.01
carbon tetrachloride	0.29	175	0.46	2E-06	<0.01	0.42	1E-06	<0.01	0.43	1E-06	<0.01	0.44	2E-06	<0.01	0.41	1E-06	<0.01
chlorobenzene		220															
chloroethane		44,000															
chloroform	0.53	429										20	4E-05	0.05			
chloromethane		394	1.3		<0.01	1.3		<0.01	1.3		<0.01	1.4		<0.01	1.2		<0.01
cis-1,2-dichloroethene		31															
cis-1,3-dichloropropene	0.77	88	0.28	4E-07	<0.01	0.077	1E-07	<0.01	0.06	8E-08	<0.01	0.071	9E-08	<0.01			
cyclohexane		26,000	0.64		<0.01	1.2		<0.01	1.4		<0.01	1.6		<0.01	1.3		<0.01
dibromochloromethane	0.45	310															
dichlorodifluoromethane		440	2.5		<0.01	2.7		<0.01	2.7		<0.01	2.8		<0.01	2.8		<0.01
ethanol		31,000	37		<0.01	21		<0.01	23		<0.01	30		<0.01	27		<0.01
ethyl acetate		31,000				0.69		<0.01	0.9			0.9			1.1		
ethylbenzene	4.90	4,380	1.9	4E-07	<0.01	1.6	3E-07	<0.01	2.0	4E-07	<0.01	2.2	4E-07	<0.01	2.0	4E-07	<0.01
ethylene dibromide (EDB)	0.02	39															
hexachlorobutadiene	0.56	15															
isopropanol		31,000	4		<0.01	2		<0.01	2.6			11			3.9		
isopropylbenzene		1,800	0.56		<0.01				0.14		<0.01	0.17		<0.01	0.14		<0.01
m- & p-xylene		440	5.1		0.01	6.7		0.02	8.1		0.02	9.0		0.02	8.7		0.02

INDOOR AIR RISK CALCULATION BUILDING 4806 (DTSC APPROACH) - MARCH 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47	13,140															
methylene chloride	12	1,752															
naphthalene	0.36	13				0.63	2E-06	0.05	0.83	2E-06	0.06	0.94	3E-06	0.07	0.89	2E-06	0.07
n-butyl benzene		770	0.36		<0.01	0.35		<0.01	0.45		<0.01	0.72		<0.01	0.52		<0.01
n-heptane		3,100	1.2		<0.01	1.8		<0.01	2		<0.01	2.1		<0.01	2		<0.01
n-hexane		3,100	2.1		<0.01	4.0		<0.01	5.4		<0.01	8.2		<0.01	10		<0.01
o-xylene		440	1.9		<0.01	2.5		<0.01	3.0		<0.01	3.3		<0.01	3.1		<0.01
p-isopropyltoluene		1,800	0.87		<0.01				0.55		<0.01	0.16		<0.01	0.42		<0.01
propene		13,140															
sec-butyl benzene		1,800															
styrene		4,400	0.22		<0.01	0.15		<0.01	0.15		<0.01	0.19		<0.01	0.21		<0.01
tetrachloroethene (PCE)	2.08	153															
tetrahydrofuran		8,800	0.56		<0.01	0.28		<0.01	0.18		<0.01	0.19		<0.01	0.53		<0.01
toluene		1,300	6		<0.01	8.5		<0.01	9.3		<0.01	10		<0.01	10		<0.01
trans-1,2-dichloroethene		310															
trans-1,3-dichloropropene	0.77	876,000															
trichloroethene (TCE)	2.99	8.8															
trichlorofluoromethane		3,100	2.5		<0.01	1.7		<0.01	1.8		<0.01	1.5		<0.01	1.3		<0.01
vinyl chloride	0.16	438						<0.01									
Cumulative Risks and Hazard Indices:				5E-06	0.2		7E-06	0.3		8E-06	0.4		5E-05	0.5		9E-06	0.4

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
DTSC Department of Toxic Substances Control
HQ Hazard Quotient

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

INDOOR AIR RISK CALCULATION BUILDING 4806 (USAF/CERCLA APPROACH) - AUGUST 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		22,000															
1,1,1,2-tetrachloroethane	1.66																
1,1,2,2-tetrachlorethane	0.21																
1,1,2-trichoroethane	0.77	1															
1,1,2-trichlorotrifluoroethane		130,000	0.59		<0.01	0.6		<0.01	0.56		<0.01	0.58		<0.01	0.59		<0.01
1,1-dichloroethane	7.66																
1,1-dichloroethene		880															
1,2,4-trichlorobenzene		8.8															
1,2,4-trimethylbenzene		31	2.7		0.09	0.38		0.01	0.35		0.01	0.51		0.02	0.61		0.02
1,2-dichlorobenzene		880															
1,2-dichloroethane	0.47	31															
1,2-dichloropropane	1.23	18															
1,2-dichlorotetrafluoroethane		130,000															
1,3,5-trimethylbenzene		153	0.71		<0.01										0.23		<0.01
1,3-butadiene	0.41	9															
1,3-dichlorobenzene		880															
1,4-dichlorobenzene	1.11	3,504				0.15	1E-07	<0.01									
2-butanone (MEK)		22,000	4.5		<0.01	5.0		<0.01	1.8		<0.01	2.6		<0.01	6.4		<0.01
2-hexanone		130							0.28		<0.01						
4-ethyltoluene		440	2.2		<0.01	0.27		<0.01	0.21		<0.01	0.36		<0.01	0.55		<0.01
4-methyl-2-pentanone (MIBK)		13,000															
acetone		140,000	110		<0.01	21		<0.01	14		<0.01	12		<0.01	20		<0.01
acrylonitrile	0.18	9															
benzene	1.57	131	1.2	8E-07	<0.01	0.91	6E-07	<0.01	0.93	6E-07	<0.01	0.77	5E-07	<0.01	0.94	6E-07	<0.01
benzyl chloride	0.25	4													0.24	1E-06	0.05
bromodichloromethane	0.33					0.49	1E-06		0.15	5E-07							
bromoform	11.15								0.34	3E-08							
bromomethane		22															
carbon disulfide		3,100	8.1		<0.01	0.72		<0.01	0.41		<0.01	2.2		<0.01	140		0.05
carbon tetrachloride	2.04	438	0.43	2E-07	<0.01	0.48	2E-07	<0.01	0.46	2E-07	<0.01	0.39	2E-07	<0.01	0.43	2E-07	<0.01
chlorobenzene		220															
chloroethane		44,000															
chloroform	0.53	1,314				0.21	4E-07	<0.01	0.14	3E-07	<0.01	7.9	1E-05	<0.01	1.1	2E-06	<0.01
chloromethane		390	1.4		<0.01	1.6		<0.01	1.3		<0.01	1.2		<0.01	1.6		<0.01
cis-1,2-dichloroethene		31															
cis-1,3-dichloropropene	3.07	88													0.097	3E-08	<0.01
cyclohexane		26,000	0.67		<0.01										1.1		<0.01
dibromochloromethane	0.45	310							0.42	9E-07							
dichlorodifluoromethane		440	8.8		0.02	10		0.02	13		0.03	3.1		<0.01	3.9		<0.01
ethanol		31,000	20		<0.01	28		<0.01	5.4		<0.01	20		<0.01	14		<0.01
ethyl acetate		31,000						<0.01									
ethylbenzene	4.90	4,380	1.5	3E-07	<0.01	0.29	6E-08	<0.01	0.15	3E-08	<0.01	0.22	4E-08	<0.01	0.29	6E-08	<0.01
ethylene dibromide (EDB)	0.02	39															
hexachlorobutadiene	0.56																
isopropanol		31,000	3.0		<0.01	24		<0.01	1.9			5.3			64		
isopropylbenzene		1,800															
m- & p-xylene		440	7.1		0.02	0.99		<0.01	0.77		<0.01	0.87		<0.01	1.2		<0.01

INDOOR AIR RISK CALCULATION BUILDING 4806 (USAF/CERCLA APPROACH) - AUGUST 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47	13,140															
methylene chloride	1200	2,628															
naphthalene	0.36	13	0.46	1E-06	0.04	0.72	2E-06	0.05	0.22	6E-07	0.02	0.26	7E-07	0.02	1	3E-06	0.08
n-butyl benzene		1,800	0.39		<0.01	0.77		<0.01	0.25		<0.01	0.33		<0.01			
n-heptane		3,100	0.97		<0.01												
n-hexane		3,100	9.4		<0.01	2.8		<0.01	2.3		<0.01	5.7		<0.01	220		0.07
o-xylene		440	2.4		<0.01	0.35		<0.01	0.21		<0.01	0.32		<0.01	1.2		<0.01
p-isopropyltoluene		1,800	0.64		<0.01	0.41		<0.01				0.38		<0.01	3.3		<0.01
propene		13,000															
sec-butyl benzene		1,800															
styrene		4,400	0.51		<0.01	0.16		<0.01							0.13		<0.01
tetrachloroethene (PCE)	47.15	175															
tetrahydrofuran		8,800				0.52		<0.01							0.36		<0.01
toluene		22,000	83		<0.01	3.0		<0.01	2.2		<0.01	1.3		<0.01	1.6		<0.01
trans-1,2-dichloroethene		880															
trans-1,3-dichloropropene	3.07	88															
trichloroethene (TCE)	2.99	8.8															
trichlorofluoromethane		3,100	6.4		<0.01	2.3		<0.01	2.6		<0.01	1.4		<0.01	1.9		<0.01
vinyl chloride	2.79	438															
Cumulative Risks and Hazard Indices:				3E-06	0.2		5E-06	0.1		3E-06	0.08		2E-05	0.07		7E-06	0.3

Notes:

[a] Concentration in air corresponding to a cancer risk of 1×10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United State Air Force

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

INDOOR AIR RISK CALCULATION BUILDING 4806 (DTSC APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		4,400															
1,1,1,2-tetrachloroethane	1.66	482															
1,1,2,2-tetrachlorethane	0.21	310															
1,1,2-trichoroethane	0.77	1															
1,1,2-trichlorotrifluoroethane		130,000	0.59		<0.01	0.6		<0.01	0.56		<0.01	0.58		<0.01	0.59		<0.01
1,1-dichloroethane	7.66	3,100															
1,1-dichloroethene		310															
1,2,4-trichlorobenzene	1.23	8.8															
1,2,4-trimethylbenzene		31	2.7		0.09	0.38		0.01	0.35		0.01	0.51		0.02	0.61		0.02
1,2-dichlorobenzene		880															
1,2-dichloroethane	0.47	1,752															
1,2-dichloropropane	1.23	18															
1,2-dichlorotetrafluoroethane		130,000															
1,3,5-trimethylbenzene		153	0.71		<0.01										0.23		<0.01
1,3-butadiene	0.07	9															
1,3-dichlorobenzene		880															
1,4-dichlorobenzene	1.11	3,504				0.15	1E-07	<0.01									
2-butanone (MEK)		21,900	4.5		<0.01	5.0		<0.01	1.8		<0.01	2.6		<0.01	6.4		<0.01
2-hexanone		130							0.28		<0.01						
4-ethyltoluene		440	2.2		<0.01	0.27		<0.01	0.21		<0.01	0.36		<0.01	0.55		<0.01
4-methyl-2-pentanone (MIBK)		13,000															
acetone		140,000	110		<0.01	21		<0.01	14		<0.01	12		<0.01	20		<0.01
acrylonitrile	0.04	9															
benzene	0.42	13	1.2	3E-06	0.09	0.91	2E-06	0.07	0.93	2E-06	0.07	0.77	2E-06	0.06	0.94	2E-06	0.07
benzyl chloride	0.25	4													0.24	1E-06	0.06
bromodichloromethane	0.33	310				0.49	1E-06	<0.01	0.15	5E-07	<0.01						
bromoform	11.15								0.34	3E-08							
bromomethane		22															
carbon disulfide		3,100	8.1		<0.01	0.72		<0.01	0.41		<0.01	2.2		<0.01	140		0.05
carbon tetrachloride	0.29	175	0.43	1E-06	<0.01	0.48	2E-06	<0.01	0.46	2E-06	<0.01	0.39	1E-06	<0.01	0.43	1E-06	<0.01
chlorobenzene		220															
chloroethane		44,000															
chloroform	0.53	429				0.21	4E-07	<0.01	0.14	3E-07	<0.01	7.9	1E-05	0.02	1.1	2E-06	<0.01
chloromethane		394	1.4		<0.01	1.6		<0.01	1.3		<0.01	1.2		<0.01	1.6		<0.01
cis-1,2-dichloroethene		31															
cis-1,3-dichloropropene	0.77	88													0.097	1E-07	<0.01
cyclohexane		26,000	0.67		<0.01										1.1		<0.01
dibromochloromethane	0.45	310							0.42	9E-07							
dichlorodifluoromethane		440	8.8		0.02	10		0.02	13		0.03	3.1		<0.01	3.9		<0.01
ethanol		31,000	20		<0.01	28		<0.01	5.4		<0.01	20		<0.01	14		<0.01
ethyl acetate		31,000															
ethylbenzene	4.90	4,380	1.5	3E-07	<0.01	0.29	6E-08	<0.01	0.15	3E-08	<0.01	0.22	4E-08	<0.01	0.29	6E-08	<0.01
ethylene dibromide (EDB)	0.02	39															
hexachlorobutadiene	0.56	15															
isopropanol		31,000	3.0		<0.01	24		<0.01	1.9			5.3			64		
isopropylbenzene		1,800															
m- & p-xylene		440	7.1		0.02	0.99		<0.01	0.77		<0.01	0.87		<0.01	1.2		<0.01

INDOOR AIR RISK CALCULATION BUILDING 4806 (DTSC APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47	13,140															
methylene chloride	12	1,752															
naphthalene	0.36	13	0.46	1E-06	0.04	0.72	2E-06	0.05	0.22	6E-07	0.02	0.26	7E-07	0.02	1	3E-06	0.08
n-butyl benzene		770	0.39		<0.01	0.77		<0.01	0.25		<0.01	0.33		<0.01			
n-heptane		3,100	0.97		<0.01												
n-hexane		3,100	9.4		<0.01	2.8		<0.01	2.3		<0.01	5.7		<0.01	220		0.07
o-xylene		440	2.4		<0.01	0.35		<0.01	0.21		<0.01	0.32		<0.01	1.2		<0.01
p-isopropyltoluene		1,800	0.64		<0.01	0.41		<0.01				0.38		<0.01	3.3		<0.01
propene		13,140															
sec-butyl benzene		1,800															
styrene		4,400	0.51		<0.01	0.16		<0.01							0.13		<0.01
tetrachloroethene (PCE)	2.08	153															
tetrahydrofuran		8,800				0.52		<0.01							0.36		<0.01
toluene		1,300	83		0.06	3.0		<0.01	2.2		<0.01	1.3		<0.01	1.6		<0.01
trans-1,2-dichloroethene		310															
trans-1,3-dichloropropene	0.77	876,000															
trichloroethene (TCE)	2.99	8.8															
trichlorofluoromethane		3,100	6.4		<0.01	2.3		<0.01	2.6		<0.01	1.4		<0.01	1.9		<0.01
vinyl chloride	0.16	438															
Cumulative Risks and Hazard Indices:				6E-06	0.3		8E-06	0.2		6E-06	0.1		2E-05	0.1		1E-05	0.4

Notes:

[a] Concentration in air corresponding to a cancer risk of 1×10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
DTSC Department of Toxic Substances Control
HQ Hazard Quotient

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

INDOOR AIR RISK CALCULATION BUILDING 4807 (USAF/CERCLA APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		21,900												
1,1,1,2-tetrachloroethane	1.66													
1,1,2,2-tetrachlorethane	0.21													
1,1,2-trichoroethane	0.77	1												
1,1,2-trichlorotrifluoroethane		130,000	0.64		<0.01	0.59		<0.01	0.6		<0.01	0.6		<0.01
1,1-dichloroethane	7.66													
1,1-dichloroethene		880												
1,2,4-trichlorobenzene		8.8												
1,2,4-trimethylbenzene		31	2.0		0.07	2.4		0.08	8.2		0.3	8.2		0.3
1,2-dichlorobenzene		880												
1,2-dichloroethane	0.47	31												
1,2-dichloropropane	1.23	18												
1,2-dichlorotetrafluoroethane		130,000						<0.01						
1,3,5-trimethylbenzene		153	0.59		<0.01	0.7		<0.01	2.5		0.02	2.5		0.02
1,3-butadiene	0.41	9												
1,3-dichlorobenzene		880												
1,4-dichlorobenzene	1.11	3,504												
2-butanone (MEK)		22,000	3.0		<0.01	2.3		<0.01	2.6		<0.01	2.6		<0.01
2-hexanone		130												
4-ethyltoluene		440	1.7		<0.01	2.1		<0.01	6.5		0.01	6.5		0.01
4-methyl-2-pentanone (MIBK)		13,000												
acetone		140,000	18		<0.01	16		<0.01	19		<0.01	19		<0.01
acrylonitrile	0.18	9							1.3		0.1			
benzene	1.57	131	1.7	1E-06	0.01	2.0	1E-06	0.02	8.3	5E-06	0.06	4.8	3E-06	0.04
benzyl chloride	0.25	4												
bromodichloromethane	0.33													
bromoform	11.15													
bromomethane		22	0.2		<0.01	0.21		<0.01	0.17		<0.01	0.17		<0.01
carbon disulfide		3,100	0.75		<0.01	2.1		<0.01	1.1		<0.01	1.1		<0.01
carbon tetrachloride	2.04	438	0.42	2E-07	<0.01	0.42	2E-07	<0.01	0.39	2E-07	<0.01	0.39	2E-07	<0.01
chlorobenzene		220												
chloroethane		44,000												
chloroform	0.53	1,314												
chloromethane		390	1.5		<0.01	1.3		<0.01	1.3		<0.01	1.3		<0.01
cis-1,2-dichloroethene		31												
cis-1,3-dichloropropene	3.07	88	0.11	4E-08	<0.01	0.056	2E-08	<0.01						
cyclohexane		26,000	1.3		<0.01	1.6		<0.01	3.7		<0.01	3.7		<0.01
dibromochloromethane	0.45	310												
dichlorodifluoromethane		440	2.7		<0.01	2.7		<0.01	2.7		<0.01	2.7		<0.01
ethanol		31,000	25		<0.01	23		<0.01	47		<0.01	47		<0.01
ethyl acetate		31,000	1.2		<0.01	0.86		<0.01	1.9			1.9		
ethylbenzene	4.90	4,380	1.4	3E-07	<0.01	1.6	3E-07	<0.01	4.3	9E-07	<0.01	4.3	9E-07	<0.01
ethylene dibromide (EDB)	0.02	39												
hexachlorobutadiene	0.56													
isopropanol		31,000	240		<0.01	38		<0.01	5.3			5.3		
isopropylbenzene		1,800							0.39		<0.01	0.39		<0.01
m- & p-xylene		440	5.3		0.01	6.5		0.01	18		0.04	18		0.04

INDOOR AIR RISK CALCULATION BUILDING 4807 (USAF/CERCLA APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47	13,140												
methylene chloride	1200	2,628												
naphthalene	0.36	13							1.5	4E-06	0.1	1.5	4E-06	0.1
n-butyl benzene		1,800	0.33		<0.01	0.26		<0.01	1.4		<0.01	1.4		<0.01
n-heptane		3,100	1.8		<0.01	2.1		<0.01	4.9		<0.01	4.9		<0.01
n-hexane		3,100	3.7		<0.01	4.3		<0.01	11		<0.01	11		<0.01
o-xylene		440	1.9		<0.01	2.4		<0.01	6.4		0.01	6.4		0.01
p-isopropyltoluene		1,800				0.17		<0.01	0.61		<0.01	0.61		<0.01
propene		13,000												
sec-butyl benzene		1,800							0.35		<0.01	0.35		<0.01
styrene		4,400	0.23		<0.01	0.26		<0.01	0.62		<0.01	0.62		<0.01
tetrachloroethene (PCE)	47.15	175												
tetrahydrofuran		8,800	1.7		<0.01				0.24		<0.01	0.24		<0.01
toluene		22,000	7.6		<0.01	8.9		<0.01	24		<0.01	24		<0.01
trans-1,2-dichloroethene		880												
trans-1,3-dichloropropene	3.07	88												
trichloroethene (TCE)	2.99	8.8												
trichlorofluoromethane		3,100	2.8		<0.01	3.4		<0.01	3.2		<0.01	3.2		<0.01
vinyl chloride	2.79	438						<0.01						
Cumulative Risks and Hazard Indices:				2E-06	0.1		2E-06	0.1		1E-05	0.7		8E-06	0.5

Notes:

[a] Concentration in air corresponding to a cancer risk of 1×10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United State Air Force

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

INDOOR AIR RISK CALCULATION BUILDING 4807 (DTSC APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		4,400												
1,1,1,2-tetrachloroethane	1.66	482												
1,1,2,2-tetrachlorethane	0.21	310												
1,1,2-trichoroethane	0.77	1												
1,1,2-trichlorotrifluoroethane		130,000	0.64		<0.01	0.59		<0.01	0.56		<0.01	0.6		<0.01
1,1-dichloroethane	7.66	3,100												
1,1-dichloroethene		310												
1,2,4-trichlorobenzene	1.23	8.8												
1,2,4-trimethylbenzene		31	2.0		0.07	2.4		0.08	13		0.4	8.2		0.3
1,2-dichlorobenzene		880												
1,2-dichloroethane	0.47	1,752												
1,2-dichloropropane	1.23	18												
1,2-dichlorotetrafluoroethane		130,000						<0.01						
1,3,5-trimethylbenzene		153	0.59		<0.01	0.7		<0.01	3.9		0.03	2.5		0.02
1,3-butadiene	0.07	9												
1,3-dichlorobenzene		880												
1,4-dichlorobenzene	1.11	3,504												
2-butanone (MEK)		21,900	3.0		<0.01	2.3		<0.01	6.1		<0.01	2.6		<0.01
2-hexanone		130												
4-ethyltoluene		440	1.7		<0.01	2.1		<0.01	11		0.03	6.5		0.01
4-methyl-2-pentanone (MIBK)		13,000												
acetone		140,000	18		<0.01	16		<0.01	30		<0.01	19		<0.01
acrylonitrile	0.04	9							1.3	3E-05	0.1			
benzene	0.42	13	1.7	4E-06	0.1	2.0	5E-06	0.2	8.3	2E-05	0.6	4.8	1E-05	0.4
benzyl chloride	0.25	4												
bromodichloromethane	0.33	310												
bromoform	11.15													
bromomethane		22	0.2		<0.01	0.21		<0.01	0.28		0.01	0.17		<0.01
carbon disulfide		3,100	0.75		<0.01	2.1		<0.01	1.6		<0.01	1.1		<0.01
carbon tetrachloride	0.29	175	0.42	1E-06	<0.01	0.42	1E-06	<0.01	0.42	1E-06	<0.01	0.39	1E-06	<0.01
chlorobenzene		220												
chloroethane		44,000												
chloroform	0.53	429							0.18	3E-07	<0.01			
chloromethane		394	1.5		<0.01	1.3		<0.01	1.4		<0.01	1.3		<0.01
cis -1,2-dichloroethene		31												
cis -1,3-dichloropropene	0.77	88	0.11	1E-07	<0.01	0.056	7E-08	<0.01	0.16	2E-07	<0.01			
cyclohexane		26,000	1.3		<0.01	1.6		<0.01	11		<0.01	3.7		<0.01
dibromochloromethane	0.45	310												
dichlorodifluoromethane		440	2.7		<0.01	2.7		<0.01	2.8		<0.01	2.7		<0.01
ethanol		31,000	25		<0.01	23		<0.01	150		<0.01	47		<0.01
ethyl acetate		31,000	1.2		<0.01	0.86		<0.01	7.3			1.9		
ethylbenzene	4.90	4,380	1.4	3E-07	<0.01	1.6	3E-07	<0.01	8.3	2E-06	<0.01	4.3	9E-07	<0.01
ethylene dibromide (EDB)	0.02	39												
hexachlorobutadiene	0.56	15												
isopropanol		31,000	240		<0.01	38		<0.01	4.3			5.3		
isopropylbenzene		1,800							0.63		<0.01	0.39		<0.01
m- & p-xylene		440	5.3		0.01	6.5		0.01	34		0.08	18		0.04

INDOOR AIR RISK CALCULATION BUILDING 4807 (DTSC APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47	13,140												
methylene chloride	12	1,752												
naphthalene	0.36	13							1.9	5E-06	0.1	1.5	4E-06	0.1
n-butyl benzene		770	0.33		<0.01	0.26		<0.01	1.4		<0.01	1.4		<0.01
n-heptane		3,100	1.8		<0.01	2.1		<0.01	11		<0.01	4.9		<0.01
n-hexane		3,100	3.7		<0.01	4.3		<0.01	34		0.01	11		<0.01
o-xylene		440	1.9		<0.01	2.4		<0.01	12		0.03	6.4		0.01
p-isopropyltoluene		1,800				0.17		<0.01	0.63		<0.01	0.61		<0.01
propene		13,140												
sec-butyl benzene		1,800							0.21		<0.01	0.35		<0.01
styrene		4,400	0.23		<0.01	0.26		<0.01	0.55		<0.01	0.62		<0.01
tetrachloroethene (PCE)	2.08	153							0.27	1E-07	<0.01			
tetrahydrofuran		8,800	1.7		<0.01				0.17		<0.01	0.24		<0.01
toluene		1,300	7.6		<0.01	8.9		<0.01	43		0.03	24		0.02
trans-1,2-dichloroethene		310												
trans-1,3-dichloropropene	0.77	876,000												
trichloroethene (TCE)	2.99	8.8												
trichlorofluoromethane		3,100	2.8		<0.01	3.4		<0.01	5.0		<0.01	3.2		<0.01
vinyl chloride	0.16	438						<0.01						
Cumulative Risks and Hazard Indices:				6E-06	0.3		7E-06	0.3		6E-05	2		2E-05	0.9

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
DTSC Department of Toxic Substances Control
HQ Hazard Quotient

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

INDOOR AIR RISK CALCULATION BUILDING 4807 (USAF/CERCLA APPROACH) - AUGUST 2013

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	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4806IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		22,000												
1,1,1,2-tetrachloroethane	1.66		0.17	1E-07										
1,1,2,2-tetrachlorethane	0.21													
1,1,2-trichoroethane	0.77	1												
1,1,2-trichlorotrifluoroethane		130,000	0.59		<0.01	0.58		<0.01	0.51		<0.01	0.53		<0.01
1,1-dichloroethane	7.66													
1,1-dichloroethene		880												
1,2,4-trichlorobenzene		8.8												
1,2,4-trimethylbenzene		31	3.6		0.1	5.1		0.2	33		1.1	1.1		0.04
1,2-dichlorobenzene		880												
1,2-dichloroethane	0.47	31												
1,2-dichloropropane	1.23	18												
1,2-dichlorotetrafluoroethane		130,000						<0.01						
1,3,5-trimethylbenzene		153	1.1		<0.01	1.5		<0.01	11		0.07	0.28		<0.01
1,3-butadiene	0.41	9												
1,3-dichlorobenzene		880												
1,4-dichlorobenzene	1.11	3,504										0.14	1E-07	<0.01
2-butanone (MEK)		22,000	2.9		<0.01	3.0		<0.01	170		<0.01	3.6		<0.01
2-hexanone		130							1.9		0.01			
4-ethyltoluene		440	3.2		<0.01	4.5		0.01	32		0.07	0.84		<0.01
4-methyl-2-pentanone (MIBK)		13,000										0.62		<0.01
acetone		140,000	17		<0.01	19		<0.01	72		<0.01	19		<0.01
acrylonitrile	0.18	9							2	1E-05	0.2			
benzene	1.57	131	1.6	1E-06	0.01	1.2	8E-07	<0.01	7.4	5E-06	0.06	0.93	6E-07	<0.01
benzyl chloride	0.25	4												
bromodichloromethane	0.33					0.14	4E-07							
bromoform	11.15													
bromomethane		22												
carbon disulfide		3,100	9.9		<0.01	2.3		<0.01	13		<0.01	2.7		<0.01
carbon tetrachloride	2.04	438	0.44	2E-07	<0.01	0.41	2E-07	<0.01	0.37	2E-07	<0.01	0.43	2E-07	<0.01
chlorobenzene		220												
chloroethane		44,000												
chloroform	0.53	1,314	0.24	5E-07	<0.01	0.28	5E-07	<0.01				0.38	7E-07	<0.01
chloromethane		390	0.7		<0.01	1.3		<0.01	4.7		0.01	1.2		<0.01
cis-1,2-dichloroethene		31												
cis-1,3-dichloropropene	3.07	88	0.057	2E-08	<0.01									
cyclohexane		26,000				1.4		<0.01	11		<0.01	0.52		<0.01
dibromochloromethane	0.45	310												
dichlorodifluoromethane		440	0.24		<0.01	7.8		0.02	16		0.04	3.7		<0.01
ethanol		31,000	25		<0.01	30		<0.01	430		0.01	18		<0.01
ethyl acetate		31,000						<0.01						
ethylbenzene	4.90	4,380	1.9	4E-07	<0.01	2.4	5E-07	<0.01	18	4E-06	<0.01	0.6	1E-07	<0.01
ethylene dibromide (EDB)	0.02	39												
hexachlorobutadiene	0.56													
isopropanol		31,000	27		<0.01	14		<0.01	17			19		
isopropylbenzene		1,800	0.17		<0.01	0.2		<0.01	1.3		<0.01			
m- & p-xylene		440	7.8		0.02	10		0.02	74		0.2	2.3		<0.01

INDOOR AIR RISK CALCULATION BUILDING 4807 (USAF/CERCLA APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4806IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47	13,140												
methylene chloride	1200	2,628												
naphthalene	0.36	13	0.56	2E-06	0.04	0.58	2E-06	0.04	1.7	5E-06	0.1	0.3	8E-07	0.02
n-butyl benzene		1,800	0.41		<0.01	0.82		<0.01	3.2		<0.01	0.49		<0.01
n-heptane		3,100	1.5		<0.01	1.7		<0.01	14		<0.01	0.52		<0.01
n-hexane		3,100	25		<0.01	34		0.01	41		0.01	55		0.02
o-xylene		440	2.8		<0.01	3.9		<0.01	28		0.06	0.76		<0.01
p-isopropyltoluene		1,800	0.43		<0.01	0.39		<0.01	0.41		<0.01	0.38		<0.01
propene		13,000												
sec-butyl benzene		1,800							0.46		<0.01			
styrene		4,400	0.27		<0.01	0.27		<0.01	1.9		<0.01	0.19		<0.01
tetrachloroethene (PCE)	47.15	175												
tetrahydrofuran		8,800	1		<0.01	0.14		<0.01						
toluene		22,000	11		<0.01	11		<0.01	58		<0.01	4.5		<0.01
trans-1,2-dichloroethene		880												
trans-1,3-dichloropropene	3.07	88												
trichloroethene (TCE)	2.99	8.8												
trichlorofluoromethane		3,100	6.7		<0.01	7.1		<0.01	3.9		<0.01	5.3		<0.01
vinyl chloride	2.79	438						<0.01						
Cumulative Risks and Hazard Indices:				4E-06	0.2		4E-06	0.3		2E-05	2		3E-06	0.1

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HQ Hazard Quotient
USAF United State Air Force

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

INDOOR AIR RISK CALCULATION BUILDING 4807 (DTSC APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,1,1-trichloroethane		4,400												
1,1,1,2-tetrachloroethane	1.66	482	0.17	1E-07										
1,1,2,2-tetrachlorethane	0.21	310												
1,1,2-trichoroethane	0.77	1												
1,1,2-trichlorotrifluoroethane		130,000	0.59		<0.01	0.58		<0.01	0.51		<0.01	0.53		<0.01
1,1-dichloroethane	7.66	3,100												
1,1-dichloroethene		310												
1,2,4-trichlorobenzene	1.23	8.8												
1,2,4-trimethylbenzene		31	3.6		0.1	5.1		0.2	33		1.1	1.1		0.04
1,2-dichlorobenzene		880												
1,2-dichloroethane	0.47	1,752												
1,2-dichloropropane	1.23	18												
1,2-dichlorotetrafluoroethane		130,000						<0.01						
1,3,5-trimethylbenzene		153	1.1		<0.01	1.5		<0.01	11		0.07	0.28		<0.01
1,3-butadiene	0.07	9												
1,3-dichlorobenzene		880												
1,4-dichlorobenzene	1.11	3,504										0.14	1E-07	<0.01
2-butanone (MEK)		21,900	2.9		<0.01	3.0		<0.01	170		<0.01	3.6		<0.01
2-hexanone		130							1.9		0.01			
4-ethyltoluene		440	3.2		<0.01	4.5		0.01	32		0.07	0.84		<0.01
4-methyl-2-pentanone (MIBK)		13,000										0.62		<0.01
acetone		140,000	17		<0.01	19		<0.01	72		<0.01	19		<0.01
acrylonitrile	0.04	9							2	5E-05	0.2			
benzene	0.42	13	1.6	4E-06	0.1	1.2	3E-06	0.09	7.4	2E-05	0.6	0.93	2E-06	0.07
benzyl chloride	0.25	4												
bromodichloromethane	0.33	310				0.14	4E-07	<0.01						
bromoform	11.15													
bromomethane		22												
carbon disulfide		3,100	9.9		<0.01	2.3		<0.01	13		<0.01	2.7		<0.01
carbon tetrachloride	0.29	175	0.44	2E-06	<0.01	0.41	1E-06	<0.01	0.37	1E-06	<0.01	0.43	1E-06	<0.01
chlorobenzene		220												
chloroethane		44,000												
chloroform	0.53	429	0.24	5E-07	<0.01	0.28	5E-07	<0.01				0.38	7E-07	<0.01
chloromethane		394	0.7		<0.01	1.3		<0.01	4.7		0.01	1.2		<0.01
cis-1,2-dichloroethene		31												
cis-1,3-dichloropropene	0.77	88	0.057	7E-08	<0.01									
cyclohexane		26,000				1.4		<0.01	11		<0.01	0.52		<0.01
dibromochloromethane	0.45	310												
dichlorodifluoromethane		440	0.24		<0.01	7.8		0.02	16		0.04	3.7		<0.01
ethanol		31,000	25		<0.01	30		<0.01	430		0.01	18		<0.01
ethyl acetate		31,000						<0.01						
ethylbenzene	4.90	4,380	1.9	4E-07	<0.01	2.4	5E-07	<0.01	18	4E-06	<0.01	0.6	1E-07	<0.01
ethylene dibromide (EDB)	0.02	39												
hexachlorobutadiene	0.56	15												
isopropanol		31,000	27		<0.01	14		<0.01	17			19		
isopropylbenzene		1,800	0.17		<0.01	0.2		<0.01	1.3		<0.01			
m- & p-xylene		440	7.8		0.02	10		0.02	74		0.2	2.3		<0.01

INDOOR AIR RISK CALCULATION BUILDING 4807 (DTSC APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
methyl tert-butyl ether (MTBE)	47	13,140												
methylene chloride	12	1,752												
naphthalene	0.36	13	0.56	2E-06	0.04	0.58	2E-06	0.04	1.7	5E-06	0.1	0.3	8E-07	0.02
n-butyl benzene		770	0.41		<0.01	0.82		<0.01	3.2		<0.01	0.49		<0.01
n-heptane		3,100	1.5		<0.01	1.7		<0.01	14		<0.01	0.52		<0.01
n-hexane		3,100	25		<0.01	34		0.01	41		0.01	55		0.02
o-xylene		440	2.8		<0.01	3.9		<0.01	28		0.06	0.76		<0.01
p-isopropyltoluene		1,800	0.43		<0.01	0.39		<0.01	0.41		<0.01	0.38		<0.01
propene		13,140												
sec-butyl benzene		1,800							0.46		<0.01			
styrene		4,400	0.27		<0.01	0.27		<0.01	1.9		<0.01	0.19		<0.01
tetrachloroethene (PCE)	2.08	153												
tetrahydrofuran		8,800	1		<0.01	0.14		<0.01						
toluene		1,300	11		<0.01	11		<0.01	58		0.04	4.5		<0.01
trans-1,2-dichloroethene		310												
trans-1,3-dichloropropene	0.77	876,000												
trichloroethene (TCE)	2.99	8.8												
trichlorofluoromethane		3,100	6.7		<0.01	7.1		<0.01	3.9		<0.01	5.3		<0.01
vinyl chloride	0.16	438						<0.01						
Cumulative Risks and Hazard Indices:				8E-06	0.4		7E-06	0.4		7E-05	3		5E-06	0.2

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter
DTSC Department of Toxic Substances Control
HQ Hazard Quotient

Surrogate list:

isopropanol is surrogate for ethanol

xylene is surrogate for 4-ethyltoluene

n-hexane is surrogate for n-heptane

isopropylbenzene is surrogate for isopropyltpoluene

VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4806 (USAF/CERCLA APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
2-butanone (MEK)		22,000	6.5		<0.01	2.8		<0.01	2.5		<0.01	2.6		<0.01	2.8		<0.01
acetone		140,000	18		<0.01	17		<0.01	17		<0.01	19		<0.01	12		<0.01
benzene	1.57	131	1.1	7E-07	<0.01	1.3	8E-07	<0.01	1.5	1E-06	0.01	1.8	1E-06	0.01	1.8	1E-06	0.01
isopropanol		31,000	4		<0.01	2		<0.01	2.6		<0.01	11		<0.01	3.9		<0.01
isopropylbenzene		1,800	0.56		<0.01				0.14		<0.01	0.17		<0.01	0.14		<0.01
n-heptane		3,100	1.2		<0.01	1.8		<0.01	2		<0.01	2.1		<0.01	2		<0.01
n-hexane		3,100	2.1		<0.01	4.0		<0.01	5.4		<0.01	8.2		<0.01	10		<0.01
p-isopropyltoluene		1,800	0.87		<0.01				0.55		<0.01	0.16		<0.01	0.42		<0.01
Cumulative Risks and Hazard Indices for all Analytes:				7E-07	0.01		8E-07	0.01		1E-06	0.01		1E-06	0.02		1E-06	0.02
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01			<0.01			<0.01		1E-06	0.02			<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

VIP vapor intrusion pathway

USAF United State Air Force

n-hexane is surrogate for n-heptane

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4806 (DTSC APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
2-butanone (MEK)		21,900	6.5		<0.01	2.8		<0.01	2.5		<0.01	2.6		<0.01	2.8		<0.01
acetone		140,000	18		<0.01	17		<0.01	17		<0.01	19		<0.01	12		<0.01
benzene	0.42	13	1.1	3E-06	0.08	1.3	3E-06	0.1	1.5	4E-06	0.1	1.8	4E-06	0.1	1.8	4E-06	0.1
isopropanol		31,000	4		<0.01	2		<0.01	2.6		<0.01	11		<0.01	3.9		<0.01
isopropylbenzene		1,800	0.56		<0.01				0.14		<0.01	0.17		<0.01	0.14		<0.01
n-heptane		3,100	1.2		<0.01	1.8		<0.01	2		<0.01	2.1		<0.01	2		<0.01
n-hexane		3,100	2.1		<0.01	4.0		<0.01	5.4		<0.01	8.2		<0.01	10		<0.01
p-isopropyltoluene		1,800	0.87		<0.01				0.55		<0.01	0.16		<0.01	0.42		<0.01
Cumulative Risks and Hazard Indices:				3E-06	0.09		3E-06	0.1		4E-06	0.1		4E-06	0.1		4E-06	0.1
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01			<0.01			<0.01		4E-06	0.1			<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

n-hexane is surrogate for n-heptane

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4806 (USAF/CERCLA APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,2,4-trimethylbenzene		31	2.7		0.09	0.38		0.01	0.35		0.01	0.51		0.02	0.61		0.02
2-butanone (MEK)		22,000	4.5		<0.01	5.0		<0.01	1.8		<0.01	2.6		<0.01	6.4		<0.01
4-ethyltoluene		440	2.2		<0.01	0.27		<0.01	0.21		<0.01	0.36		<0.01	0.55		<0.01
benzene	1.6	131	1.2	8E-07	<0.01	0.91	6E-07	<0.01	0.93	6E-07	<0.01	0.77	5E-07	<0.01	0.94	6E-07	<0.01
carbon disulfide		3,100	8.1		<0.01	0.72		<0.01	0.41		<0.01	2.2		<0.01	140		0.05
ethanol		31,000	20		<0.01	28		<0.01	5.4		<0.01	20		<0.01	14		<0.01
ethylbenzene	4.90	4,380	1.5	3E-07	<0.01	0.29	6E-08	<0.01	0.15	3E-08	<0.01	0.22	4E-08	<0.01	0.29	6E-08	<0.01
naphthalene	0.36	13	0.46	1E-06	0.04	0.72	2E-06	0.05	0.22	6E-07	0.02	0.26	7E-07	0.02	1	3E-06	0.08
o-xylene		440	2.4		<0.01	0.35		<0.01	0.21		<0.01	0.32		<0.01	1.2		<0.01
p-isopropyltoluene		1,800	0.64		<0.01	0.41		<0.01				0.38		<0.01	3.3		<0.01
Cumulative Risks and Hazard Indices:				2E-06	0.1		3E-06	0.1		1E-06	0.04		1E-06	0.05		6E-07	0.2
Cumulative Risks and Hazard Indices for VIP-related Analytes:				1E-06	0.04		6E-07	0.02			<0.01		5E-07	0.01		6E-07	<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4806 (DTSC APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4806IA1			Sample Location N3-4806IA2			Sample Location N3-4806IA3			Sample Location N3-4806IA4			Sample Location N3-4806IA5		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
1,2,4-trimethylbenzene		31	2.7		0.09	0.38		0.01	0.35		0.01	0.51		0.02	0.61		0.02
2-butanone (MEK)		21,900	4.5		<0.01	5.0		<0.01	1.8		<0.01	2.6		<0.01	6.4		<0.01
4-ethyltoluene		440	2.2		<0.01	0.27		<0.01	0.21		<0.01	0.36		<0.01	0.55		<0.01
benzene	0.42	13	1.2	3E-06	0.09	0.91	2E-06	0.07	0.93	2E-06	0.07	0.77	2E-06	0.06	0.94	2E-06	0.07
carbon disulfide		3,100	8.1		<0.01	0.72		<0.01	0.41		<0.01	2.2		<0.01	140		0.05
ethanol		31,000	20		<0.01	28		<0.01	5.4		<0.01	20		<0.01	14		<0.01
ethylbenzene	4.90	4,380	1.5	3E-07	<0.01	0.29	6E-08	<0.01	0.15	3E-08	<0.01	0.22	4E-08	<0.01	0.29	6E-08	<0.01
naphthalene	0.36	13	0.46	1E-06	0.04	0.72	2E-06	0.05	0.22	6E-07	0.02	0.26	7E-07	0.02	1	3E-06	0.08
o-xylene		440	2.4		<0.01	0.35		<0.01	0.21		<0.01	0.32		<0.01	1.2		<0.01
p-isopropyltoluene		1,800	0.64		<0.01	0.41		<0.01				0.38		<0.01	3.3		<0.01
Cumulative Risks and Hazard Indices:				4E-06	0.2		4E-06	0.1		3E-06	0.1		3E-06	0.1		5E-06	0.2
Cumulative Risks and Hazard Indices for VIP-related Analytes:				1E-06	0.04		2E-06	0.08			<0.01		2E-06	0.06		2E-06	0.07

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4807 (USAF/CERCLA APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
2-butanone (MEK)		22,000	3.0		<0.01	2.3		<0.01	2.6		<0.01	2.6		<0.01
acetone		140,000	18		<0.01	16		<0.01	19		<0.01	19		<0.01
tetrahydrofuran		8,800	1.7		<0.01				0.24		<0.01	0.24		<0.01
Cumulative Risks and Hazard Indices:					<0.01			<0.01			<0.01			<0.01
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01			<0.01			<0.01			<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1×10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4807 (DTSC APPROACH) - MARCH 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
2-butanone (MEK)		21,900	3.0		<0.01	2.3		<0.01	6.1		<0.01	2.6		<0.01
acetone		140,000	18		<0.01	16		<0.01	30		<0.01	19		<0.01
tetrahydrofuran		8,800	1.7		<0.01				0.17		<0.01	0.24		<0.01
Cumulative Risks and Hazard Indices:					<0.01			<0.01			<0.01			<0.01
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01			<0.01			<0.01			<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1×10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4807 (USAF/CERCLA APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4806IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
acetone		140,000	17		<0.01	19		<0.01	72		<0.01	19		<0.01
benzene	1.57	131	1.6	1E-06	0.01	1.2	8E-07	<0.01	7.4	5E-06	0.06	0.93	6E-07	<0.01
carbon disulfide		3,100	9.9		<0.01	2.3		<0.01	13		<0.01	2.7		<0.01
dichlorodifluoromethane		440	0.24		<0.01	7.8		0.02	16		0.04	3.7		<0.01
Cumulative Risks and Hazard Indices:				1E-06	0.02		8E-07	0.03		5E-06	0.1		6E-07	0.02
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01		8E-07	0.01			<0.01			<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1×10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

VAPOR INTRUSION PATHWAY-RELATED INDOOR AIR RISK CALCULATION BUILDING 4807 (DTSC APPROACH) - AUGUST 2013

	IASL ($\mu g/m^3$)		Sample Location N3-4807IA1			Sample Location N3-4807IA2			Sample Location N3-4807IA3			Sample Location N3-4807IA4		
	Cancer[a]	Non-Cancer[b]	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ	Concentration $\mu g/m^3$	Cancer Risk	HQ
acetone		140,000	17		<0.01	19		<0.01	72		<0.01	19		<0.01
benzene	0.42	13	1.6	4E-06	0.1	1.2	3E-06	0.09	7.4	2E-05	0.6	0.93	2E-06	0.07
carbon disulfide		3,100	9.9		<0.01	2.3		<0.01	13		<0.01	2.7		<0.01
dichlorodifluoromethane		440	0.24		<0.01	7.8		0.02	16		0.04	3.7		<0.01
Cumulative Risks and Hazard Indices:				4E-06	0.1		3E-06	0.1		2E-05	0.6		2E-06	0.08
Cumulative Risks and Hazard Indices for VIP-related Analytes:					<0.01		3E-06	0.09			<0.01			<0.01

Notes:

[a] Concentration in air corresponding to a cancer risk of 1 x 10^{-6} under the current industrial land use scenario.

[b] Concentration in air corresponding to a Hazard Quotient of 1 under the current industrial land use scenario.

$\mu g/m^3$ Micrograms per cubic meter

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

HQ Hazard Quotient

USAF United State Air Force

Analyte is not likely vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air at this location and in groundwater. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration, and the sub-slab vapor concentration at this location was not at least 10 times higher than that detected in the indoor air.

The analyte is vapor intrusion pathway-related at this sample location. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentration was higher than, or lower but within the same order of magnitude as, the outdoor air concentration and the sub-slab vapor concentration at this location was at least 10 times higher than those detected in the indoor air.

APPENDIX F

PORTABLE GAS CHROMATOGRAPH/MASS SPECTROMETER DATA

APPENDIX F
HAPSITE™ DATA ASSESSMENT

Data assessment is a systematic process for reviewing data against a pre-defined set of criteria to provide assurance that the data meets project Data Quality Objective (DQO) requirements. The purpose of the data assessment process is to determine if and how the overall analytical processes and sample collection and handling procedures affect the usability of the analytical data. If specific DQOs are not met, the data are qualified (i.e., data flags are assigned to sample results) in accordance with guidelines established by the United States Environmental Protection Agency (USEPA). Data assessment allows the data user to adequately determine if the data can be used for its intended purpose. The data acceptance criteria are established according to Standard Operating Procedures (SOPs) and Statements of Work (SOWs), and were provided to the contracted analytical services provider (i.e., KD Analytical of Harrisburg, Pennsylvania).

DATA REVIEW PROCEDURES

AECOM performed an independent quality control (QC) review and assessment of the HAPSITE™ field screening-level data. The QC review and assessment is conducted to verify the data collected are of appropriate quality for the intended use and meets site-specific DQOs. The steps and guidelines followed during the data review process were modeled after the USEPA's *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (USEPA 1999) to the extent possible. In addition, the DQOs set forth in the HAPSITE™ SOP (KD Analytical 2015) for the analysis of volatile organic compounds (VOCs) by HAPSITE™ gas chromatography/mass spectrometry (GC/MS) were used during the data review process where appropriate. This data review process has been adapted to meet the DQO requirements for the generation of screening-level data.

DATA REVIEW RESULTS

The analytical data consists of nine vapor samples and one field duplicate collected at Site N3 at Edwards Air Force Base, California on 1 February 2016. The following samples were analyzed onsite by KD Analytical:

- Building 4807: N3-4806-IA01, N3-4806-IA02, N3-4806-IA03, N3-4806-IA04, N3-4806-IA05, and N3-4806-OA03.
- Building 4807: N3-4807-IA01, N3-4807-IA02, N3-4807-IA03, N3-4807-IA04 and N3-4807-IA04 DUPLICATE.

VOLATILE ORGANIC COMPOUNDS BY HAPSITE™ GC/MS

The GC/MS was calibrated using a five point calibration curve. The percent relative standard deviation (%RSD) of the curve fit must be less than 25% for each analyte calibrated according to the Vapor Intrusion Analysis by HAPSITE GC/MS SOP #2, revision 2, 1 January 2015. The calibration for all analytes meets the acceptance criteria of less the 25% RSD; therefore, no further action is required.

The initial calibration check verification standard (ICV) and continuing calibration check standard (CCV) must exhibit a percent difference (%D) of less than 30%, according to the SOP. All analytes were in control for all analytes with the following exceptions:

- 1 February 2016 – ICV: Vinyl chloride was biased high (131%); however, since this analyte was non-detect in all samples, no further action is required.

- 1 February 2016 – CCV: Benzene was biased high in the CCV (1495%), therefore the quantitation of benzene in the associated samples may be considered as biased high.

The method blank was in-control, and the field duplicate was non-detect and in-control, therefore meeting the project DQOs. In general, the HAPSITE™ screening-level data was biased low when compared to the USEPA Method TO-15 definitive-level results for all analytes reported by both methods. An MDL was not available for Acrylonitrile by USEPA Method TO-15 for comparison.

No QC excursions were encountered during the analysis of the referenced samples that would have resulted in the rejection of data. As a result, the assessment of data quality and usability as defined indicate that the sample results for this analytical fraction are acceptable and compliant for their intended use.

REFERENCES

KD Analytical. 2015. *Vapor Intrusion Analysis by HAPSITE GC/MS, SOP #2, Rev #2*. January.

United States Environmental Protection Agency (USEPA). 1999. *Contract Laboratory Program National Functional Guidelines for Organic Data Review*. EPA 540/R-99/008, (OSWER 9240.1-05A-P).

ATTACHMENT

Attachment F-1 KD Analytical Edwards AFB Sample Results, 1 February 2016

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KD ANALYTICAL

5045 College Oak Drive, Suite D
Sacramento, CA. 95841 916-897-4547

Edwards AFB

Sample Results

Field Gas Chromatograph / Mass Spectrometry

Sample Name:	**CV**
File Number:	**20160201_007**
Collection Date:	**1-Feb-16**
Collection Time:	**NA**
Analysis Date:	**1-Feb-16**
Analysis Time:	**4:42**
Analyst	**DRS**
Instrument ID	**B4HP26A00774**
Dilution Factor:	**1**

Compound	Concentration (ug/m3)	Percent Recovery
Vinyl Chloride	3.4	131%
Acrylonitrile	2.9	130%
trans-1,2-Dichloroethene	4.4	110%
cis-1,2-Dichloroethene	4.9	122%
Chloroform	4.9	101%
1,2-Dichloroethane	4.2	101%
Benzene	3.1	96.0%
Carbon Tetrachloride	6.5	103%
Bromodichloromethane	6.0	88.0%
Trichloroethene	5.3	96.2%
Tetrachloroethene	6.9	100%
Ethyl benzene	3.9	88.4%
Naphthalene	5.3	100%

Unknown Compounds/Notes:

Q= Outside established limits of 70% to 130% recovery

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Sample Results

Field Gas Chromatograph / Mass Spectrometry

Sample Name:	**MBLK**
File Number:	**20160201_002**
Collection Date:	**1-Feb-16**
Collection Time:	**NA**
Analysis Date:	**1-Feb-16**
Analysis Time:	**12:44**
Analyst	**DRS**
Instrument ID	**B4HP26A00774**
Dilution Factor:	**1**

Compound	Concentration (ug/m3)	Detection Limit (ug/m3)
Vinyl Chloride	Not Detected	1.3
Acrylonitrile	Not Detected	0.44
trans-1,2-Dichloroethene	Not Detected	0.81
cis-1,2-Dichloroethene	Not Detected	0.81
Chloroform	Not Detected	0.98
1,2-Dichloroethane	Not Detected	0.82
Benzene	Not Detected	0.65
Carbon Tetrachloride	Not Detected	1.3
Bromodichloromethane	Not Detected	1.4
Trichloroethene	Not Detected	1.1
Tetrachloroethene	Not Detected	1.4
Ethyl benzene	Not Detected	0.88
Naphthalene	Not Detected	1.1

Unknown Compounds/Notes:

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Sample Results

Field Gas Chromatograph / Mass Spectrometry

Sample Name:	**N3-4806IA1**
File Number:	**20160201_003**
Collection Date:	**1-Feb-16**
Collection Time:	**NA**
Analysis Date:	**1-Feb-16**
Analysis Time:	**20160201_003**
Analyst	**DRS**
Instrument ID	**B4HP26A00774**
Dilution Factor:	**1**

Compound	Concentration (ug/m3)	Detection Limit (ug/m3)
Vinyl Chloride	Not Detected	1.3
Acrylonitrile	Not Detected	0.44
trans-1,2-Dichloroethene	Not Detected	0.81
cis-1,2-Dichloroethene	Not Detected	0.81
Chloroform	Not Detected	0.98
1,2-Dichloroethane	Not Detected	0.82
Benzene	0.97	0.65
Carbon Tetrachloride	Not Detected	1.3
Bromodichloromethane	Not Detected	1.4
Trichloroethene	Not Detected	1.1
Tetrachloroethene	Not Detected	1.4
Ethyl benzene	Not Detected	0.88
Naphthalene	Not Detected	1.1

Unknown Compounds/Notes:

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Sample Results

Field Gas Chromatograph / Mass Spectrometry

Sample Name:	**N3-4807IA1**
File Number:	**20160117_001**
Collection Date:	**1-Feb-16**
Collection Time:	**NA**
Analysis Date:	**1-Feb-16**
Analysis Time:	**13:20**
Analyst	**DRS**
Instrument ID	**B4HP26A00774**
Dilution Factor:	**1**

Compound	**Concentration (ug/m3)**	**Detection Limit (ug/m3)**
Vinyl Chloride	Not Detected	1.3
Acrylonitrile	Not Detected	0.44
trans-1,2-Dichloroethene	Not Detected	0.81
cis-1,2-Dichloroethene	Not Detected	0.81
Chloroform	Not Detected	0.98
1,2-Dichloroethane	Not Detected	0.82
Benzene	Not Detected	0.65
Carbon Tetrachloride	Not Detected	1.3
Bromodichloromethane	Not Detected	1.4
Trichloroethene	Not Detected	1.1
Tetrachloroethene	Not Detected	1.4
Ethyl benzene	Not Detected	0.88
Naphthalene	Not Detected	1.1

Unknown Compounds/Notes:

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Sample Results

Field Gas Chromatograph / Mass Spectrometry

Sample Name:	**N3-4807IA2**
File Number:	**20160117_002**
Collection Date:	**1-Feb-16**
Collection Time:	**NA**
Analysis Date:	**1-Feb-16**
Analysis Time:	**13:37**
Analyst	**DRS**
Instrument ID	**B4HP26A00774**
Dilution Factor:	**1**

Compound	Concentration (ug/m3)	Detection Limit (ug/m3)
Vinyl Chloride	Not Detected	1.3
Acrylonitrile	Not Detected	0.44
trans-1,2-Dichloroethene	Not Detected	0.81
cis-1,2-Dichloroethene	Not Detected	0.81
Chloroform	Not Detected	0.98
1,2-Dichloroethane	Not Detected	0.82
Benzene	Not Detected	0.65
Carbon Tetrachloride	Not Detected	1.3
Bromodichloromethane	Not Detected	1.4
Trichloroethene	Not Detected	1.1
Tetrachloroethene	Not Detected	1.4
Ethyl benzene	Not Detected	0.88
Naphthalene	Not Detected	1.1

Unknown Compounds/Notes:

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Sample Results

Field Gas Chromatograph / Mass Spectrometry

Sample Name:	**N3-4806IA3**
File Number:	**20160112_003**
Collection Date:	**1-Feb-16**
Collection Time:	**NA**
Analysis Date:	**1-Feb-16**
Analysis Time:	**14:10**
Analyst	**DRS**
Instrument ID	**B4HP26A00774**
Dilution Factor:	**1**

Compound	**Concentration (ug/m3)**	**Detection Limit (ug/m3)**
Vinyl Chloride	Not Detected	1.3
Acrylonitrile	Not Detected	0.44
trans-1,2-Dichloroethene	Not Detected	0.81
cis-1,2-Dichloroethene	Not Detected	0.81
Chloroform	Not Detected	0.98
1,2-Dichloroethane	Not Detected	0.82
Benzene	Not Detected	0.65
Carbon Tetrachloride	Not Detected	1.3
Bromodichloromethane	Not Detected	1.4
Trichloroethene	Not Detected	1.1
Tetrachloroethene	Not Detected	1.4
Ethyl benzene	Not Detected	0.88
Naphthalene	Not Detected	1.1

Unknown Compounds/Notes:

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Sample Results

Field Gas Chromatograph / Mass Spectrometry

Sample Name:	**N3-4807IA3**
File Number:	**20160117_004**
Collection Date:	**1-Feb-16**
Collection Time:	**NA**
Analysis Date:	**1-Feb-16**
Analysis Time:	**14:26**
Analyst	**DRS**
Instrument ID	**B4HP26A00774**
Dilution Factor:	**1**

Compound	**Concentration (ug/m3)**	**Detection Limit (ug/m3)**
Vinyl Chloride	Not Detected	1.3
Acrylonitrile	Not Detected	0.44
trans-1,2-Dichloroethene	Not Detected	0.81
cis-1,2-Dichloroethene	Not Detected	0.81
Chloroform	Not Detected	0.98
1,2-Dichloroethane	Not Detected	0.82
Benzene	2.2	0.65
Carbon Tetrachloride	Not Detected	1.3
Bromodichloromethane	Not Detected	1.4
Trichloroethene	Not Detected	1.1
Tetrachloroethene	Not Detected	1.4
Ethyl benzene	1.3	0.88
Naphthalene	Not Detected	1.1

Unknown Compounds/Notes:

Naphthalene was also detected below reporting limit

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Sample Results

Field Gas Chromatograph / Mass Spectrometry

Sample Name:	**N3-4806IA2**
File Number:	**20160117_005**
Collection Date:	**1-Feb-16**
Collection Time:	**NA**
Analysis Date:	**1-Feb-16**
Analysis Time:	**14:43**
Analyst	**DRS**
Instrument ID	**B4HP26A00774**
Dilution Factor:	**1**

Compound	**Concentration (ug/m3)**	**Detection Limit (ug/m3)**
Vinyl Chloride	Not Detected	1.3
Acrylonitrile	Not Detected	0.44
trans-1,2-Dichloroethene	Not Detected	0.81
cis-1,2-Dichloroethene	Not Detected	0.81
Chloroform	Not Detected	0.98
1,2-Dichloroethane	Not Detected	0.82
Benzene	Not Detected	0.65
Carbon Tetrachloride	Not Detected	1.3
Bromodichloromethane	Not Detected	1.4
Trichloroethene	Not Detected	1.1
Tetrachloroethene	Not Detected	1.4
Ethyl benzene	Not Detected	0.88
Naphthalene	Not Detected	1.1

Unknown Compounds/Notes:

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Sample Results

Field Gas Chromatograph / Mass Spectrometry

Sample Name:	**N3-4806IA4**
File Number:	**20160117_006**
Collection Date:	**1-Feb-16**
Collection Time:	**NA**
Analysis Date:	**1-Feb-16**
Analysis Time:	**15:00**
Analyst	**DRS**
Instrument ID	**B4HP26A00774**
Dilution Factor:	**1**

Compound	**Concentration (ug/m3)**	**Detection Limit (ug/m3)**
Vinyl Chloride	Not Detected	1.3
Acrylonitrile	0.53	0.44
trans-1,2-Dichloroethene	Not Detected	0.81
cis-1,2-Dichloroethene	Not Detected	0.81
Chloroform	Not Detected	0.98
1,2-Dichloroethane	Not Detected	0.82
Benzene	Not Detected	0.65
Carbon Tetrachloride	Not Detected	1.3
Bromodichloromethane	Not Detected	1.4
Trichloroethene	Not Detected	1.1
Tetrachloroethene	Not Detected	1.4
Ethyl benzene	Not Detected	0.88
Naphthalene	Not Detected	1.1

Unknown Compounds/Notes:

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Sample Results

Field Gas Chromatograph / Mass Spectrometry

Sample Name:	**N3-4806IA5**
File Number:	**20160117_007**
Collection Date:	**1-Feb-16**
Collection Time:	**NA**
Analysis Date:	**1-Feb-16**
Analysis Time:	**15:18**
Analyst	**DRS**
Instrument ID	**B4HP26A00774**
Dilution Factor:	**1**

Compound	**Concentration (ug/m3)**	**Detection Limit (ug/m3)**
Vinyl Chloride	Not Detected	1.3
Acrylonitrile	Not Detected	0.44
trans-1,2-Dichloroethene	Not Detected	0.81
cis-1,2-Dichloroethene	Not Detected	0.81
Chloroform	4.0	0.98
1,2-Dichloroethane	Not Detected	0.82
Benzene	Not Detected	0.65
Carbon Tetrachloride	Not Detected	1.3
Bromodichloromethane	Not Detected	1.4
Trichloroethene	Not Detected	1.1
Tetrachloroethene	Not Detected	1.4
Ethyl benzene	Not Detected	0.88
Naphthalene	Not Detected	1.1

Unknown Compounds/Notes:

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Sample Results

Field Gas Chromatograph / Mass Spectrometry

Sample Name:	**N3-4807IA4**
File Number:	**20160117_008**
Collection Date:	**1-Feb-16**
Collection Time:	**NA**
Analysis Date:	**1-Feb-16**
Analysis Time:	**15:37**
Analyst	**DRS**
Instrument ID	**B4HP26A00774**
Dilution Factor:	**1**

Compound	**Concentration (ug/m3)**	**Detection Limit (ug/m3)**
Vinyl Chloride	Not Detected	1.3
Acrylonitrile	Not Detected	0.44
trans-1,2-Dichloroethene	Not Detected	0.81
cis-1,2-Dichloroethene	Not Detected	0.81
Chloroform	Not Detected	0.98
1,2-Dichloroethane	Not Detected	0.82
Benzene	Not Detected	0.65
Carbon Tetrachloride	Not Detected	1.3
Bromodichloromethane	Not Detected	1.4
Trichloroethene	Not Detected	1.1
Tetrachloroethene	Not Detected	1.4
Ethyl benzene	Not Detected	0.88
Naphthalene	Not Detected	1.1

Unknown Compounds/Notes:

KD ANALYTICAL

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Sample Results

Field Gas Chromatograph / Mass Spectrometry

Sample Name:	**N3-4807IA4 DUPLICATE**
File Number:	**20160117_009**
Collection Date:	**1-Feb-16**
Collection Time:	**NA**
Analysis Date:	**1-Feb-16**
Analysis Time:	**15:54**
Analyst	**DRS**
Instrument ID	**B4HP26A00774**
Dilution Factor:	**1**

Compound	**Concentration (ug/m3)**	**Detection Limit (ug/m3)**
Vinyl Chloride	Not Detected	1.3
Acrylonitrile	Not Detected	0.44
trans-1,2-Dichloroethene	Not Detected	0.81
cis-1,2-Dichloroethene	Not Detected	0.81
Chloroform	Not Detected	0.98
1,2-Dichloroethane	Not Detected	0.82
Benzene	Not Detected	0.65
Carbon Tetrachloride	Not Detected	1.3
Bromodichloromethane	Not Detected	1.4
Trichloroethene	Not Detected	1.1
Tetrachloroethene	Not Detected	1.4
Ethyl benzene	Not Detected	0.88
Naphthalene	Not Detected	1.1

Unknown Compounds/Notes:

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Sample Results

Field Gas Chromatograph / Mass Spectrometry

Sample Name:	**N3-4806OA3**
File Number:	**20160117_010**
Collection Date:	**1-Feb-16**
Collection Time:	**NA**
Analysis Date:	**1-Feb-16**
Analysis Time:	**16:12**
Analyst	**DRS**
Instrument ID	**B4HP26A00774**
Dilution Factor:	**1**

Compound	**Concentration (ug/m3)**	**Detection Limit (ug/m3)**
Vinyl Chloride	Not Detected	1.3
Acrylonitrile	Not Detected	0.44
trans-1,2-Dichloroethene	Not Detected	0.81
cis-1,2-Dichloroethene	Not Detected	0.81
Chloroform	Not Detected	0.98
1,2-Dichloroethane	Not Detected	0.82
Benzene	Not Detected	0.65
Carbon Tetrachloride	Not Detected	1.3
Bromodichloromethane	Not Detected	1.4
Trichloroethene	Not Detected	1.1
Tetrachloroethene	Not Detected	1.4
Ethyl benzene	Not Detected	0.88
Naphthalene	Not Detected	1.1

Unknown Compounds/Notes:

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APPENDIX G

VIP-RELATED VOC DETERMINATION

APPENDIX G-1
BUILDING 4806 VAPOR INTRUSION PATHWAY DETERMINATION - FEBRUARY 2016
(Page 1 of 2)

Analyte	N3-4806IA1	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	Analyte in indoor air	Analyte in groundwater	Analyte in outdoor air	Analyte in sub-slab vapor	Indoor air higher than or similar to outdoor air	Sub-slab vapor 10 times higher than indoor air	Analyte vapor intrusion pathway related
1,1,1-trichloroethane	<0.22	<0.22	<0.21	<0.24	<0.25							
1,1,1,2-tetrachloroethane	<5.8	<5.9	<5.6	<6.3	<6.7							
1,1,2,2-tetrachloroethane	<0.12	<0.12	<0.11	<0.13	<0.14		**Yes**					
1,1,2-trichloroethane	<0.46	<0.47	<0.45	<0.50	<0.53		**Yes**					
1,1,2-trichloro-1,2,2-trifluoroethane	0.48	0.54	0.55	0.57	0.53	**Yes**		**Yes**		**Yes**		**No[a]**
1,1-dichloroethane	<0.087	<0.088	<0.085	<0.094	<0.10			**Yes**	**Yes**			
1,1-dichloroethene	<0.13	<0.14	<0.13	<0.14	<0.16		**Yes**					
1,2,4-trichlorobenzene	<0.25	<0.26	<0.24	<0.27	<0.29							
1,2,4-trimethylbenzene	0.25	0.18	0.32	0.24	0.47	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[f]**
1,2-dichlorobenzene	<0.31	<0.32	<0.30	<0.34	<0.36		**Yes**		**Yes**			
1,2-dichloroethane	<0.23	<0.23	<0.22	<0.25	<0.26		**Yes**	**Yes**	**Yes**			
1,2-dichloropropane	<0.17	<0.17	<0.16	<0.18	<0.20		**Yes**	**Yes**	**Yes**			
1,2-dichlorotetrafluoroethane	<0.22	<0.22	<0.21	<0.24	<0.25							
1,3,5-trimethylbenzene	<0.14	<0.15	<0.14	<0.16	<0.17		**Yes**	**Yes**	**Yes**			
1,3-butadiene	<0.054	<0.055	<0.053	<0.059	<0.063							
1,3-dichlorobenzene	<0.13	<0.13	<0.13	<0.14	<0.15				**Yes**			
1,4-dichlorobenzene	<0.14	<0.14	<0.14	<0.15	<0.16		**Yes**					
1,4-dioxane	<0.18	<0.18	<0.18	<0.20	<0.21							
2-butanone (MEK)	0.88	4.6	1.2	3.3	0.81	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[f]**
2-hexanone	<0.36	0.60	<0.35	<0.39	<0.42	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[c]**
4-ethyltoluene	0.20	0.18	0.28	0.21	0.39	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[e]**
4-methyl-2-pentanone (MIBK)	<0.12	0.25	<0.12	0.29	<0.15	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[f]**
acetone	18	37	40	71	58	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
acrylonitrile	<1.8	<1.8	<1.8	<2.0	<2.1							
benzene	0.44	0.44	0.54	0.80	0.54	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[f]**
benzyl chloride	<0.18	<0.19	<0.18	<0.20	<0.21							
bromodichloromethane	<0.17	<0.18	<0.17	<0.19	<0.20		**Yes**					
bromoform	<0.32	<0.33	<0.31	<0.35	<0.38		**Yes**		**Yes**			
bromomethane	<1.0	<1.0	<0.98	<1.1	<1.2							
carbon disulfide	<0.21	<0.21	<0.20	<0.23	<0.24		**Yes**		**Yes**			
carbon tetrachloride	0.38	0.37	0.29	0.36	0.32	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[c]**
chlorobenzene	<0.19	<0.20	<0.19	<0.21	<0.23		**Yes**		**Yes**			
chloroethane	<0.35	<0.36	<0.34	<0.38	<0.41		**Yes**					
chloroform	0.31	0.39	0.65	1.5	5.0	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
chloromethane	1.1	1.3	1.2	1.2	1.2	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[c]**
cis-1,2-dichloroethene	<0.19	<0.19	<0.19	<0.21	<0.22		**Yes**					
cis-1,3-dichloropropene	<0.16	<0.16	<0.16	<0.18	<0.19							
cyclohexane	<0.098	<0.099	0.10	0.16	0.16	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[e]**
dibromochloromethane	<0.24	<0.24	<0.23	<0.26	<0.28		**Yes**					

APPENDIX G-1
BUILDING 4806 VAPOR INTRUSION PATHWAY DETERMINATION - FEBRUARY 2016
(Page 2 of 2)

Analyte	N3-4806IA1	N3-4806IA2	N3-4806IA3	N3-4806IA4	N3-4806IA5	Analyte in indoor air	Analyte in groundwater	Analyte in outdoor air	Analyte in sub-slab vapor	Indoor air higher than or similar to outdoor air	Sub-slab vapor 10 times higher than indoor air	Analyte vapor intrusion pathway related
dichlorodifluoromethane	2.4	2.5	2.4	3.7	2.4	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[b]**
ethanol	5.0	140	7.5	19	3.9	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[b]**
ethyl acetate	<3.0	6.7	<3.0	<3.3	<3.5	**Yes**		**Yes**		**Yes**		**No[a]**
ethylbenzene	<0.21	<0.21	0.24	0.34	0.34	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[f]**
ethylene dibromide (EDB)	<0.22	<0.22	<0.22	<0.24	<0.26		**Yes**					
hexachlorobutadiene	<0.45	<0.46	<0.44	<0.49	<0.52		**Yes**		**Yes**			
isopropyl alcohol	0.63	7.8	0.90	9.4	1.8	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[b]**
isopropylbenzene	<0.13	<0.13	<0.13	<0.14	<0.15		**Yes**	**Yes**	**Yes**			
m- & p-xylene	0.38	0.50	0.66	0.85	1.1	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[e]**
methyl tert-butyl ether (MTBE)	<0.080	<0.082	<0.078	<0.087	<0.094							
methylene chloride	<0.29	<0.31	<0.31	<0.26	<0.27		**Yes**					
naphthalene	<0.098	0.13	0.12	<0.11	<0.11	**Yes**	**Yes**		**Yes**	**Yes**		**Likely No[d]**
n-butylbenzene	<4.6	<4.7	<4.5	<5.0	<5.4		**Yes**					
n-heptane	0.25	0.30	0.35	0.50	0.39	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[e]**
n-hexane	0.31	0.22	0.36	0.44	0.41	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[e]**
o-xylene	<0.18	0.25	0.37	0.35	0.36	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[f]**
p-isopropyl toluene	<4.6	<4.7	<4.5	<5.0	<5.4		**Yes**					
propene	<0.38	<0.39	<0.38	<0.42	<0.45							
sec-butylbenzene	<4.6	<4.7	<4.5	<5.0	<5.4		**Yes**					
styrene	<0.073	0.10	0.14	0.083	0.18	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Likely Yes[e]**
tetrachloroethene (PCE)	<0.31	<0.32	<0.30	<0.34	<0.36		**Yes**	**Yes**	**Yes**			
tetrahydrofuran	<0.42	<0.43	<0.42	0.82	<0.50	**Yes**				**Yes**		**No[a]**
toluene	8.0	12	20	26	30	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
trans-1,2-dichloroethene	<0.20	<0.20	<0.19	<0.22	<0.23		**Yes**					
trans-1,3-dichloropropene	<0.16	<0.17	<0.16	<0.18	<0.19							
trichloroethene (TCE)	<0.27	<0.27	<0.26	<0.29	<0.31		**Yes**		**Yes**			
trichlorofluoromethane	2.2	1.4	1.5	1.5	1.4	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[b]**
vinyl chloride	<0.095	<0.097	<0.093	<0.10	<0.11		**Yes**					

Notes:

[a]Not vapor intrusion pathway related for all samples. The analyte was (1) detected only in indoor air (not in groundwater or outdoor air or sub-slab-vapor) or (2) detected in indoor air and outdoor air, but not in groundwater or sub-slab vapor.

[b]Not likely vapor intrusion pathway related. The analyte was detected in indoor air and sub-slab vapor but not in groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations, and the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[c]Not likely vapor intrusion pathway related. The analyte was detected in indoor air and groundwater but not in sub-slab vapor. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations.

[d]Not likely vapor intrusion pathway related. The analyte was detected in indoor air, groundwater, and sub-slab vapor. However, the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[e]Likely vapor intrusion pathway related. Although the analyte is not a groundwater contaminant of concern, it was detected in indoor air and sub-slab vapor. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were at least 10 times higher than those detected in the indoor air.

[f]Vapor intrusion pathway related. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were 10 times higher than those detected in the indoor air.

APPENDIX G-2
BUILDING 4807 VAPOR INTRUSION PATHWAY DETERMINATION - FEBRUARY 2016
(Page 1 of 2)

Analyte	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA3[a]	N3-4807IA4	Analyte in indoor air	Analyte in groundwater	Analyte in outdoor air	Analyte in sub-slab vapor	Indoor air higher than or similar to outdoor air	Sub-slab vapor 10 times higher than indoor air	Analyte vapor intrusion pathway related
1,1,1-trichloroethane	<0.21	<0.22	<0.19	<0.21	<0.23							
1,1,1,2-tetrachloroethane	<5.6	<5.8	<5.0	<5.5	<6.0							
1,1,2,2-tetrachloroethane	<0.11	<0.12	<0.10	<0.11	<0.12		**Yes**					
1,1,2-trichloroethane	<0.44	<0.46	<0.40	<0.44	<0.48		**Yes**					
1,1,2-trichloro-1,2,2-trifluoroethane	0.52	0.51	0.59	0.54	0.63	**Yes**		**Yes**		**Yes**		**No[b]**
1,1-dichloroethane	1.4	<0.088	<0.075	<0.083	<0.090	**Yes**		**Yes**		**Yes**		**No[b]**
1,1-dichloroethene	<0.13	<0.13	<0.12	<0.13	<0.14		**Yes**					
1,2,4-trichlorobenzene	<0.24	<0.25	<0.22	<0.24	<0.26							
1,2,4-trimethylbenzene	0.65	0.40	1.9	1.7	0.35	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
1,2-dichlorobenzene	<0.30	<0.32	<0.27	<0.30	<0.32		**Yes**					
1,2-dichloroethane	0.29	<0.23	<0.20	<0.22	<0.24	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
1,2-dichloropropane	1.9	<0.17	<0.15	<0.16	<0.18	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
1,2-dichlorotetrafluoroethane	<0.21	<0.22	<0.19	<0.21	<0.22							
1,3,5-trimethylbenzene	0.22	0.15	0.64	0.50	<0.15	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
1,3-butadiene	0.12	<0.055	0.055	<0.052	<0.056	**Yes**				**Yes**		**No[b]**
1,3-dichlorobenzene	<0.13	<0.13	<0.11	<0.13	<0.14							
1,4-dichlorobenzene	<0.14	<0.14	<0.12	<0.14	<0.15		**Yes**					
1,4-dioxane	<0.17	<0.18	<0.16	<0.17	<0.19							
2-butanone (MEK)	14	0.54	3.1	0.76	0.82	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
2-hexanone	<0.35	<0.37	0.36	<0.35	<0.38	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
4-ethyltoluene	0.68	0.36	1.6	1.6	0.37	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
4-methyl-2-pentanone (MIBK)	3.0	<0.13	0.36	0.15	0.14	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
acetone	44	23	59	52	37	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
acrylonitrile	<1.8	<1.8	<1.6	<1.7	<1.9							
benzene	1.1	0.69	2.0	2.0	0.58	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes[f]**
benzyl chloride	<0.18	<0.18	<0.16	<0.18	<0.19							
bromodichloromethane	<0.17	<0.17	<0.15	<0.16	<0.18		**Yes**					
bromoform	<0.31	<0.32	<0.28	<0.31	<0.34		**Yes**					
bromomethane	<0.97	<1.0	<0.87	<0.96	<1.0							
carbon disulfide	<0.67	<0.21	<0.18	<0.20	<0.22		**Yes**		**Yes**			
carbon tetrachloride	0.39	0.36	0.43	0.41	0.40	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
chlorobenzene	<0.19	<0.20	<0.17	<0.18	<0.20		**Yes**					
chloroethane	<0.34	<0.36	<0.30	<0.34	<0.36		**Yes**					
chloroform	0.46	0.30	0.77	0.82	0.56	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[d]**
chloromethane	1.2	1.2	1.1	1.2	1.2	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
cis-1,2-dichloroethene	<0.18	<0.19	<0.16	<0.18	<0.20		**Yes**					
cis-1,3-dichloropropene	<0.16	<0.16	<0.14	<0.15	<0.17							
cyclohexane	1.5	0.24	1.4	1.4	0.14	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
dibromochloromethane	<0.23	<0.24	<0.20	<0.23	<0.24		**Yes**					

APPENDIX G-2
BUILDING 4807 VAPOR INTRUSION PATHWAY DETERMINATION - FEBRUARY 2016
(Page 2 of 2)

Analyte	N3-4807IA1	N3-4807IA2	N3-4807IA3	N3-4807IA3[a]	N3-4807IA4	Analyte in indoor air	Analyte in groundwater	Analyte in outdoor air	Analyte in sub-slab vapor	Indoor air higher than or similar to outdoor air	Sub-slab vapor 10 times higher than indoor air	Analyte vapor intrusion pathway related
dichlorodifluoromethane	4.5	2.9	2.2	2.4	2.4	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
ethanol	66	11	25	19	5.6	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
ethyl acetate	38	<3.1	2.8	<2.9	<3.2	**Yes**		**Yes**		**Yes**		**No[b]**
ethylbenzene	2.2	0.23	1.8	1.8	0.35	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
ethylene dibromide (EDB)	<0.21	<0.22	<0.19	<0.21	<0.23		**Yes**					
hexachlorobutadiene	<0.43	<0.46	<0.39	<0.43	<0.47		**Yes**					
isopropanol	8.0	0.93	1.7	0.98	0.56	**Yes**		**Yes**		**Yes**		**No[b]**
isopropylbenzene	0.21	<0.13	<0.11	<0.12	<0.14	**Yes**	**Yes**	**Yes**		**Yes**		**Likely No[d]**
m- & p-xylene	6.0	1.0	6.4	6.6	0.87	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
methyl tert-butyl ether (MTBE)	<0.077	<0.081	0.16	0.14	<0.084	**Yes**						**No[b]**
methylene chloride	2.7	<0.30	<0.42	<0.44	<0.35	**Yes**	**Yes**			**Yes**		**Likely No[d]**
naphthalene	0.095	<0.099	0.21	0.16	<0.10	**Yes**	**Yes**		**Yes**	**Yes**		**Likely No[e]**
n-butylbenzene	<4.4	<4.7	<4.0	<4.4	<4.8		**Yes**					
n-heptane	2.0	0.76	2.8	2.1	0.54	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
n-hexane	2.3	0.66	3.6	3.8	0.35	**Yes**		**Yes**		**Yes**		**No[b]**
o-xylene	3.0	0.31	2.4	2.2	0.47	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
p-isopropyltoluene	<4.4	<4.7	<4.0	<4.4	<4.8		**Yes**					
propene	<0.37	<0.39	<0.33	<0.37	<0.40							
sec-butylbenzene	<4.4	<4.7	<4.0	<4.4	<4.8		**Yes**					
styrene	0.99	0.088	0.15	0.24	0.15	**Yes**		**Yes**		**Yes**		**No[b]**
tetrachloroethene (PCE)	2.1	<0.32	<0.27	<0.30	<0.32	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
tetrahydrofuran	0.58	<0.43	<0.37	<0.41	<0.44	**Yes**				**Yes**		**No[b]**
toluene	32	12	37	40	20	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		**Likely No[e]**
trans-1,2-dichloroethene	<0.19	<0.20	<0.17	<0.19	<0.21		**Yes**					
trans-1,3-dichloropropene	<0.16	<0.16	<0.14	<0.16	<0.17							
trichloroethene (TCE)	<0.26	<0.27	<0.23	<0.26	<0.28		**Yes**		**Yes**			
trichlorofluoromethane	2.4	3.0	3.1	3.0	2.1	**Yes**		**Yes**	**Yes**	**Yes**		**Likely No[c]**
vinyl chloride	<0.092	<0.097	<0.082	<0.091	<0.099		**Yes**					

Notes:

[a]Duplicate sample.

[b]Not vapor intrusion pathway related. The analyte was (1) detected only in indoor air (not in groundwater or outdoor air or sub-slab-vapor) or (2) detected in indoor air and outdoor air, but not in groundwater or sub-slab vapor.

[c]Not likely vapor intrusion pathway related. The analyte was detected in indoor air and sub-slab vapor but not in groundwater. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[d]Not likely vapor intrusion pathway related. The analyte was detected in indoor air and groundwater but not sub-slab vapor. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations.

[e]Not likely vapor intrusion pathway related. The analyte was detected in indoor air, groundwater, and sub-slab vapor. However, the sub-slab vapor concentrations were not at least 10 times higher than those detected in the indoor air.

[f]Vapor intrusion pathway related. The analyte was detected in indoor air, groundwater, and sub-slab vapor. Additionally, the indoor air concentrations were higher than, or lower but within the same order of magnitude as, the outdoor air concentrations and the sub-slab vapor concentrations were 10 times higher than those detected in the indoor air.

APPENDIX D

REGULATORY COMMENTS TO THE ADDENDUM TO THE FIRST FIVE-YEAR REVIEW REPORT APPLICABLE TO THE SECOND FIVE-YEAR REVIEW REPORT

APPENDIX D

Regulatory Comments to the Addendum to the First Five-Year Review Report Applicable to the Second Five-Year Review Report

Reviewer	Comment #	Comment on the Addendum to the First Five-Year Review Report	Response and Comment Incorporation in the First Five-Year Review Report	Relevancy to the Second Five-Year Review Report
Kimberly C. Gettmann, Ph.D (HERO, DTSC)	General Comment 1	Risk Management Range (1×10^{-6} to 1×10^{-4}). HERO disagrees with the use of the language "generally acceptable" when referring to the risk range of 1×10^{-6} to 1×10^{-4} and recommends removing the language from the Report. Please note that the risk range is not intended to imply that any risk within this range is acceptable. The actual level of acceptable risk is a site-specific risk management decision, with 1×10^{-6} as the point of departure for making such decisions. Clear justification must be provided for risk management decisions which result in residual risk levels greater than 1×10^{-6}. HERO defers to the project manager for risk management decisions.	The Human Health Risk Assessment Addendum (Appendix C) was prepared in support of a Five-Year Review and in the context of a Five-Year Review, guidance (USEPA 2001), indicates that the new estimated risk should be evaluated to determine if it is acceptable. The guidance defines acceptable risk as "within or below the generally acceptable risk range of 10^{-4} to 10^{-6} for carcinogenic risk and the hazard index is below 1 for non-carcinogenic effects." Reference cited: United States Environmental Protection Agency. 2001. *Comprehensive Five-Year Review Guidance*. Office of Emergency and Remedial Response. EPA540-R-01-007. June. To resolve this comment, a risk management discussion among the RPMs is recommended. Clarification language such as "The target risk range (also known as the risk management range) is between 10^{-4} to 10^{-6}. Depending on site-specific factors, cleanup is considered when risks are greater than 10^{-6} but is generally required when risks are greater than 10^{-4}" would be added to appropriate sections of the document followed by a summary of the risk management discussion. This approach is consistent with that taken in the 2006 Operable Unit 6 ROD (Section 2.7.1) which states "…from 10^{-4} to 10^{-6} is considered generally acceptable when site-specific circumstances allow…". The 2006 ROD also provided site-specific justification for no action for soil even though risk levels were within the risk management range (e.g., PAHs in soil due to low frequency of detection and nearby asphalt).	The term "generally acceptable" is used in Section 5.2.2 to describe the results of the 2003 Baseline Human Health Risk Assessment. Text related to applying the risk management range to the 2013 and 2016 assessments is limited to the following: "Using both approaches, the results indicated that all of the cancer risks from VIP-related chemicals for the industrial scenario were less than 1×10^{-4} (the highest cancer risk was 4×10^{-6}), and the non-cancer Hazard Quotients were less than 1 (Table 7). The USEPA has provided FYR guidance for interpreting these risk results within the CERCLA framework (USEPA 2001): *Generally, your human health determination should be based on whether the cancer risk could now be greater than 10^{-4} and/or the hazard index could be greater than 1 for non-carcinogenic effects. "*
Kimberly C. Gettmann, Ph.D (HERO, DTSC)	General Comment 2	Section 2.1.2.1 (page 2-8). Cleanup levels to protect receptors (industrial workers) from potential vapor intrusion into occupied buildings were not established in the ROD because the estimated cancer risks were less than 1×10^{-4}. The re-evaluation of the vapor intrusion risks indicate that the cancer risks range from 7×10^{-7} to 5×10^{-6} using the Air Force preferred toxicity criteria and 9×10^{-7} to 2×10^{-5} using DTSC preferred toxicity criteria. HERO acknowledges that the estimated industrial vapor intrusion cancer risks are within the risk management range, however, the decision to derive cleanup values should not be based on risks being less than 1×10^{-4},	The Human Health Risk Assessment Addendum (Appendix C) was prepared in support of a Five-Year Review and in the context of a Five-Year Review, guidance (USEPA 2001), indicates that the new estimated risk should be compared to the baseline risk and that "If the estimated risk has increased, then you should determine whether the new estimated risk is acceptable. In most cases, you should base this determination on whether the risk is within or below the generally acceptable risk range of 10^{-4} to 10^{-6} for carcinogenic risk and the hazard index is below 1 for non-carcinogenic effects. If the estimated risk is not protective, you should determine what actions need to be taken to achieve an acceptable level of risk."	Text related to applying the risk management range to the 2013 and 2016 assessments is limited to the following: "Using both approaches, the results indicated that all of the cancer risks from VIP-related chemicals for the industrial scenario were less than 1×10^{-4} (the highest cancer risk was 4×10^{-6}), and the non-cancer Hazard Quotients were less than 1 (Table 7). The USEPA has provided FYR guidance for interpreting these risk results within the CERCLA framework (USEPA 2001): *Generally, your human health determination should be based on whether the cancer risk could now be greater than 10^{-4} and/or the hazard index could be greater than 1 for non-carcinogenic effects. "*

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		the upper risk management range, but based on whether the risks are greater than the point of departure and site specific conditions. The Report is lacking this justification and having risks less than 1×10^{-4} is not adequate justification for not deriving cleanup values.	The paragraph preceding the text cited in the comment clearly refers to the EPA Five-Year Review guidance: "The USEPA has provided Five-Year Review guidance for interpreting these risk results within the CERCLA framework (USEPA 2001): Generally, your human health determination should be based on whether the cancer risk could now be greater than 10^{-4} and/or the hazard index could be greater than 1 for non-carcinogenic effects. " Reference cited: United States Environmental Protection Agency. 2001. *Comprehensive Five-Year Review Guidance*. Office of Emergency and Remedial Response. EPA540-R-01-007. June. See also response to HERO's General Comment 1 regarding recommendation to conduct an RPM risk management discussion.	
Kimberly C. Gettmann, Ph.D (HERO, DTSC)	General Comment 3	<u>Groundwater Monitoring of Well N3-MW20 and Building 4806/4807</u>. The Final Vapor Intrusion Investigation Report for OU6 recommended "groundwater sampling of well N3-MW20 [for benzene] as part of the ongoing remedial action until Buildings 4806 and 4807 are removed." The concentration of benzene in groundwater would be used as an indicator for when indoor air sampling is necessary. While HERO does not concur with the groundwater trigger level for benzene, as discussed in our response to Air Force Comments regarding HERO's June 23, 2014 memorandum for the Draft Vapor Intrusion Investigation Report, the Addendum Report lacks any discussion on this recommendation.	The referenced comment to the Final Vapor Intrusion Investigation Report has been overcome by events. A delay in the demolition of Buildings 4806 and 4807 and the need to confirm seasonal variances to ensure that the indoor air risk is still in the protective range for the site workers under the industrial land use scenario warranted an additional Winter sampling event. The additional VIP investigation was conducted in February 2016 and will be documented in the Second FYRR. The following paragraph has been added as the last paragraph of Section 3.2.3 Additional Remedial Action Implementation: "A delay in the demolition of two OU 6 buildings and the need to confirm seasonal variances to ensure that the indoor air risk is still in the protective range for the site workers under the industrial land use scenario warranted an additional Winter sampling event. The additional VIP investigation was conducted in February 2016 and will be documented in the Second FYRR."	The recommendation that a concentration of benzene in groundwater would be used as an indicator for when indoor air sampling is necessary at Buildings 4806 and 4807 was removed from the Final Vapor Intrusion Investigation Report and the FYRR Addendum. Instead, an additional Winter sampling event was recommended. The results of the additional investigation conducted in February 2016 are reported in the Vapor Intrusion Investigation Report Addendum (Appendix C of the Second FYRR).
Kimberly C. Gettmann, Ph.D (HERO, DTSC)	General Comment 4	<u>HERO has the following comments on Appendix C.</u> a. Section 2.0 (page 2-3). The text states that "The DTSC has developed toxicity values through OEHHA [Office of Environmental Health Hazard Assessment]." Please note that DTSC does not develop toxicity criteria through	a. The referenced text has been revised to read: "The DTSC uses the toxicity values developed by OEHHA." b. The following text has been added as the first paragraph of the referenced section: "This section discusses major uncertainties as they relate to risk assessment. Although the groundwater plume is not fully delineated	a and b – not applicable c. see description of applicability for HERO's General Comments 1 and 2. d. see description of applicability for HERO's General Comment 3.

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		OEHHA. Both DTSC and OEHHA are separate agencies under the Cal EPA. Under the umbrella of Cal EPA, OEHHA is responsible for establishing toxicity criteria for the State's regulatory programs. DTSC uses the toxicity criteria established by OEHHA. Please revise the text for accuracy. b. Section 2.2 – Uncertainty Analysis. Please include a discussion on any uncertainty associated the lack of plume stability at the leading edge. c. Section 3.1 – Vapor Intrusion Investigation- 2013 (page 3-3). i. The text on page 3-3, lines 6 through 20, discuss the potential VIP-related cancer risk for the buildings sampled during March and August 2013, and whether the risk is less than 1×10^{-4}, the upper end of the risk management range. The discussion should be focused on whether the estimated cancer risk from Buildings 4806, 4807, and 4810 are greater than the point of departure (1×10^{-6}) and not focused on the upper end of the risk management range. The actual level of acceptable risk is a site-specific risk management decision, with 1×10^{-6} as the point of departure for making such decisions. Clear justification must be provided for risk management decisions which result in residual risk levels greater than 1×10^{-6}. See HERO's Comments 1 and 2 above. Please revise the text. ii. The text on page 3-3, lines 27-29, states ".VIP results for the current industrial and hypothetical future residential exposure scenarios are within the acceptable ranges cited in USEPA's Five-Year Review guidance, no further actions beyond the selected remedy need to be taken to achieve an acceptable risk level…" HERO disagrees with the interpretation that risks within the	at the leading edge and it is not yet known if the plume is migrating, the undelineated portion is not expected to yield higher concentrations or new COCs than those already captured in the Sites N1 and N4 risk assessments (Site N1 and N4 are along the leading edge of the plume)." c. Section 3.1 – Vapor Intrusion Investigation- 2013 (page 3-3). c.i. Please see responses to HERO's General Comments 1 and 2. c.ii. This risk assessment was performed in support of and in the context of a Five-Year Review. Therefore, application of USEPA's Five-Year Review guidance is appropriate. The guidance states: "Generally, your human health determination should be based on whether the cancer risk could now be greater than 10^{-4} and/or the hazard index could be greater than 1 for non-carcinogenic effects." See also response to HERO's General Comment 1 regarding recommendation to conduct an RPM risk management discussion. d. The recommendation is included in Appendix C as it is included in an attachment to the appendix (Attachment B). Additionally in response to HERO's General Comment 3, the recommendation has been added to Section 3.2.3 Additional Remedial Action Implementation Recommendations of the main document text. e. The Air Force has responded to HERO's responses to the Air Forces' responses to HERO's comments on the Draft Vapor Intrusion Investigation Report under separate cover.	e. RTCs on the Vapor Intrusion Investigation Report were applied where applicable to the Vapor Intrusion Investigation Report Addendum (Appendix C of the Second FYRR).

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		risk management range are acceptable and no action is needed. The actual level of acceptable risk is a site-specific risk management decision, with 1×10^{-6} as the point of departure for making such decisions. Clear justification must be provided for risk management decisions which result in residual risk levels greater than 1×10^{-6} HERO reiterates our Comments 1, 2, and 4.c.i. d. The Final Vapor Intrusion Investigation Report for OU6 recommended "groundwater sampling .of well N3-MW20 [for benzene] as part of the ongoing remedial action until Building 4806 and 4807 are removed." The concentration of benzene in groundwater would be used as an indicator for when indoor air sampling is necessary. While HERO does not concur with the groundwater trigger level for benzene, as discussed in our response to Air Force Comments regarding HERO's June 23, 2014 memorandum for the Draft Vapor Intrusion Investigation Report, there is no discussion of this recommendation in Appendix C. Please include a discussion of the proposed monitoring for vapor intrusion at Buildings 4806 and 4807. e. Appendix C – Attachment B – Draft Final Vapor Intrusion Investigation Report. HERO reviewed the Draft Final Vapor Intrusion Investigation Report along with the Air Force's responses to HERO's June 23, 2014 memorandum. HERO has several new comments on the revised and new text added to the Draft Final VI Report, along with our responses to the Air Force's responses. These comments and responses are being submitted under separate cover. HERO's concerns with the VI report need to be addressed and incorporated as appropriate into the text of Appendix C.		
Kimberly C. Gettmann, Ph.D (HERO, DTSC)	Specific Comment 1	<u>Appendix C List of Abbreviations and Acronyms.</u> a. The acronym for HERO should be reported as Human and Ecological Risk Office. b. The acronym listed for COC is chemical of concern and for COPC is contaminant of potential concern. For consistency please use either chemical or	a. The acronym for HERO has been corrected as Human and Ecological Risk Office throughout the document. b. The acronym for COPC has been revised as chemical of potential concern throughout the document.	Not applicable.

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		contaminant for both COC and COPC.		
Bruce Lewis (DTSC)	General Comment 1	DTSC appreciates the effort put forth by the Air Force in evaluating the vapor intrusion pathway and the potential risks to workers in Buildings 4806, 4807, and 4810. However, DTSC is disappointed that work completed over the past three years since the First Five-Year Review in 2011 has not been insufficient to address the data gaps identified by the regulatory agencies that would facilitate a protectiveness determination for OU6. The data gaps identified by the regulatory agencies in 2011 on the First Five Year Review that were not achieved include the lateral and vertical characterization of trichloroethene (TCE), benzene, and carbon tetrachloride in groundwater needed to evaluate plume stability and a determine that the In-Situ Chemical Oxidation (ISCO) injections performed as part of the remedy is functioning as intended. Additionally, DTSC is concerned that proposed investigation work does not appear to be proceeding at a pace to provide sufficient data to close the identified data gaps in time for the Second Five-Year Review Report scheduled for 2016.	The primary focus of the Addendum to the First Five-Year Review Report is Risk Assessment (specifically VIP), however the Addendum includes a discussion of plume delineation based on the most recent data available as specified in Section 2.0 of the First Five-Year Review Addendum: "Though the Plume Characterization Key Action Items are dynamic and the status update will be included the Second FYRR in September 2016, this Addendum includes a discussion of the plume delineation based on the most recent data available (up through 2012) (Section 2.1.1.3)." This approach was documented as follows in the Remedial Action Work Plan Addendum: "due to budgetary constraints and based on the agreements at the 5 December 2011 RPM meeting that the assessment of the VIP is a higher priority than the Plume Characterization key action item" and "The Plume Characterization key action will be fully addressed in the Second FYRR and therefore, with concurrence of the RPMs, the actions necessary to address plume characterization will not be completed within the two years specified in the non-concurrence letter." Wells installed as part of the Site 25 lakebed investigation effort have provided additional lateral and vertical characterization data at the leading edge of the plume. Ten monitoring wells are scheduled for installation in Spring 2015 to further delineate the lateral extent of the TCE, benzene, and carbon tetrachloride plumes. In regards to whether or not the ISCO injections are functioning as intended, please note that although areas of increasing concentrations and possible plume instability were not necessarily anticipated, they are not unusual occurrences when plume delineation is ongoing. Contaminant mass estimates will be updated as new wells are installed, data are compiled, and plume extent estimates are updated. Treatment areas will be selected on the latest available data to ensure efficient RA progress. Areas of possible plume instability and expansion were identified at the downgradient edge of the commingled plume after initial RA design and implementation. Therefore, possible plume expansion and instability is an indication of incomplete contamination delineation as opposed to failure or shortcoming of the ISCO component. The Site 25 lakebed investigation results were unexpected and have significantly impacted the schedule proposed in the Remedial Action Work Plan Addendum. The Site 25 data indicates that the OU 6 plume may extend over 500	The Second FYRR includes figures with plume extents and results based on the 10 monitoring wells installed in Spring 2015 to further delineate the plume. The text states that "TCE has been detected in groundwater samples collected from the eastern-most (downgradient) OU 6 wells N1-MW13 and N4-MW20, indicating that the plume extends beyond the monitored area and a data gap exists (AECOM 2016c). Because exposure pathways that could result in unacceptable risks in the short-term are being controlled through institutional controls, current protectiveness has not been affected. However, additional groundwater sampling points are planned to further delineate the leading edge of the plume." Regarding ISCO implementation during the reporting period, the text includes: "Continued ISCO in the areas with the highest VOC concentrations is recommended. Based on the persistence of permanganate observed in the wells used for injection and the TCE concentration rebound timeframes (both timeframes ranged from less than 14 months to greater than 60 months), ISCO should be employed at three-year intervals. An injection event is planned for 2017."

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			feet further downgradient than the 2012 groundwater sampling results indicated. Well installations specified in the Final Groundwater Investigation Work Plan were delayed and locations reassessed based on the Site 25 lakebed investigation data. Though the Air Force and NASA are planning on installing 8 wells on the lakebed (2 additional wells will be installed in the upgradient plume areas near Site N3) in Spring 2015, given the large areal extent to be investigated, additional wells may be necessary to delineate the downgradient edge of the plume and to determine the connectivity between the plume in the Sites N1, N4, and N7 areas and the elevated concentration areas identified by the Site 25 well installations.	
Bruce Lewis (DTSC)	General Comment 2	In the *Draft Final Vapor Intrusion Report for OU6* (Appendix C, Attachment B), the Air Force recommended "groundwater sampling of well N3-MW20 [for benzene) as part of the ongoing remedial action…until Buildings 4806 and 4807 are removed." As stated in comments on the *Draft Final Vapor Intrusion Report*, DTSC does not concur with the concentration of benzene being proposed as the trigger level for additional indoor air sampling at Buildings 4806 and 4807 or that such sampling is an appropriate indicator for determining the need for additional sampling Nevertheless, there is no discussion of this recommendation in this document. Please include a discussion of the proposed monitoring for vapor intrusion in this report.	The referenced comment to the Final Vapor Intrusion Investigation Report has been overcome by events. A delay in the demolition of Buildings 4806 and 4807 and the need to confirm seasonal variances to ensure that the indoor air risk is still in the protective range for the site workers under the industrial land use scenario warranted an additional Winter sampling event. The additional VIP investigation was conducted in February 2016 and will be documented in the Second FYRR. The following paragraph has been added as the last paragraph of Section 3.2.3 Additional Remedial Action Implementation Recommendations: "A delay in the demolition of two OU 6 buildings and the need to confirm seasonal variances to ensure that the indoor air risk is still in the protective range for the site workers under the industrial land use scenario warranted an additional Winter sampling event. The additional VIP investigation was conducted in February 2016 and will be documented in the Second FYRR."	See description of applicability for HERO's General Comment 3.
Bruce Lewis (DTSC)	Specific Comment 1	Figure 2. Not all the proposed wells are shown on the figure and the location of the wells does not reflect changes agreed upon by the Air Force and regulatory agencies during a teleconference on November 25, 2014. Please revise the figure to show the location of all proposed wells at the agreed upon locations. Additionally, revise the TCE iso-concentration contours using data from all wells in the OU6 area, including those installed as part of the groundwater investigation of Site 25 (OU8).	All applicable report figures (including Figure 2) have been revised to show the revised well locations agreed to by the Air Force, NASA, and regulatory agencies during the 25 November 2014 teleconference. Additionally, on applicable figures, the TCE and carbon tetrachloride figures have been extended around monitoring well N4-MW14. The contours have not been extended to include the Site 25 lakebed wells as sampling points are not currently available to determine the relationship between the downgradient Sites N1, N4, and N7 wells and the Site 25 lakebed wells. Proposed monitoring wells N4-MW15 and N4-MW16 will further the understanding of the connection between the concentrations	The Second FYRR includes figures depicting the locations of the 10 new monitoring wells. Isoconcentration contours included on figures are based on sampling results from the 10 new monitoring wells as well as the Site 25 wells installed on the lakebed.

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			detected at downgradient Sites N1, N4, and N7 monitoring wells and VOC concentrations detected at Site 25 lakebed wells. Although TCE concentrations were detected at the same order of magnitude at downgradient Sites N1, N4, and N7 wells as Site 25 lakebed wells, carbon tetrachloride (present in Site N4 wells) was not detected in any of the Site 25 lakebed wells which lends some uncertainty to the relationship of the OU 6 plume in the area of Site N4 to the Site 25 lakebed wells.	
Bruce Lewis (DTSC)	Specific Comment 2	Section 2.1.1.3, Page 2-4, Line 18. Show the location of proposed well N3-MW29 on associated Figure 3.	Figure 3 has been revised to show proposed monitoring well N3-MW29.	Well N3-MW29 is shown on applicable figures.
Bruce Lewis (DTSC)	Specific Comment 3	Section 2.1.2.1, Page 2-7, Line 19. Discussion of risk should be focused on whether the estimated cancer risks are greater than the point of departure (1×10^{-6}) and not the upper end of the risk management range (1×10^{-4}). This comment also applies to Line 23 where it states "…all cancer risks were still below 1×10^{-4}. The Air Force should note that in their letter *"EPA Non-Concurrence on the Edwards AFB Draft Final First Five-Year Review Report, NASA Dryden Flight Research Center, Operable Unit 6, Edwards Air Force Base, California"* dated September 30, 2011, the USEPA stated the following under Major Issue Item 1, Vapor Intrusion Pathway (VIP) Risk: *"In addition, when performing the VIP risk assessment, the Air Force must use 10^{-6} as the point of departure for evaluating risk in terms of the area of risk for both the industrial scenario and for a future residential scenario, as the trigger for developing action levels within the risk management range."* The USEPA's statement also supports Dr. Kimberly Gettmann's General Comment 2 in the attached letter which states "…the decision to derive cleanup values should not be based on risks being less than 1×10^{-4}, the upper risk management range, but based on whether the risks are greater than the point of departure and site specific conditions.	Please see responses to HERO's General Comments 1, 2, and 4.c.ii.	See description of applicability for HERO's General Comments 1 and 2.
Lahontan Regional Water Quality Control Board	General Comment 1	In September 2011, EPA issued a Non-Concurrence letter on the Draft Final FYR, stating that a protectiveness determination could not be made until further information was obtained. The Remedial Action Work Plan Addendum [RAWPA (April 2013)] was prepared to provide a documented path forward for the remedial action through the next FYR. Additional	The comment indicates that additional tasks are needed to delineate the vertical extent of the plume. This no longer appears to be the case based on vertical delineation data obtained from the Site 25 investigation. For clarity, the third paragraph of Section 2.1.1.3 has been modified to read: "Since the review period, 18 groundwater monitoring wells	The Second FYRR summarizes the results of the 2011, 2012, and 2015 groundwater monitoring events and references the applicable Remedy Performance and Groundwater Monitoring Reports. Results from the 10 groundwater monitoring wells installed in Spring 2015 to further delineate the plume are included and discussed with the conclusion that a data gap still exists at the leading edge.

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		plume characterization was identified as an investigation priority. The additional plume investigations were to consist of delineation of VOC plumes at the leading edge of the TCE plumes, vertical and lateral extent delineation; and annual remedy performance and groundwater monitoring. The OU 6 Groundwater Investigation Work Plan Uniform Federal Policy- Quality Assurance Project Plan (Work Plan) was finalized in January 2014. The Work Plan proposed installing, developing, and sampling ten groundwater monitoring wells to evaluate contaminant lateral and vertical extent of the contaminant plumes. April through September 2013, eighteen monitoring wells were installed on the lakebed east and southeast of OU 6 associated with a separate work plan for Site 25. Results from the Site 25 groundwater investigations identified contaminants at a further lateral downgradient extent. The extent of the plume remains undefined both laterally and vertically. The Work Plan is being revised to focus on delineating the lateral extent of the plume. Additional tasks are needed to delineate the vertical extent of the plume. Please provide a schedule for installing additional wells to meet the initial objectives of the Work Plan. Review of information from the site shows groundwater monitoring has not been conducted as required by the ROD and described in RAWPA. Water Board staff are concerned that the information needed to make a protectiveness determination will not be available for the Second FYR, scheduled for completion in September 2016. To address our concerns we ask that the Air Force implement the actions identified in the RAWPA.	(RL-25-MW01 to RL-25-MW18) associated with Site 25 (OU 8) were installed in April through September 2013 on the lakebed east and southeast of OU 6 and groundwater samples were collected from those wells and well N4-MW14. Figure 2 presents the locations of these wells and an updated plume configuration estimate based on data collected since those data shown on Figure 6-4 of the *First FYRR*. The laboratory analytical results for those groundwater samples indicated the presence of TCE at 12 of the 18 wells and at well N4-MW14. The horizontal extent of the plume remains unclear to the east, southeast, and south of Site N4 and additional wells will be installed in Spring 2015 to close these data gaps. The rationale for the additional well locations is provided in the Revised Final *Groundwater Investigation Work Plan* (AECOM 2015). Site 25 lakebed results (Figure 2) agree with the results of previous investigations regarding vertical contaminant gradient and extent. Site 25 lakebed results indicate that the highest TCE concentrations occur at the water table. This finding is consistent with previous investigations conducted in upgradient areas. As further discussed and illustrated in the Revised Final *Groundwater Investigation Work Plan* (AECOM 2015), packer testing performed at Site N1 indicated a vertical concentration gradient with the highest TCE concentrations present at the water table. Plume characterization extent findings will be updated during the second five-year review period and in future five-year review periods." A detailed schedule for installing the additional wells will be included in the Revised Final *Groundwater Investigation Work Plan* (AECOM 2015) which is planned for release in March 2015. Additionally, Table 2 has been revised to identify a date of "4/2015" for installation of the 10 monitoring wells. Groundwater sampling data from the 2011 (not available for the First FYR), 2012, 2014 (Site 25 investigation), 2015, and 2016 monitoring events are anticipated to be available for the Second FYR. The schedule forecasted in the Remedial Action Work Plan Addendum was developed prior to the Site 25 lakebed investigation. The results of which were unexpected and have significantly impacted the schedule proposed in the Remedial Action Work Plan Addendum. The Site 25 data indicates that the OU 6 plume may extend over 500 feet further downgradient than the 2012 groundwater sampling results indicated. Well	The text includes the following recommendation: "To further address the apparent gaps in groundwater plume data, a series of direct-push boreholes will be advanced, grab groundwater samples will be collected, and additional wells will be installed on Rogers Dry Lake (Figure 10)."

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			installations specified in the Final Groundwater Investigation Work Plan were delayed and locations reassessed based on the Site 25 lakebed investigation data. Though the Air Force and NASA are planning on installing 8 wells on the lakebed (2 additional wells will be installed in the upgradient plume areas near Site N3) in Spring 2015, given the large areal extent to be investigated, additional wells may be necessary to delineate the downgradient edge of the plume and to determine the connectivity between the plume in the Sites N1, N4, and N7 areas and the elevated concentration areas identified by the Site 25 well installations. NASA has allocated funding to additional well installations *in lieu* of performing an injection event in 2015. To further understand whether or not the plume is migrating, several years of groundwater data from the new wells is needed and that evaluation would be complicated by manipulation of the plume through ISCO treatment. Additionally, recommendations to assess and evaluate different oxidants and plume mobilization potential from injection prior to the next injection event is proposed in the Addendum to the First-Five Year Review Report.	
Lahontan Regional Water Quality Control Board	Specific Comment 2 (no Specific Comment 1 indicated)	P. 2-3, Section 2.1.1.1, Plume Boundaries and In Situ Chemical Oxidation Implementation- The First FYR provided supportive analytical data that the In Situ Chemical Oxidation (ISCO) remedy in the source areas appeared to be working successfully where applied. Further, the FYR Addendum states that the possible plume expansion and instability is an indication of incomplete contamination delineation as opposed to failure or shortcoming of the ISCO component of the remedy. While work is being completed to define the extent of the plume Water Board staff request that the ISCO injection event for Calendar Year 2015 be implemented as scheduled.	Please see response to Lahontan Regional Water Quality Control General Comment 1.	The text includes the following description regarding ISCO implementation: "No injection activities were performed during the reporting period. ISCO activities were discontinued in the Site N4 area (downgradient plume area) in order to minimize the introduction of additional variables that may alter site characteristics and complicate or impede plume delineation and fate and transport modeling efforts. Groundwater sampling data collected prior to 2015 indicated the continued presence of permanganate in the Site N3 and N7 treatment areas; therefore, additional injection events were unnecessary. Due to the absence of permanganate in a majority of the injection wells during the 2015 (fifth) performance monitoring event (PME) (based on field observations) and the rebounding VOC concentrations (based on laboratory analytical results), ISCO activities are scheduled to resume in 2017 at Sites N3 and N7. RPGMRs will present any ISCO activities performed during the reporting period for which they are submitted and will assess occurrences of dichloroethene or vinyl chloride as potential intermediate degradation compounds."
Lahontan Regional Water	Specific Comment 3	P. 2-3, Section 2.1.1.3, Groundwater Monitoring Data Review - A key action item identified for Plume Characterization in the RAWPA is annual groundwater	As indicated on Table 2, the 2015 Groundwater Monitoring Event is scheduled for June/July 2015. Please also see response to Lahontan Regional Water Quality Control	The Second FYRR summarizes the results of the 2011, 2012, and 2015 groundwater monitoring events and references the applicable Remedy Performance and

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Quality Control Board		monitoring to assess plume movement and stability. Deviations from the RAWPA have resulted in two missed annual groundwater monitoring events (2013 and 2014). The groundwater monitoring component of the Remedial Action was established to evaluate the performance of the ISCO remedy and monitor the changes in plume characteristics. For ongoing compliance with the ROD, it is important to continue annual groundwater monitoring. Water Board staff request that the 2015 Annual Groundwater Monitoring be performed.	General Comment 1.	Groundwater Monitoring Reports.
Lahontan Regional Water Quality Control Board	Specific Comment 4	P. 2-3, Section 2.1.1.3, Groundwater Monitoring Data Review - The section discusses the latest groundwater data for Chemical of Concern (COC) TCE, Benzene, and CT in regard to the lateral distribution of contaminants. The Addendum does not discuss the vertical distribution of COCs, however, Figure 2, depicts proposed deep wells and the Site 25 multiple depth wells. Please revise the Addendum to also discuss the lateral distribution of Potential Chemical of Concern (PCOC). Also revise the Addendum to discuss the vertical distribution of COCs and PCOCs and associated potential data gaps.	Please see response to Lahontan Regional Water Quality Control General Comment 1.	See description of applicability for Lahontan Regional Water Quality Control General Comment 1.
Lahontan Regional Water Quality Control Board	Specific Comment 5	P. 2-3, Section 2.1.1.3, Groundwater Monitoring Data Review - The section states that Figure 2 shows groundwater TCE plume extents based on data collected since the First FYR, including preliminary data. However, Figure 2 does not incorporate the Site 25 monitoring well data in the estimated plume extent. Please revise Figure 2 to incorporate the Site 25 groundwater data in the estimated plume extent (e.g. revised contaminant concentration contours).	All applicable report figures (including Figure 2) have been revised to show the revised well locations agreed to by the Air Force, NASA, and regulatory agencies during the 25 November 2014 teleconference. Additionally, on applicable figures, the TCE and carbon tetrachloride figures have been extended around monitoring well N4-MW14. The contours have not been extended to include the Site 25 lakebed wells as sampling points are not currently available to determine the relationship between the downgradient Sites N1, N4, and N7 wells and the Site 25 lakebed wells. Proposed monitoring wells N4-MW15 and N4-MW16 will further the understanding of the connection between the concentrations detected at downgradient Sites N1, N4, and N7 monitoring wells and VOC concentrations detected at Site 25 lakebed wells. Although TCE concentrations were detected at the same order of magnitude at downgradient Sites N1, N4, and N7 wells as Site 25 lakebed wells, carbon tetrachloride (present at Site N4) was not detected in any of the Site 25 lakebed wells which lends some uncertainty to the relationship of the OU 6 plume in the area of Site N4 to the Site 25 lakebed wells.	The Second FYRR includes figures depicting the locations of the 10 new monitoring wells. Isoconcentration contours included on figures are based on sampling results from the 10 new monitoring wells as well as the Site 25 wells installed on the lakebed.
Lahontan Regional Water	Specific Comment 6	P. 3-1, Section 3.1.1, Leading Edge Data Gap - The section states that "to address apparent data gaps in the groundwater plume data, additional well installations	All applicable report figures have been revised to show the revised well locations agreed to by the Air Force, NASA, and regulatory agencies during the 25 November 2014	The Second FYRR includes figures depicting the locations of the 10 new monitoring wells. Isoconcentration contours included on figures are based on sampling results from the

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Quality Control Board		are proposed in the area of Site N4 and on Rogers Dry Lake as presented in the Groundwater Investigation Work Plan (January 2014).” It is further stated that "data generated during the Site 25 investigation may warrant a revision of the proposed well locations." The agencies agreed verbally that the results of the Site 25 investigation warranted a revision of the proposed well locations. Please revise the Addendum globally to discuss the revision of the proposed well locations with rationale for each location.	teleconference. Change-out pages constituting the Revised Final Groundwater Investigation Work Plan and documenting the revised monitoring well locations is planned for release in March 2015 in anticipation of well installations in April 2015. Worksheet 17 of the Revised Final Groundwater Investigation Work Plan has been extensively revised to provide the objective and rationale for each of the 10 proposed monitoring well locations. The following sentence has been added to Section 2.1.1.3 of the Addendum to First Five-Year Review Report: “The rationale for the additional well locations is provided in the Revised Final *Groundwater Investigation Work Plan* (AECOM 2015).”	10 new monitoring wells as well as the Site 25 wells installed on the lakebed.
Lahontan Regional Water Quality Control Board	Specific Comment 7	P. 3-3, Section 3.2.3, Additional Remedial Action Implementation Recommendations- Further evaluation and recommendations for ISCO of Fenton's reagent or persulfate treatment at Site N4 is stated to be needed in the AFYR. It is also stated that the results of the evaluations and recommendations will be included in the Remedy Performance and Groundwater Monitoring Reports and the Second FYR. The needed evaluation and recommendations should be identified now to ensure sufficient implementation time is available for it to be addressed prior to the Second FYR. We request that the need for further ISCO evaluation and recommendations be identified as an Issue Warranting Follow-Up Actions. Please provide a timetable for the evaluation and include it in the data gaps schedule. Please revise the Addendum accordingly to reflect the changes.	Please see response to Lahontan Regional Water Quality Control General Comment 1 regarding the delay of the next ISCO injection event. As the next ISCO injection event will likely occur after the next five-year review and Tables 1 and 2 provide action items to be completed prior to the next five-year review, the current location of recommendations regarding ISCO implementation in Section 3.2.3 is appropriate.	See description of applicability for Lahontan Regional Water Quality Control Specific Comment 2. Additionally the Second FYRR includes the following recommendation: “Continued ISCO in the areas with the highest VOC concentrations is recommended. Based on the persistence of permanganate observed in the wells used for injection and the TCE concentration rebound timeframes (both timeframes ranged from less than 14 months to greater than 60 months), ISCO should be employed at three-year intervals. An injection event is planned for 2017.”
Lahontan Regional Water Quality Control Board	Specific Comment 8	Table 1, Recommendations and Follow-Up Actions - The Table does not reflect updated relative dates for the Specific Issues. Please revise the Anticipated Completion Date for the Specific Issues to reflect updated relative dates. Specify the anticipated completion dates for Groundwater Monitoring Events 2015 and 2016. Update the Initial Investigation completion date. Please revise the Addendum discussions accordingly for consistency.	Tables 1 and/or 2 have been updated with current forecasted dates for the 2015 and 2016 Groundwater Monitoring Events and the Initial Groundwater Investigation. The ISCO event originally planned for 2015 has been removed from Table 2 as the table provides dates for remedial action activities completed or planned up to the next five-year review and for reasons discussed in the response to Lahontan Regional Water Quality Control General Comment 1, the next ISCO event will not occur prior to the next five-year review in 2016.	The Second FYRR includes the following recommendation: “Continued ISCO in the areas with the highest VOC concentrations is recommended. Based on the persistence of permanganate observed in the wells used for injection and the TCE concentration rebound timeframes (both timeframes ranged from less than 14 months to greater than 60 months), ISCO should be employed at three-year intervals. An injection event is planned for 2017.”
Lahontan Regional Water Quality Control Board	Specific Comment 9	Table 2, Summary of Anticipated Remedial Action Activities in the Next Five Years - Please revise the table to include the Groundwater Monitoring events for 2013 and 2016. Additionally, please revise the table to provide rationale for actions that were not conducted.	Table 2 has been updated with current forecasted dates for the 2015 and 2016 Groundwater Monitoring Events. An explanation for actions that were not or will not be conducted is provided in the response to Lahontan Regional Water Quality Control General Comment 1. The responses to comments will be documented by inclusion as an appendix to the final document. The addition of rationale	The Second FYRR includes the following recommendation: “Annual groundwater monitoring for NDMA, metals (including total and hexavalent chromium), potential intermediate ISCO degradation compounds and VOCs is recommended.”

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			for actions not conducted to Table 2 would result in a complicated and unwieldy table resulting in the focus of the table (activities to be completed prior to the next five-year review) being lost.	
Lahontan Regional Water Quality Control Board	Specific Comment 10	Figure 1, Approximate Extent of TCE in Groundwater - Please revise the figure to depict the estimated extent of the TCE plume based on the 2014 Site 25 groundwater investigation data.	Please see response to Lahontan Regional Water Quality Control Board Specific Comment 5.	The Second FYRR includes figures depicting the locations of the 10 new monitoring wells. Isoconcentration contours included on figures are based on sampling results from the 10 new monitoring wells as well as the Site 25 wells installed on the lakebed.
USEPA	General Comment 1	The Addendum does not provide adequate information to support the data gap investigation proposed as Specific Issue 2 in Section 3.2.1, Issues Warranting Follow-up Actions. For example, Section 3.2.1 states, "Step-out monitoring wells should include locations south of existing monitoring wells N4 MW04, N4 MW05, N4 MW11, N4-MW12, N4 MW13, and N7 MW13. Other recommended monitoring well locations include east of N1-MW08, N1-MW10, N1 MW11, and N4 MW13;" however, only three locations with 6 proposed wells are shown on Figure 2, TCE Groundwater Concentration Contours May - June 2012 and Proposed Well Locations. As such, it is not clear if these locations are appropriate. Also, the rationale for these wells is not discussed in the Addendum. Further, as acknowledged in the text, these wells need to be relocated because of the elevated detections found in well N4-MW14 and the Site 25 lakebed well clusters. Please revise the Addendum to provide additional or revised proposed well locations, along with a rationale for each location. In addition, ensure that Figure 2 is consistent with the text of the Addendum.	All applicable report figures (including Figure 2) have been revised to show the revised well locations agreed to by the Air Force, NASA, and regulatory agencies during the 25 November 2014 teleconference. Change-out pages constituting the Revised Final Groundwater Investigation Work Plan and documenting the revised monitoring well locations is planned for release in March 2015 in anticipation of well installations in April 2015. Worksheet 17 of the Revised Final Groundwater Investigation Work Plan has been extensively revised to provide the objective and rationale for each of the 10 proposed monitoring well locations. The following sentence has been added to Section 2.1.1.3 of the Addendum to First Five-Year Review Report: "The rationale for the additional well locations is provided in the Revised Final *Groundwater Investigation Work Plan* (AECOM 2015)."	The Second FYRR includes figures depicting the locations of the 10 new monitoring wells. Isoconcentration contours included on figures are based on sampling results from the 10 new monitoring wells as well as the Site 25 wells installed on the lakebed.
USEPA	General Comment 2	The Addendum does not include adequate information to assess whether the data collected after previous In-situ Chemical Oxidation (ISCO) injections performed as part of the remedy indicate that the remedy is functioning as intended. For example, Section 2.1.1.1, Plume Boundaries and In Situ Chemical Oxidation Implementation, indicates plume expansion and instability is an indication of incomplete contamination delineation as opposed to failure or a shortcoming of the ISCO component of the remedy for plumes identified in the Record of Decision (ROD); however, information to support this assertion is not provided in the Addendum. Further, Figure 2, TCE Groundwater Concentration Contours May - June 2012 and Proposed Well Locations, shows uncertainty in the extent of the plume	The following text has been inserted as the third paragraph of Section 2.1.1.1: "Localized effects of pressurized injections in the form of groundwater mounding and surfacing have been observed up to 30 feet away from injection points during field implementation. Based on this observation the recommendation that ISCO injections be conducted only at wells greater than 100 feet from occupied buildings to avoid displacing/mobilizing the plumes under buildings and possibly completing the VIP has been made in Section 3.2.3. To evaluate if ISCO injections have affected plume stability at the downgradient edge, concentration trends in downgradient wells in relation to Site N7 injection events were evaluated. Site N7 injection events in relation to	Section 5.1.1.1 in the Second FYRR discusses whether the ISCO component is functioning as designed. Information regarding ISCO performance is included in Section 4.2.2.1.

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		downgradient of two sites which received ISCO injections (Sites N4 and N7), which indicates that plume expansion may be occurring due to plume displacement resulting from the ISCO injections. For example, at Site N7, the injections occur in fractured bedrock, which has a limited volume, making displacement likely. At Site N4, injection into fractured bedrock as well as into alluvium may be occurring. However, the Addendum does not acknowledge this potential or provide calculations that demonstrate how much displacement would occur. Please revise the Addendum to provide additional information to assess whether the ISCO remedy is functioning as intended or include this as a formal issue in the Addendum.	downgradient monitoring wells were evaluated due to the proximity of the site to downgradient areas and the availability of long-term data as a result of early ISCO implementation (in 2000) at the site. Trend graphs of TCE concentrations in groundwater were generated for wells in the Site N7 and downgradient edge areas (Appendix D) and notated with the timing of Site N7 injections. The locations of wells for which trend graphs were generated are shown on Figure D-1 provided in Appendix D. As further discussed in Section 2.1.1.2, of the leading edge wells with an adequate number of data points, only monitoring well N4-MW06 demonstrates a clear trend of increasing TCE concentrations indicating possible plume movement. As shown on Figure D-1, monitoring well N4-MW06 is located over 1,000 feet away and cross-gradient of the Site N7 treatment area. Given the distance from the Site N7 treatment area and that permanganate has not been observed in monitoring well N4-MW06, it is unlikely that increasing TCE concentrations at this well are a result of injections at Site N7. A closer evaluation of the trend graph indicates that the TCE concentration trend for well N4-MW06 may be becoming asymptotic or leveling off. If this trend is further defined or confirmed during the 2015 and 2016 groundwater monitoring events then it should be determined if there were any site activities that could have caused the increase in TCE concentrations from 2006 to 2010. For example, was an unusually large volume of surface water discharged to the South Retention Pond (Site N4) during this timeframe? It is also noted, that when the Site N4 TCE high concentration area or hotspot is overlain on an aerial photograph (Figure D-1), the hotspot appears to align with an outflow point from the Retention Pond."	
USEPA	General Comment 3	The Addendum does not discuss the vertical distribution of the contaminant of concern (COC) groundwater plumes. For example, while Figure 2, TCE Groundwater Concentration Contours May - June 2012 and Proposed Well Locations, shows several proposed "deep" wells and TCE data is provided for multiple depths for the wells associated with Site 25 (OU 8), the Addendum does not discuss the vertical distribution of COCs. As such, it is not clear if the vertical distribution is a data gap that will be addressed by the proposed additional groundwater well installations and sampling. Please revise the Addendum to discuss the vertical distribution of COCs and the potential impact in evaluating data gaps and the remedy function.	Figure 2 has been modified to show the revised well locations agreed to by the Air Force, NASA, and regulatory agencies during the 25 November 2014 teleconference. As discussed during the teleconference, deep wells are no longer proposed for installation as the Site 25 investigation wells provided vertical extent data. The third paragraph of Section 2.1.1.3 has been modified to read: "Since the review period, 18 groundwater monitoring wells (RL-25-MW01 to RL-25-MW18) associated with Site 25 (OU 8) were installed in April through September 2013 on the lakebed east and southeast of OU 6 and groundwater samples were collected from those wells and well N4-MW14. Figure 2 presents the locations of these wells and an updated plume configuration estimate based on data collected since those data shown on Figure 6-4 of the *First*	The Second FYRR includes figures depicting the locations of the 10 new monitoring wells. Isoconcentration contours included on figures are based on sampling results from the 10 new monitoring wells as well as the Site 25 wells installed on the lakebed.

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			FYRR. The laboratory analytical results for those groundwater samples indicated the presence of TCE at 12 of the 18 wells and at well N4-MW14. The horizontal extent of the plume remains unclear to the east, southeast, and south of Site N4 and additional wells will be installed in Spring 2015 to close these data gaps. The rationale for the additional well locations is provided in the Revised Final *Groundwater Investigation Work Plan* (AECOM 2015). Site 25 lakebed results (Figure 2) agree with the results of previous investigations regarding vertical contaminant gradient and extent. Site 25 lakebed results indicate that the highest TCE concentrations occur at the water table. This finding is consistent with previous investigations conducted in upgradient areas. As further discussed and illustrated in the Revised Final *Groundwater Investigation Work Plan* (AECOM 2015), packer testing performed at Site N1 indicated a vertical concentration gradient with the highest TCE concentrations present at the water table. Plume characterization extent findings will be updated during the second five-year review period and in future five-year review periods."	
USEPA	General Comment 4	Review of Tables 1 through 5 (Human Health Risk Screening) of the Draft Human Health Risk Assessment Addendum (HHRA Addendum) in Appendix C indicates that numerous analytes were not detected above their applicable reporting limit in 2012; however, the HHRA does not include an evaluation of detection limits, reporting limits or, preferably, sample quantitation limits (SQLs) for constituents in groundwater in comparison to applicable health-based screening criteria. Elevated sample quantitation limits may result in some constituents not being identified as constituents of potential concern (COPCs). Non-detect results associated with SQLs which exceed the most relevant health-based screening criteria should result in additions to the site-specific COPC list. This list of COPCs predicated on non-detect results can be further refined in consideration of a data review of contributing/receiving media, a review of historical land use at the site, or an assessment of potential breakdown/daughter products from known site COPCs, among other phenomena within the context of the data evaluation or uncertainty assessment To ensure that constituents were not overlooked in the risk assessment, please revise the HHRA to include an evaluation of non-detect results as a function of sample quantitation limits in comparison to the most relevant health-based screening criteria.	The USEPA Five-Year Review guidance indicates that the new estimated risk should be compared to the baseline risk. For a close comparison, the updated risk assessment based on 2012 groundwater sampling results was conducted similarly to the baseline risk assessment (based on 2003 groundwater sampling results) which was conducted in accordance with the Basewide HHRA Work Plan for Edwards Air Force Base (Earth Tech 2001). Since per guidance the new estimated risk is generated for comparison purposes (if the new risk is greater than the baseline risk, action may be required), the following approach in response to the comment was taken. Overall when the updated risk assessment results were compared to the baseline risk assessment, results were lower. To determine if an analyte that was not detected in 2012 had the potential to make the updated risk assessment results higher than the baseline risk assessment results, for each site, the baseline risk assessment risk drivers were identified and evaluated to see if they were detected in 2012. Only 1,2 dichloroethane at Site N7 was a risk driver in the baseline risk assessment and not detected in Site N7 groundwater sampling results. The risk and hazards for 1,2 dichloroethane were calculated using the method detection level of 0.15 μg/L. The addition of the 1,2 dichloroethane risk and hazards calculated using the method detection level did not change the Site N7 cancer risk nor the non-cancer hazard. See	Not applicable. USEPA's letter dated June 8, 2015 regarding USEPA's Review of the FYRR Addendum RTCs indicated that this comment was addressed.

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			attachment "Table 5 Attachment to RTCs.xlsx" to this comment response document.	
USEPA	General Comment 5	Section 3.0, Vapor Intrusion Risk Assessment, of the HHRA Addendum, indicates that risks to the hypothetical future resident population were calculated based on a comparison of the concentrations of contaminants detected in indoor air samples to applicable residential indoor air screening levels; however, the assessment does not include a discussion or evaluation of sub-slab soil gas (SSSG) concentrations relative to residential vapor intrusion screening levels. As previously indicated in USEPA comments on the Vapor Intrusion Investigation Report, dated April 2014, indoor air concentrations are significantly more dynamic than SSSG, are subject to myriad confounding influences (e.g., intermittent operation of HVAC systems), and represent a snapshot in time. SSSG data are, generally, more stable and consistent and provide an understanding of the potential to adversely impact indoor air breathing zones. A comparison of empirical SSSG data to health-based screening criteria is fundamental in supporting a defensible vapor intrusion potential assessment. Please revise the assessment to discuss SSSG data in comparison to the most relevant health-based screening criteria.	The assessment of residential exposure using indoor air samples is consistent with the approach specified for the HHRA Addendum in the Final Remedial Action Work Plan Addendum "Potential risk will be evaluated by a comparison of the indoor air results to concentrations in air calculated to protect receptors under both residential and industrial exposure scenarios." Additionally see response to HERO's General Comment 1 regarding recommendation to conduct an RPM risk management discussion.	Not applicable. USEPA's letter dated June 8, 2015 regarding USEPA's Review of the FYRR Addendum RTCs indicated that this comment was addressed.
USEPA	General Comment 6	As discussed in Section 1.0, Introduction, of the HHRA Addendum, the focus of the document is assessment of risks associated with exposure to groundwater and indoor air via the vapor intrusion pathway. While it is recognized that risks to an industrial worker due to exposure to indoor air were previously assessed in the Vapor Intrusion Investigation Report included as Attachment B of the HHRA Addendum, for clarity and completeness, it is recommended that the results and conclusions of the investigation be summarized in the HHRA Addendum, along with a discussion as to whether any further actions are necessary to preclude exposures, as applicable. Please revise the HHRA Addendum to include a summary of the results of the vapor intrusion investigation, including whether any future action is necessary.	The HHRA Addendum already includes a summary of the results of the vapor intrusion investigation, most significantly in Section 3.1 Vapor Intrusion Investigation – 2013. Additionally Table 6 of the HHRA Addendum summarizes both the Residential and Industrial results for all 3 buildings investigated and both sampling seasons. The second to last paragraph of Section 3.1 includes the following text, "…no further actions beyond the selected remedy need to be taken to achieve an acceptable risk level…"	Not applicable. USEPA's letter dated June 8, 2015 regarding USEPA's Review of the FYRR Addendum RTCs indicated that this comment was addressed.
USEPA	Specific Comment 1	**Section 2.1.1.1, Plume Boundaries and *In Situ* Chemical Oxidation Implementation, Page 2-2 and Section 3.2.1, Issues Warranting Follow-up Actions, Page 3-2:** This section recommends establishing an artificial plume boundary for Site N4 as part of the next five-year review to initiate removal estimates in that	The recommendation appears more appropriate for inclusion in Section 3.2.3 Additional Remedial Action Implementation Recommendation. Section 3.2.3 has been revised to include the following: "Artificial plume boundaries were established at Sites N3 and N7 to allow for consistent future contaminant mass estimates. To initiate	USEPA's letter dated June 8, 2015 regarding USEPA's Review of the FYRR Addendum RTCs indicated that this comment was addressed.

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		treatment area; however, this is not included as an issue or part of the recommendations in the Addendum For example, Section 3.2.1, Issues Warranting Follow-up Actions, does not include this as specific issue or as a recommendation that is part of one of the existing two issues. As such, it is unclear if this issue will be addressed as part of the next five-year review. Please revise Section 3.2.1 to include establishing an artificial plume boundary for Site N4 as part of an issue for the next five-year review.	removal estimates and allow for consistent future contaminant mass estimates an artificial plume boundary for Site N4 is recommended as part of the next five-year review."	
USEPA	Specific Comment 2	**Section 2.1.1.3, Groundwater Monitoring Data Review, Page 2-3:** The text states, "Figure 2 includes trend graphs for wells with an adequate number of data points;" however, Section 2.1.1.3 does not provide any analysis of trends or analysis of plume stability based on these trends. As such, the current state of the plume (i.e., whether the plume is expanding, shrinking, or stable) is not clear. Please revise the Addendum to provide information on the COC trends in leading edge wells and an evaluation of the plume stability, based on current data.	The following text has been added to the second paragraph of Section 2.1.1.3: "Trend graphs for wells with an adequate number of data points are included on Figure 2, and indicate that the extent of leading edge plume instability appears to be limited to the southern portion of Site N1 and the northern portion of Site N4 as indicated by increasing TCE concentrations at monitoring well N4-MW06. TCE concentrations in samples collected from monitoring well N4-MW06 have consistently increased since its initial sampling in 2005."	USEPA's letter dated June 8, 2015 regarding USEPA's Review of the FYRR Addendum RTCs indicated that this comment was addressed.
USEPA	Specific Comment 3	**Section 2.1.1.3, Groundwater Monitoring Data Review, Page 2-3:** The description of the plume extent in this section and Figure 1, Approximate Extent of TCE in Groundwater do not appear to be consistent. For example, this section states, "TCE concentrations detected in samples collected from wells installed at OU 6 since 2009 indicate that the commingled plume extends further downgradient than the plume delineation based on previous monitoring events." While this statement appears to be accurate, the depiction of the TCE plumes from 2010 and 2012 in Figure 1 does not appear show this clearly, apparently because the data from N4-MW-14 and the new Site 25 wells were not used to estimate the plume boundary in this figure. Please revise the Addendum to address the discrepancy in description of the plume extent in Section 2.1.1.3 and Figure 1.	Figure 1 has been revised to include contouring based on 2014 monitoring well N4-MW14 data. As explained in the response to DTSC's Specific Comment 1, on applicable figures, the TCE and carbon tetrachloride figures have been extended around monitoring well N4-MW14. The contours have not been extended to include the Site 25 lakebed wells as sampling points are not currently available to determine the relationship between the downgradient Sites N1, N4, and N7 wells and the Site 25 lakebed wells. Proposed monitoring wells N4-MW15 and N4-MW16 will further the understanding of the connection between the concentrations detected at downgradient Sites N1, N4, and N7 monitoring wells and VOC concentrations detected at Site 25 lakebed wells. Although TCE concentrations were detected at the same order of magnitude at downgradient Sites N1, N4, and N7 wells as Site 25 lakebed wells, carbon tetrachloride (present at Site N4) was not detected in any of the Site 25 lakebed wells which lends some uncertainty to the relationship of the OU 6 plume in the area of Site N4 to the Site 25 lakebed wells.	The Second FYRR includes figures depicting the locations of the 10 new monitoring wells. Isoconcentration contours included on figures are based on sampling results from the 10 new monitoring wells as well as the Site 25 wells installed on the lakebed.
USEPA	Specific Comment 4	**Section 2.1.1.3, Groundwater Monitoring Data Review, Page 2-4:** This section indicates that Figure 2, TCE Groundwater Concentration Contours May - June 2012 and Proposed Well Locations, presents the locations of recent Site 25 (OU 8) wells and an updated	Figure 2 has been revised to include contouring based on 2014 monitoring well N4-MW14 data. As explained in the response to DTSC's Specific Comment 1, on applicable figures, the TCE and carbon tetrachloride figures have been extended around monitoring well N4-MW14. The contours	The Second FYRR includes figures depicting the locations of the 10 new monitoring wells. Isoconcentration contours included on figures are based on sampling results from the 10 new monitoring wells as well as the Site 25 wells installed on the lakebed.

Regulatory Comments to the Addendum to the First Five-Year Review Report Applicable to the Second Five-Year Review Report

Reviewer	Comment #	Comment on the Addendum to the First Five-Year Review Report	Response and Comment Incorporation in the First Five-Year Review Report	Relevancy to the Second Five-Year Review Report
		plume configuration estimate based on some of the available data; however, the plume depiction in Figure 2 does not appear to include the Site 25 (OU 8) data or data from well N4-MW14. For example, Figure 2 indicates that wells RL-25-MW07 and RL-25-MW08 have TCE concentrations exceeding 100 micrograms per liter (ug/L); however, the 100 ug/L groundwater TCE concentration contour on Figure 2 has not been extended to include RL-25-MW07 and RL-25-MW08. Since this data was collected more than six months ago, it should have been validated. Please revise Figure 2 to add all relevant data and provide revised contours.	have not been extended to include the Site 25 lakebed wells as sampling points are not currently available to determine the relationship between the downgradient Sites N1, N4, and N7 wells and the Site 25 lakebed wells. Proposed monitoring wells N4-MW15 and N4-MW16 will further the understanding of the connection between the concentrations detected at downgradient Sites N1, N4, and N7 monitoring wells and VOC concentrations detected at Site 25 lakebed wells. Although TCE concentrations were detected at the same order of magnitude at downgradient Sites N1, N4, and N7 wells as Site 25 lakebed wells, carbon tetrachloride (present at Site N4) was not detected in any of the Site 25 lakebed wells which lends some uncertainty to the relationship of the OU 6 plume in the area of Site N4 to the Site 25 lakebed wells.	
USEPA	Specific Comment 5	**Section 2.1.1.3, Groundwater Monitoring Data Review, Page 2-4:** This section states, "Installation of a monitoring well (proposed well N3-MW29, Figure 3) downgradient of well N3-MW24 is planned by December 2014;" however, proposed well N3-MW29 is not shown on Figure 3. Please revise the Addendum figures to show all new proposed wells.	All applicable report figures (including Figure 3) have been revised to show the revised well locations agreed to by the Air Force, NASA, and regulatory agencies during the 25 November 2014 teleconference.	The Second FYRR includes figures depicting the locations of the 10 new monitoring wells. Isoconcentration contours included on figures are based on sampling results from the 10 new monitoring wells as well as the Site 25 wells installed on the lakebed.
USEPA	Specific Comment 6	**Section 2.1.1.3, Groundwater Monitoring Data Review, Page 2-4 and Figure 4, CT Groundwater Concentration Contours - May-June 2012**: The text under the subheading "Carbon Tetrachloride in Groundwater" does not discuss if carbon tetrachloride (CT) was detected in N4-MW14 or in the new Site 25 wells. For completeness, this should be discussed in the Section 2.1.1.3 and included on Figure 4, CT Groundwater Concentration Contours - May-June 2012. Further, for clarity, Figure 4 should include the drainage ditch and South Retention Pond as they are discussed in the Section 2.1.1.3. Please revise Section 2.1.1.3 and Figure 4 to address these issues.	The fifth paragraph of Section 2.1.1.3 has been revised to include the following text: "This observation was further confirmed by the 2014 sampling data collected as part of the Site 25 investigation effort. CT was detected at a concentration of 60 μg/L at well N4-MW14 and was not detected above the reporting limit at wells RL-25-MW01 to RL-25-MW18 on Rogers Dry Lake (Figure 4)." Figure 4 has been revised to include revised proposed well locations, CT data for monitoring well N4-MW14 and Site 25 investigation wells, contouring around monitoring well N4-MW14, and drainage ditch and Retention Pond identification.	USEPA's letter dated June 8, 2015 regarding USEPA's Review of the FYRR Addendum RTCs indicated that this comment was addressed.
USEPA	Specific Comment 7	**Section 3.1.1, Leading Edge Data Gap, Page 3-1 and Section 3.2.1, Issues Warranting Follow-Up Actions, Page 3-2:** This section does not discuss the proposed method for treatment of CT. Section 2.1.1.3, Groundwater Monitoring Data Review, indicates that permanganate is not effective for CT. As such, it appears that Fenton's reagent or persulfate should be considered for areas that have CT. Further, it is not clear why this is not included as a specific issue in Section 3.2.1, Issues Warranting Follow-Up Actions. Please revise Section 3.1.1 and Section 3.2.1 to address	The second paragraph of Section 3.1.1 has been revised to include the following: "ISCO treatment in the Site N4 area using a strong oxidant such as Fenton's reagent or persulfate will likely be required to reduce CT and TCE concentrations." Section 3.2.3 Additional Remedial Action Implementation Recommendations already includes the recommendation to evaluate employing Fenton's reagent or persulfate treatment at Site N4. Section 3.2.3 appears to be a more appropriate location for this recommendation than Section 3.2.1. The Addendum organization is based on the two key action items (Risk Assessment and Plume	USEPA's letter dated June 8, 2015 regarding USEPA's Review of the FYRR Addendum RTCs indicated that this comment was addressed.

Regulatory Comments to the Addendum to the First Five-Year Review Report Applicable to the Second Five-Year Review Report

Reviewer	Comment #	Comment on the Addendum to the First Five-Year Review Report	Response and Comment Incorporation in the First Five-Year Review Report	Relevancy to the Second Five-Year Review Report
		these issues.	Characterization) identified during the First Five-Year Review. Of the two action items only Plume Characterization requires further action. In Section 2.0, two components of the Plume Characterization action item are identified: plume delineation and plume stability assessment. Section 3.2.1 is consistent with this organization as it focuses on plume delineation (Specific Issue 1) and plume stability assessment (Specific Issue 2). A myriad of recommendations regarding remedy implementation are identified in the document and are summarized and captured in Section 3.2.3.	
USEPA	Specific Comment 8	**Section 3.2.1, Issues Warranting Follow-Up Actions, Page 3-2:** The issues described in this section are not consistent with the issues described in Table 1, Recommendation and Follow-Up Actions. For example, Table 1 includes the statement, "Data from groundwater samples to be collected from proposed monitoring wells (which will be installed in 2014) will be used to optimize remedy performance as necessary. Protectiveness will be reassessed in the Second FYRR [Five-Year Review Report];" however, this information is not included in Section 3.2.1. For clarity, please ensure that issues in both Section 3.2.1 and Table 1 are consistent.	Section 3.2.1 included the following text: "To close the leading edge data gaps, identify potential ISCO injection candidate locations, monitor cleanup progress, and verify future protectiveness, installation of monitoring wells is recommended." The text has been modified as follows (modifications in bold), "To close the leading edge data gaps, **optimize remedy performance by** identify**ing** potential ISCO injection candidate locations, monitor cleanup progress, and verify future protectiveness **(to be reassessed in the *Second FYRR*)**, installation **and sampling** of monitoring wells is recommended.	USEPA's letter dated June 8, 2015 regarding USEPA's Review of the FYRR Addendum RTCs indicated that this comment was addressed.
USEPA	Specific Comment 9	**Section 3.2.3, Anticipated Remedial Action Activities in the Next Five Years, Page 3-3:** This section states that the CT plume is larger than the TCE plume at Site N4 and that this is discussed earlier in the Addendum; however, it does not appear this issue was discussed earlier in the Addendum. Also, it is noted that based on the data from N4-MW14 and the new Site 25 wells, the TCE plume is larger than the CT plume (e.g., unless there is CT data from these wells that is not presented in the Addendum). Please revise the Addendum to clarify the size of the CT plume and any issues associated with this (e.g., a need for an expanded land use control [LUC] boundary).	The first paragraph of Section 3.2.3 has been modified to read: "During the review period, TCE and benzene were used to define the LUC boundary because these two COCs were believed to be present at concentrations above their respective MCLs over a larger area than the other detected chemicals; however, a comparison of Figures 2 and 4, indicates that the CT plume may be larger northeast of Site N4 than the TCE plume. Data from the proposed monitoring wells (specifically proposed well N4-MW15) in conjunction with the Site 25 investigation data may indicate that the TCE plume extends further to the northeast of Site N4. However, as a precaution, it is recommended that the LUC boundary be modified to include the CT plume as well as the TCE and benzene plumes (AECOM 2012)."	USEPA's letter dated June 8, 2015 regarding USEPA's Review of the FYRR Addendum RTCs indicated that this comment was addressed.
USEPA	Appendix A Evaluation of Response to General Comments 2 and 5 on Draft Final First Five-Year Review	**Evaluation of the Follow-on Responses to General Comment (GC) 2 and GC 5:** The responses appear to partially address the comment. The response indicates that Figure 2, TCE Groundwater Concentration Contours May - June 2012 and Proposed Well Locations, presents the locations of recent Site 25 (OU 8) wells and an updated plume configuration estimate based on data collected; however, the plume depiction in Figure 2 does not include the Site 25 (OU 8) data from wells that were installed in the lakebed. For example,	All applicable report figures (including Figure 2) have been revised to show the revised well locations agreed to by the Air Force, NASA, and regulatory agencies during the 25 November 2014 teleconference. Additionally, on applicable figures, the TCE and carbon tetrachloride figures have been extended around monitoring well N4-MW14. The contours have not been extended to include the Site 25 lakebed wells as sampling points are not currently available to determine the relationship between the downgradient Sites N1, N4, and N7 wells and the Site 25 lakebed wells. Proposed	USEPA's letter dated June 8, 2015 regarding USEPA's Review of the FYRR Addendum RTCs indicated that this comment was addressed.

Regulatory Comments to the Addendum to the First Five-Year Review Report Applicable to the Second Five-Year Review Report

Reviewer	Comment #	Comment on the Addendum to the First Five-Year Review Report	Response and Comment Incorporation in the First Five-Year Review Report	Relevancy to the Second Five-Year Review Report
	Report	Figure 2 shows wells RL-25-MW07 and RL-25-MW08 with TCE concentrations exceeding 100 micrograms per liter (ug/L); however, the 100 ug/L groundwater TCE concentration contour on Figure 2 has not been extended to RL-25-MW07 and RL-25-MW08. Please revise Figure 2 to base the TCE concentration contours on the data from all wells that have been sampled in the OU 6 area.	monitoring wells N4-MW15 and N4-MW16 will further the understanding of the connection between the concentrations detected at downgradient Sites N1, N4, and N7 monitoring wells and VOC concentrations detected at Site 25 lakebed wells. Although TCE concentrations were detected at the same order of magnitude at downgradient Sites N1, N4, and N7 wells as Site 25 lakebed wells, carbon tetrachloride (present at Site N4) was not detected in any of the Site 25 lakebed wells which lends some uncertainty to the relationship of the OU 6 plume in the area of Site N4 to the Site 25 lakebed wells.	
USEPA	Appendix A Evaluation of Response to General Comment 8 on Draft Final First Five-Year Review Report	**Evaluation of the Follow-on Response to GC 8:** The response partially addresses the comment by recommending the establishment of an artificial plume boundary for Site N4 as part of the next five-year review to initiate removal estimates in that treatment area; however, this recommendation is not included as an issue or part of the recommendations in the Draft Addendum to the First Five-Year Review Report, National Aeronautics and Space Administration, Armstrong Flight Research Center, Operable Unit 6, Edwards Air Force Base, California, dated September 2014 (Addendum). For example, Section 3.2.1, Issues Warranting Follow-up Actions, does not include this as a specific issue or as a recommendation that is part of one of the existing two issues. As such, it is not sure if this issue will be addressed as part of the next five-year review. Please revise Section 3.2.1, to include establishing an artificial plume boundary for Site N4 to facilitate removal estimates as part of the next five-year review.	The recommendation appears more appropriate for inclusion in Section 3.2.3 Additional Remedial Action Implementation Recommendation. Section 3.2.3 has been revised to include the following: "Artificial plume boundaries were established at Sites N3 and N7 to allow for consistent future contaminant mass estimates. To initiate removal estimates and allow for consistent future contaminant mass estimates an artificial plume boundary for Site N4 is recommended as part of the next five-year review."	USEPA's letter dated June 8, 2015 regarding USEPA's Review of the FYRR Addendum RTCs indicated that this comment was addressed.
USEPA	Appendix A Evaluation of Response to General Comment 10 on Draft Final First Five-Year Review Report	**Evaluation of the Follow-on Response to GC 10:** The response partially addresses the comment; however, the response does not address the concern that remedial action objectives (RAOs) and LUCs may not be protective with the increasing concentrations of TCE in N3-MW15, which result in the potential for exposure to VOCs in occupied buildings through the vapor intrusion pathway. Please revise the OU 6 Addendum to discuss the protectiveness of the RAOs and LUCs with respect to potential vapor intrusion into buildings located above the groundwater plume.	The comment references monitoring well N3-MW15 which as shown on Figure 3 is approximately 100 feet away from the nearest occupied buildings (Buildings 4806 and 4807 which are scheduled for demolition in July 2015 and are anticipated to be vacated in May 2015). The comment also references increasing TCE concentrations. TCE was not detected in air samples collected within Buildings 4806 and 4807 during the vapor intrusion investigation. Benzene was detected in air samples collected in Building 4806 and 4807, however the risk related to those detections was assessed and found to be in the generally acceptable risk range defined in the guidance (USEPA 2001), "… you should determine whether the new estimated risk is acceptable. In most cases, you should base this determination on whether the risk is within or below the generally acceptable risk range of 10^{-4} to 10^{-6} for carcinogenic risk and the hazard	USEPA's letter dated June 8, 2015 regarding USEPA's Review of the FYRR Addendum RTCs indicated that this comment was addressed.

Regulatory Comments to the Addendum to the First Five-Year Review Report Applicable to the Second Five-Year Review Report

Reviewer	Comment #	Comment on the Addendum to the First Five-Year Review Report	Response and Comment Incorporation in the First Five-Year Review Report	Relevancy to the Second Five-Year Review Report
			index is below 1 for non-carcinogenic effects. If the estimated risk is not protective, you should determine what actions need to be taken to achieve an acceptable level of risk." Since the calculated risk fell within the acceptable risk range, the remedy was deemed protective for the VIP and no additional action in regards to adjusting the RAOs or LUCs for VIP are needed. A delay in the demolition of Buildings 4806 and 4807 and the need to confirm seasonal variances to ensure that the indoor air risk is still in the protective range for the site workers under the industrial land use scenario warranted an additional Winter sampling event. The additional VIP investigation was conducted in February 2016 and will be documented in the Second FYRR. The following paragraph has been added as the last paragraph of Section 3.2.3 Additional Remedial Action Implementation: "A delay in the demolition of two OU 6 buildings and the need to confirm seasonal variances to ensure that the indoor air risk is still in the protective range for the site workers under the industrial land use scenario warranted an additional Winter sampling event. The additional VIP investigation was conducted in February 2016 and will be documented in the Second FYRR." See also response to HERO's General Comment 1 regarding recommendation to conduct an RPM risk management discussion.	
USEPA	Appendix A Evaluation of Response to Specific Comment 17 on Draft Final First Five-Year Review Report	**Evaluation of the Follow-on Response to SC 17:** The response partially addresses the comment; however, proposed well N3-MW29 is not shown on Figure 3, Site N3 Benzene Groundwater Concentration Contours - May-June 2012. Please revise the Addendum figures to show all new proposed wells.	All applicable report figures (including Figure 3) have been revised to show the revised well locations agreed to by the Air Force, NASA, and regulatory agencies during the 25 November 2014 teleconference.	USEPA's letter dated June 8, 2015 regarding USEPA's Review of the FYRR Addendum RTCs indicated that this comment was addressed.

APPENDIX E

INTERVIEW REPORT

INTERVIEW DOCUMENTATION FORM

The following is a list of individual interviewed for this five-year review. See the attached interview record(s) for a detailed summary of the interviews.

Name	Title/Position	Organization	Date
Daniel Mullen	Energy and Water Cons. Prog. Mgr.	NASA AFRC	19 May 2016
Julie Bond	Code XV	NASA AFRC	17 May 2016
Gemma Flores	Architect	NASA AFRC	20 May 2016
Kevin Mayer	Remedial Project Manager	USEPA	6 June 2016
Bruce Lewis	Remedial Project Manager	California DTSC	25 April 2016
Christina Guerra	Remedial Project Manager	CRWQCB, Lahontan Region	6 May 2016
Phil Saxton	Civil Engineering Project Programmer	412 TW/CENPD	13 May 2016

INTERVIEW RECORD

Site Name: Operable Unit 6, NASA AFRC	**EPA ID No.:** CA1570024504	
Subject: Five-Year Review	**Time:** 1047	**Date:** 19 May 2016
Type: Telephone Visit √ Other (email response) **Location of Visit:** not applicable	√ Incoming Outgoing	

Contact Made By:

Name: Kimberly Coleman	**Title:** Operable Unit Manager	**Organization:** AECOM (Air Force Contractor)

Individual Contacted:

Name: Daniel Mullen	**Title:** Energy and Water Conservation Program Manager	**Organization:** NASA

Telephone No: NA **E-Mail Address:** daniel.f.mullen@nasa.gov	**Street Address:** AFRC **City, State, Zip:** Edwards AFB, CA 93523-0273

Summary Of Conversation

Mr. Mullen provided the following information by email:

1. Do you have access to information on the remedies in place at AFRC; and do you access that information (e.g., at the Edwards AFB Website [Facebook], Information Repository, Administrative Record File, or at Restoration Advisory Board [RAB] meetings)?

Response: *Yes. No.*

2. Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies implemented at AFRC?

Response: *No.*

3. To the best of your knowledge, have there been any violations of the land use controls at AFRC; with the exception of previously approved activities; that required a response from your office? If so, please provide details of the events and results of the responses.

Response: *No*.

4. Are you aware of any community concerns regarding the protectiveness of the remedies at AFRC? If so, please provide details.

Response: *No*.

INTERVIEW RECORD

Site Name: Operable Unit 6, NASA AFRC	**EPA ID No.:** CA1570024504	
Subject: Five-Year Review	**Time:** 1213	**Date:** 17 May 2016
Type: Telephone Visit √ Other (email response) **Location of Visit:** not applicable	√ Incoming Outgoing	

Contact Made By:

Name: Kimberly Coleman	**Title:** Operable Unit Manager	**Organization:** AECOM (Air Force Contractor)

Individual Contacted:

Name: Julie Bond	**Title:** Code XF	**Organization:** NASA Armstrong
Telephone No: NA **E-Mail Address:** julie.bond@nasa.gov	**Street Address:** AFRC **City, State, Zip:** Edwards AFB, CA 93523-0273	

Summary Of Conversation

Ms. Bond provided the following information by email:

1. Do you have access to information on the remedies in place at AFRC; and do you access that information (e.g., at the Edwards AFB Website [Facebook], Information Repository, Administrative Record File, or at Restoration Advisory Board [RAB] meetings)?

Response: *Yes. Located in the NASA Environmental Office.*

2. Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies implemented at AFRC?

Response: *No.*

3. To the best of your knowledge, have there been any violations of the land use controls at AFRC; with the exception of previously approved activities; that required a response from your office? If so, please provide details of the events and results of the responses.

Response: *No*.

4. Are you aware of any community concerns regarding the protectiveness of the remedies at AFRC? If so, please provide details.

Response: *No*.

INTERVIEW RECORD

Site Name: Operable Unit 6, NASA AFRC	**EPA ID No.:** CA1570024504	
Subject: Five-Year Review	**Time:** 0903	**Date:** 20 May 2016
Type: Telephone Visit √ Other (email response) **Location of Visit:** not applicable	√ Incoming Outgoing	

Contact Made By:

Name: Kimberly Coleman	**Title:** Operable Unit Manager	**Organization:** AECOM (Air Force Contractor)

Individual Contacted:

Name: Gemma Flores	**Title:** Architect	**Organization:** NASA Armstrong
Telephone No: 661-276-2817 **E-Mail Address:** gemma.flores@nasa.gov	**Street Address:** AFRC **City, State, Zip:** Edwards AFB, CA 93523-0273	

Summary Of Conversation

Ms. Flores provided the following information by email:

1. Do you have access to information on the remedies in place at AFRC; and do you access that information (e.g., at the Edwards AFB Website [Facebook], Information Repository, Administrative Record File, or at Restoration Advisory Board [RAB] meetings)?

Response: *I have access to information on the remedies in place at AFRC through the RAB newsletters, the RAB representative, and the our Safety, Health, and Environmental Office. (From 2005-~2008, I served as the RAB representative for AFRC).*

2. Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies implemented at AFRC?

Response: *No, possibly the installation of a solar field, but I believe the location slated for it is not affected by the TCE plume.*

3. To the best of your knowledge, have there been any violations of the land use controls at AFRC; with the exception of previously approved activities; that required a response from your office? If so, please provide details of the events and results of the responses.

Response: *Not that I know of.*

4. Are you aware of any community concerns regarding the protectiveness of the remedies at AFRC? If so, please provide details.

Response: *No*.

Summary Of Conversation (continued)

5a. Based on your knowledge of the Master Plan, could you please describe the process for and at what frequency the Master Plan is updated. When was the Master Plan last updated?

Response: The Master Plan was last updated in 2012. The process of updating the Master Plan involves multiple meetings with the "Master Planning Steering Committee", which is comprised of senior leaders, mission stakeholders, mission support stakeholders, and we invite the AF partners to participate as well. The Master Plan is supposed to be updated (or validated) every 5 years and reviewed yearly.

5b. Is there currently any language in the Master Plan regarding new construction review by the Environmental office for vapor barrier inclusion?

Response: Not currently. The Master Plan is not necessarily a plan on processes of new construction The Master Plan address the Center needs/requirements and how the physical environment supports it. The document that would state who reviews construction projects is a different internal document.

5c. How is the Master Plan used? For example, during the procurement process for new construction, is the Master Plan referenced in contracting scopes? Is the Master Plan reviewed prior to any intrusive activities (digging permits)? Does the Master Plan limit development at AFRC to industrial use (i.e. residential use/development is restricted). Does the Master Plan limit the installation of potable drinking water wells?

Response: The Master Plan is used as tool/guide for the Center to use to ensure that the physical surroundings align with the mission and vision of the Center. It is also a tool for Headquarters to determine which future projects will be executed at our Center. The Master Plan is not referenced in contracting scopes for new construction. The Master Plan is not currently reviewed prior to any intrusive activities. The Master Plan does not limit development at AFRC to industrial use nor the limitation of installation of potable drinking water wells. If there is guidance on particular requirements/restrictions, they are addressed and recognized as constraints when creating the Master Plan.

INTERVIEW RECORD

Site Name: Operable Unit 6, NASA AFRC		**EPA ID No.:** CA1570024504
Subject: Five-Year Review	**Time:** 0917	**Date:** 6 June 2016
Type: Telephone Visit √ Other(email response) **Location of Visit:** not applicable		√ Incoming Outgoing

Contact Made By:

Name: Kimberly Coleman	**Title:** Operable Unit Manager	**Organization:** AECOM (Air Force Contractor)

Individual Contacted:

Name: Kevin Mayer	**Title:** Remedial Project Manager	**Organization:** United States Environmental Protection Agency Region 9, SFD-8-2

Telephone No: 415-972-3176 **E-Mail Address:** Mayer.Kevin@epa.gov	**Street Address:** 75 Hawthorne Street **City, State, Zip:** San Francisco, CA 94105-3901

Summary Of Conversation

Mr. Mayer provided the following information by email:

1. Do you have access to information on the remedies in place at OU6; and do you access that information (e.g., at the Edwards AFB Website, Information Repository, Administrative Record File, or at Restoration Advisory Board [RAB] meetings)?

Response: *Yes, I have access to primary information on the remedies. I do not use all the possible sources suggested in the question, such as Facebook.*

2. Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies implemented at OU6?

Response: *The primary issue is the advancement of a contaminant plume from OU8 that has been within the OU6 geographic boundary for many years. At the time of the remedy selection, we anticipated demolition of three occupied buildings above the OU6 plume. Only one has been demolished, with indoor air monitoring in the other two as an alternative so far. However, this site condition has not changed.*

3. To the best of your knowledge, have there been any violations of the land use controls at OU6; with the exception of previously approved activities (e.g., those approved under the ABW/CEVR process); that required a response from your office? If so, please provide details of the events and results of the responses.

Response: *To the best of my knowledge, the Air Force and NASA have complied with the Land Use Controls on Edwards Air Force Base.*

4. Are you aware of any community concerns regarding the protectiveness of the remedies at ERP OU6? If so, please provide details.

Response: *I attend the RAB meetings. I am not aware of expressed community concerns over protectiveness.*

INTERVIEW RECORD

Site Name: Operable Unit 6, NASA AFRC	**EPA ID No.:** CA1570024504	
Subject: Five-Year Review	**Time:** 1441	**Date:** 25 April 2016
Type: Telephone Visit √ Other(email response) **Location of Visit:** not applicable	√ Incoming Outgoing	

Contact Made By:

Name: Kimberly Coleman	**Title:** Operable Unit Manager	**Organization:** AECOM (Air Force Contractor)

Individual Contacted:

Name: Bruce Lewis	**Title:** Remedial Project Manager	**Organization:** California Department of Toxic Substances Control

Telephone No: 916-255-6648 **E-Mail Address:** bruce.lewis@dtsc.ca.gov	**Street Address:** 8800 Cal Center Drive **City, State, Zip:** Sacramento, CA 95826-3200

Summary Of Conversation

Mr. Lewis provided the following information by email:

1. Do you have access to information on the remedies in place at OU6; and do you access that information (e.g., at the Edwards AFB Website, Information Repository, Administrative Record File, or at Restoration Advisory Board [RAB] meetings)?

Response: *Yes, I have access to information on the remedies in place at OU6 and receive such information directly from the Air Force.*

2. Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies implemented at OU6?

Response: *Yes, the migration of contaminated groundwater into OU6 from Site 25 and potential comingling of the plumes may impact the protectiveness of the remedies implemented at OU6 in the future.*

3. To the best of your knowledge, have there been any violations of the land use controls at OU6; with the exception of previously approved activities (e.g., those approved under the ABW/CEVR process); that required a response from your office? If so, please provide details of the events and results of the responses.

Response: *I am not aware of any violations of land use controls that required a formal response from DTSC.*

4. Are you aware of any community concerns regarding the protectiveness of the remedies at ERP OU6? If so, please provide details.

Response: *I am not aware of any community concerns regarding the protectiveness of the remedies at OU6.*

INTERVIEW RECORD

Site Name: Operable Unit 6, NASA AFRC	**EPA ID No.:** CA1570024504	
Subject: Five-Year Review	**Time:** 1636	**Date:** 16 May 2016
Type: Telephone Visit √ Other(email response) **Location of Visit:** not applicable	√ Incoming Outgoing	

Contact Made By:

Name: Kimberly Coleman	**Title:** Operable Unit Manager	**Organization:** AECOM (Air Force Contractor)

Individual Contacted:

Name: Christina Guerra	**Title:** Remedial Project Manager	**Organization:** CRWQCB, Lahontan Region

Telephone No: 760-241-7333 **E-Mail Address:** christina.guerra@waterboards.ca.gov	**Street Address:** 14440 Civic Drive, Suite 200 **City, State, Zip:** Victorville, CA 92392

Summary Of Conversation

Ms. Guerra provided the following information by email:

1. Do you have access to information on the remedies in place at OU6; and do you access that information (e.g., at the Edwards AFB Website, Information Repository, Administrative Record File, or at Restoration Advisory Board [RAB] meetings)?

Response: *Yes, I have access to information on the remedies in place at OU 6. I primarily access that information from the Lahontan Water Board files (including GeoTracker) and the Administrative Record File.*

2. Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies implemented at OU6?

Response: *Yes, based on the results of recent groundwater investigations conducted on Rogers Dry Lake for Site 25, OU 8, it has been confirmed that the extent of the OU 6 groundwater contaminant plumes are further downgradient than initially understood. The Air Force has not yet fully delineated the downgradient extent of these groundwater contaminant plumes. Further, implementation of the in situ chemical oxidation (ISCO) remedy component has been halted as a result the Air Force's efforts to fully delineate the groundwater contaminant plumes.*

3. To the best of your knowledge, have there been any violations of the land use controls at OU6; with the exception of previously approved activities (e.g., those approved under the ABW/CEVR process); that required a response from your office? If so, please provide details of the events and results of the responses.

Response: *No, I am not aware of any violations of land use controls.*

Summary Of Conversation (cont'd)

4. Are you aware of any community concerns regarding the protectiveness of the remedies at ERP OU6? If so, please provide details.

Response: *No, I am not aware of any community concerns regarding the protectiveness of the remedies at OU 6.*

5. Do you have any comments, suggestions, or recommendation regarding management of the remedies in place at OU6? If so, please provide details.

Response: *The California Regional Water Quality Control Board, Lahontan Region (Water Board) staff has the following comment regarding management of the remedies in place at OU 6. Although, the OU 6 groundwater contaminant plumes need to be fully delineated, ISCO treatment of the groundwater should be resumed at the plume areas of highest contaminant concentration. Plume delineation investigations and ISCO treatment should be conducted concurrently to ensure data will be available to aid in substantiating the Air Force's long-term remedy protectiveness expectation.*

INTERVIEW RECORD

Site Name: Operable Unit 6, NASA AFRC	**EPA ID No.:** CA1570024504	
Subject: Five-Year Review	**Time:** 0945	**Date:** 13 May 2016
Type: Telephone Visit √ Other(email response) **Location of Visit:** not applicable	√ Incoming Outgoing	

Contact Made By:

Name: Kimberly Coleman	**Title:** Operable Unit Manager	**Organization:** AECOM (Air Force Contractor)

Individual Contacted:

Name: Phil Saxton	**Title:** CE Project Programmer	**Organization:** 412 TW/CENPD
Telephone No: 661-277-2904 **E-Mail Address:** phillip.saxton.1@us.af.mil	**Street Address:** 225 N. Rosamond Boulevard **City, State, Zip:** Edwards AFB, CA 93524	

Summary Of Conversation

Mr. Saxton provided the following information by email:

1. What is the review process for installation of a potable water well at Edwards Air Force Base?

Response: *If any organization wanted to install a potable water well on Edwards AFB they would have to submit a service request (SR) through Maximo (on-line process for requesting facility related work). This request is first reviewed by the Work Request Review Board (WRRB) within the 412th Civil Engineering (CE) Group. The WRRP is comprised of members from the Fire Department Technical Services, CE Operations, CE Environmental, CE Real Property, and CE Project Programming. At the WRRB, an initial determination is made as to whether or not the proposed work is a CE responsibility (i.e. real property or user equipment). If it's determined to be a real property asset, a further determination is made as to as to whether the scope of work is within the ability of CE shops to perform or large enough to require a contract effort. Frequently, the scope of work specified on the SR is insufficient for the WRRB to make a determination. In these cases, either the requestor is contacted for additional information/clarification or the SR is sent to a CE shop for evaluation. Once the WRRB make a determination that the work is a CE responsibility the SR is sent out through Maximo for coordination to various CE and Base agencies that have a role in protecting the Base and all assigned personnel. At a minimum, Base Safety, Fire Department, CE Environmental, CE Planning, and Real Property. Depending on the type/nature of work and/or location of the work additional Base organizations would be given an opportunity to review/comment on the proposed action. The list of potential reviewers is lengthy, but typically this might include Security Forces, BioEnvironmental Engineering, and Air Field Management. The installation of a new potable water well within the Base would be considered a CE responsibility by the WRRB.*

Summary Of Conversation (cont'd)

During the SR coordination phase, CE Environmental is one of the activities that conducts a thorough review of the proposed action. The Environmental Branch conducts an Environmental Impact Analysis Process (EIAP) review of the proposed action. As part of this effort it is determined if the proposed action will potentially cause harm to either natural or cultural resources, potentially impacts compliance with current environmental laws and regulations, may require a permit (such as an air emissions permit) or that the proposed site is located within a Land Use Control (LUC) boundary.

LUCs are typically set up around known environmental contamination sites to either prevent or control development within the LUC boundary. LUCs can also be established for reasons other than environmental contamination. Areas of the Base that are known to have either contaminated groundwater or soil beneath them are managed under the Air Force Environmental Restoration Program (ERP) by the Air Force Civil Engineer Center (AFCEC) and are typically protected by LUCs. Proposed actions within a LUC area are evaluated by AFCEC/CZO to determine if the action potentially expose personnel to harmful levels of contamination or would otherwise negatively impact ongoing remedial investigation activity or site cleanup operations. The output of the EIAP review is either the approval or disapprove of the proposed action from an Environmental perspective. If the proposed action is disapproved, the project cannot move forward and the proponent must develop a new course of action. Proposed actions that are approved are approved contingent on the proponent complying with mitigation measures outlined in a document called the EIAP Checklist. Mitigation measures are site specific, but typically require natural and or cultural resource pre-surveys. Field coordination with local AFCEC personnel is mandated to insure the location of existing monitoring wells and restoration equipment are known so that they are not damaged during construction activities. In the case of a proposed plan to install a new potable water production well, if the well was proposed within or immediately adjacent to a LUC area with significant groundwater contamination present, the proposed action would be recommended for disapproval by Environmental. In as much as BioEnvironmental Engineering is responsible for all public health issues on the Base, they would be a key organization responsible for evaluation of new drinking water wells and potable water distribution line. They generally take a conservative protective stance and therefore would also no recommend approval of locating a drink water well within a contaminated ERP site.

Following SR coordination process, projects that would result in the construction/installation of new permanent or temporary facilities, such as a potable water production well, would also be required to be presented to the Base Space Utilization Integrated Process Team (SUIPT) for consideration and approval of the proposed action. The SUIPT is chaired by the Director, 412th Civil Engineering Group, and its voting members are the group commanders of all the major Base functional areas. Proposed actions of significant importance and/or controversial in nature are further elevated to the Facility Board (FB) for final determination. The FB is chaired by the 412 TW commander.

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APPENDIX F

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS REVIEW

Item No.	Requirement	Citation	Federal, State or Local Requirement	Description	ARAR Determination	Comments	Applicable Sites	Change Since ROD Finalized?	Change to Protectiveness
Chemical-specific ARARs									
1	Primary Drinking Water Standards (Non-zero MCLGs and MCLs)	Safe Drinking Water Act, 40 CFR Part 141, Sections 141.11, 141.50-.51, 141.61-.62 40 CFR Part 300, Sections 300.430(e)(2)(i)(C)	Federal	MCLGs are goals under the SDWA which are set at levels at which no adverse health effects will occur and allow an adequate margin of safety. MCLs are promulgated and enforceable maximum concentrations of drinking water priority pollutants that are set as closely as feasible to MCLGs, considering best technology, treatment techniques, and other factors. The NCP states that primary drinking water standards are legally applicable only to drinking water at the tap, but are relevant and appropriate as cleanup standards for groundwater and surface water that have been determined to be current or future drinking water sources. Under CERCLA 121(d)(2)(A), remedial actions shall attain MCLGs where relevant and appropriate. The NCP provides that where an MCLG has been set at a level of zero, the MCL for that contaminant shall be attained.	Relevant and appropriate	This regulation addresses drinking water-based cleanup goals for groundwater plumes at OU 6. The AF and State agree, in this particular case, that use of MCLs as cleanup standards, in conjunction with Institutional Controls, is protective of human health at OU 6. Only State MCLs that are more stringent than Federal MCLs are ARARs. For the constituents at OU 6, there are no State MCLs that are more stringent than Federal MCLs.	N2, N3, and N7	Yes	An MCL of 0.01 mg/L was established for hexavalent chromium. It is recommended to add hexavalent chromium as a COC for OU 6. The change in this ARAR does not result in a change in the protectiveness of the selected remedy.
		22 CCR, Div. 4, Ch. 15, Articles 4, 4.5, and 5.5, Sections 64431 et seq., 64444	State	Establishes standards for public water supply systems, including primary MCLs. State MCLs must be at least as stringent as Federal MCLs. State MCLs are incorporated into State and Regional Water Quality Board Water Quality Control Plans as water quality objectives for protection of current and potential drinking water supply sources. MCLs are some of the applicable upper-end objectives for ambient ground and surface water where the water is a source of drinking water, as defined in the Water Quality Control Plans.					
2	Policies and Procedures for Investigation and Cleanup and Abatement	SWRCB Resolution No. 92-49 Water Code Sections 13140, 13240, 13304, 13307	State	State Board Resolution No. 92-49 establishes policies and procedures for the oversight of investigation and cleanup and abatement activities resulting from discharges of waste which affect or threaten water quality. It requires cleanup of all waste discharged and restoration of affected water to background conditions (i.e., the water quality that existed before the discharge). Requires actions for cleanup and abatement to conform to Resolution No. 68-16, water quality control plans and policies, and applicable provisions of California Code of Regulations, Title 23, Division 3, Chapter 15 (Discharges of Hazardous Waste to Land) as feasible.	Relevant and appropriate	Section III.G of Resolution 92-49 is relevant and appropriate. The AF has performed a TEFA for groundwater at OU 6 to satisfy requirements for corrective action under SWRCB Resolution 92-49. The AF and the State agree that the cleanup standards for groundwater, in this particular case, are MCLs.	N2, N3, and N7	No	NA
3	Water Quality Control Plan, South Lahontan Basin (Basin Plan)	23 CCR Div. 4, Ch. 1, Article 6, Section 3950 Water Code Sections 13140 and 13240	State	The Porter-Cologne Water Quality Control Act established authority of the SWRCB and RWQCB to regulate discharges into Waters of the State. The Basin Plan establishes beneficial uses and the water quality criteria based upon such uses (water quality objectives). The Basin Plan serves to protect the beneficial uses and water quality of the surface and groundwater in the South Lahontan Basin.	Relevant and appropriate	The water quality objectives for chemical constituents in groundwater are relevant and appropriate.	N2, N3, and N7	No	NA

Item No.	Requirement	Citation	Federal, State or Local Requirement	Description	ARAR Determination	Comments	Applicable Sites	Change Since ROD Finalized?	Change to Protectiveness
Location-specific ARARs									
4	California Endangered Species Act	CDFG Code Section 2050-2055 14 CCR Div. 1, Subdivision 3, Ch. 6 Section 783.1	State	Establishes species, subspecies, and varieties of native California plants or animals as endangered, threatened, or rare. Prohibits the taking, importation, or sale of any species, or any part thereof, of an endangered species or a threatened species. Contains provisions concerning CDFG coordination with State and Federal agencies and with project applicants. Recommends avoidance of adverse impacts on species of special concern and their habitat.	Relevant and appropriate	Potentially an ARAR where the State law has a listing that is more stringent than the Federal Endangered Species Act and Migratory Bird Treaty Act. As stated in AF Instruction 32-7064, dated 17 September 2004, State protected species will be protected when practicable and the appropriate State authority will be contacted if conflicts arise. State may provide procedures for minimization of impacts and harm to species.	All	No	NA
5	Fish and Wildlife Protection and Conservation	CDFG Code Section 1600-1607 (except 1606) 14 CCR, Div. 1.5, Ch. 4, Subchapter 4, Sections 916, 916.2, Subchapter 5, Sections 936, 936.2, and Subchapter 6, Sections 956, 956.2	State	Declares the protection and conservation of fish and wildlife to be an important public interest. Section 1602 prohibits substantial diversion or obstruction of the natural flow of, or substantial change or use of any material from the bed, channel, or bank of, any river, stream, or lake, or deposition or disposal of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake without prior notification and approval from CDFG. This section is a general statement of policy that does not impose a substantive requirement. Rather it imposes a reporting requirement when stream diversion, dredging, or waste disposal affecting fish and wildlife is to take place.	Relevant and appropriate	Remedial action must be protective and conserve fish and wildlife resources. As stated in AF Instruction 32-7064, dated 17 September 2004, State protected species will be protected when practicable and the appropriate State authority will be contacted if conflicts arise. State may provide procedures for minimization of impacts and harm to species.	All	No	NA
6	Wildlife Species/Habitats	CDFG Code Sections 2000, 2014, 3005, 3511, 3513, and 12000 et seq. 14 CCR, Div. 1, Subchapter 2, Section 250, Section 507; Subchapter 3, Section 650	State	Prohibits the taking of birds and mammals. This code section imposes a substantive, promulgated environmental protection requirement covering destruction of wildlife caused by unlawful discharges of pollutants to waters of the State in violation of Division 7 (Section 13000 et seq.) of the Water Code.	Relevant and appropriate	As stated in AF Instruction 32-7064, dated 17 September 2004, State protected species will be protected when practicable and the appropriate State authority will be contacted if conflicts arise. State may provide procedures for minimization of impacts and harm to species.	All	No	NA

Item No.	Requirement	Citation	Federal, State or Local Requirement	Description	ARAR Determination	Comments	Applicable Sites	Change Since ROD Finalized?	Change to Protectiveness
Location-specific ARARs (continued)									
7	Mammals and Reptiles Provisions	CDFG Code Sections 4700 and 5050 14 CCR, Div. 1, Subdivision 3, Ch. 3, Section 670	State	Prohibits the possession of mammals and reptiles that are identified as "fully protected."	Relevant and appropriate	Potentially applicable where the State law has a listing that is more stringent than the Federal and State Endangered Species Act or Migratory Bird Treaty Act. As stated in Air Force Instruction 32-7064, dated 17 September 2004, State protected species will be protected when practicable and the appropriate State authority will be contacted if conflicts arise. State may provide procedures for minimization of impacts and harm to species.	All	No	NA
8	Rare Native Plants	CDFG Code Sections 1900 et seq. and 2080 14 CCR, Div. 1, Subdivision 3, Ch. 6, Section 783	State	Contains provisions concerning native plant protection including: criteria for determining endangered plant species; designation of endangered plants; and other prohibitions.	Relevant and appropriate	As stated in AF Instruction 32-7064, dated 17 September 2004, State protected species will be protected when practicable and the appropriate State authority will be contacted if conflicts arise. State may provide procedures for minimization of impacts and harm to species.	All	No	NA

Item No.	Requirement	Citation	Federal, State or Local Requirement	Description	ARAR Determination	Comments	Applicable Sites	Change Since ROD Finalized?	Change to Protectiveness
Action-specific ARARs									
11	Standards Applicable to Generators of Hazardous Waste	40 CFR Part 262	Federal	These regulations apply to generators of hazardous waste. Edwards AFB is a large quantity generator of hazardous waste (EPA ID CA1570024504) and already subject to these requirements.	Applicable if soil cuttings, purge water, or spent carbon are hazardous waste.	Applicable to waste generated (soil cuttings, purge water from groundwater sampling, and spent carbon from onsite treatment of purge water) as part of OU 6 groundwater remedies if these wastes are hazardous. Substantive requirements are potentially ARARs if excavated soils or treatment residuals exceed RCRA or [1]California hazardous waste thresholds. Hazardous remediation waste may be stored onsite in Corrective Action Temporary Units. These Corrective Action Temporary Units are not subject to the less than 90-day accumulation time requirement. Temporary units may operate for 1 year with an opportunity for a 1-year extension.	Soil cuttings, purge water, and spent carbon generated from groundwater monitoring of Sites N2, N3, and N7 plumes	No	NA
		22 CCR, Div. 4.5, Ch. 12, Articles 1-4, Sections 66262.10-.47	State	Establishes standards for generators of RCRA and [1]California hazardous wastes, including those for hazardous waste determination, accumulation, identification numbers, manifesting, pre-transport, and record keeping, and reporting requirements.					
12	Underground Injection Control Program	40 CFR Parts 144, 146, 147, Sections 144.13(c), 144.82-.83, 144.89; Sections 146.5 and 146.10; Section 147.251	Federal	Protects groundwater from contamination by subsurface emplacement of fluids. According to Section 144.13(c), wells used to reinject contaminated groundwater that has been treated into the same formation from which it was drawn are not prohibited if such injection is approved by EPA, or a State, pursuant to provisions for cleanup of releases under CERCLA, 42 U.S.C. 9601–9657, or pursuant to requirements and provisions under RCRA, 42 U.S.C. 6901 through 6987. Wells for injection of treatment chemicals or treated groundwater into shallow wells are designated Class V wells according to Section 146.5. Section 144.82 prohibits the movement of fluid containing any contaminant into an underground source of drinking water if it would cause a violation of primary drinking water standards under 40 CFR Part 141, or other health-based standards, or may otherwise adversely affect the health of persons. Injection well closure must prohibit emplaced fluid movement. States and EPA Regions can establish more stringent requirements if needed to protect underground sources of drinking water. Section 144.83 specifies inventory requirements for the operation of the injection well. Section 144.89 contains well closure requirements. Section 146.10 contains well plugging and abandonment requirements. Section 147.251 states that EPA administers the UIC program in California for Class V wells.	Applicable	Substantive portions are applicable to the injection of sodium permanganate or other oxidizing chemicals in the Sites N2, N3, and N7 plumes. Reinjection of treated groundwater qualifies for the exemption in Section 144.13(c) for groundwater treatment systems.	N2, N3, and N7	No	NA

Item No.	Requirement	Citation	Federal, State or Local Requirement	Description	ARAR Determination	Comments	Applicable Sites	Change Since ROD Finalized?	Change to Protectiveness
Action-specific ARARs (continued)									
13	Statement of Policy with Respect to Maintaining High Quality of Waters in California (Non-degradation Policy)	SWRCB Resolution Number 68-16 (23 CCR Section 2900)	State	Resolution No. 68-16 (anti-degradation policy) has been incorporated into all Regional Board Basin Plans, including the Lahontan Water Board's Basin Plan. This resolution requires that the quality of waters of the State that is better than needed to protect all beneficial uses be maintained unless certain findings are made. Discharges to high quality waters must be treated using best practicable treatment or control necessary to prevent pollution or nuisance and to maintain the highest quality water. This resolution also requires cleanup to background quality or lowest concentrations technically and economically feasible to achieve. Beneficial uses, at minimum, must be protected.	Applicable	State Water Resources Control Board Resolution 68-16 is an ARAR for the injection or reinjection of sodium permanganate, any treatment chemicals, or any reagent into groundwater to treat contaminants.	N2, N3, and N7	No	NA
14	Sources of Drinking Water Policy	SWRCB Resolution No. 88-63; Porter-Cologne Water Quality Act (CWC Sections 13000, 13140, 13240) H&S Code Section 25356.1.5 (a)	State	Resolution 88-63 has been incorporated into all Regional Board Basin Plans, including the Lahontan Water Board's Basin Plan. This resolution designates all ground and surface waters of the State as drinking water except where the TDS is greater than 3,000 ppm, the well yield is less than 200 gpd from a single well, the water is a geothermal resource or in a waste water conveyance facility, or the water cannot reasonably be treated for domestic use using either best management practices or best economically achievable treatment practices.	Applicable	The AF agrees with the designation of the current and potential use of the groundwater for this OU as drinking/domestic use.	N2, N3, and N7 groundwater remedial action	No	NA
15	Definition of and Criteria for Identifying Hazardous Wastes	40 CFR 261.3 22 CCR, Div. 4.5, Ch. 11, Article 1, Sections 66261.2-.3; Articles 3, Sections 66262.24 -.33; Article 5, Sections 66261.100-.101	Federal State	Defines wastes that are subject to regulation as a RCRA or [1]California hazardous waste. Excavated contaminated soil, extracted groundwater, and spent treatment residuals (e.g., granular activated carbon) must be classified using AF knowledge of the timing and nature of the release as well as waste toxicity characteristic testing. If, after good faith effort, the AF determines that the contaminated soil or groundwater contains a listed RCRA or [1]California hazardous waste or fails the Federal or State toxicity characteristic tests, then the excavated soil or extracted groundwater is considered hazardous based on EPA's "contained-in" policy and must be managed as hazardous remediation waste. Contaminated soils or groundwater that are treated *in situ* are not subject to the identification or classification requirements.	Applicable	The definitions of hazardous waste in Article 1 and toxicity characteristic criteria (i.e., TTLC and STLC levels) in Section 66261.24 are applicable for the characterization of soil cuttings from well installation, as well as purge water and spent carbon from groundwater monitoring and onsite water treatment. The soil cuttings are not expected to be hazardous. Treated purge water that is discharged to the Base sanitary wastewater treatment facility will no longer be hazardous waste and will be subject to discharge limits based on the facility's discharge permit limits. Spent carbon will be tested prior to off-site disposal or regeneration.	Onsite purge water treatment at Sites N2, N3, and N7	No	NA

Item No.	Requirement	Citation	Federal, State or Local Requirement	Description	ARAR Determination	Comments	Applicable Sites	Change Since ROD Finalized?	Change to Protectiveness
Action-specific ARARs (continued)									
16	Hazardous Waste Land Disposal Restrictions	40 CFR Part 268 22 CCR, Div. 4.5, Ch. 18, Section 66268	Federal State	Identifies hazardous wastes that are restricted from land disposal without prior treatment to UTS. Hazardous remediation wastes that are managed off-site are subject to the LDR UTS specified in Section 66268 for wastewater (liquid) and non-wastewater (solid). Hazardous soils must be treated to 90% reduction in concentration capped at 10 times the UTS for principal hazardous constituents (90% capped at 10 x UTS). On-site treatment or disposal of hazardous remediation wastes are not strictly subject to the LDR treatment standards, but are subject to similar treatment standards specified in the Corrective Action Management Unit Amendment Rule codified in 40 CFR 264.550-.555 and 22 CCR 66264.550-.553.	Applicable	LDR applicable to off-site disposal of soil cuttings, treated groundwater, and spent carbon if these remediation wastes are RCRA or [1]California hazardous waste, as determined through toxicity characteristic testing using TCLP and TTLC/STLC.	Offsite disposal of hazardous remediation wastes from Sites N2, N3, and N7	No	NA
17	Land Use Controls	22 CCR, Div. 4.5, Ch. 39, Section 67391.1 Civil Code Section 1471, a & b	State	Requires that if a remedy will result in hazardous substances remaining on a property at levels not suitable for unrestricted use, the limitations or controls are clearly set forth and defined in the response action decision document, and that the decision document include an implementation and enforcement plan. In the event of a property transfer, requires the state to enter into restrictive land use covenants with land-owners and their successors under such circumstances, with exceptions for federal-to-federal property transfers.	Relevant and appropriate	Institutional controls, limiting exposure to contaminated groundwater, are required at OU 6 until hazardous substance concentrations in groundwater are suitable for unrestricted use. Although it is not contemplated that property at OU 6 will be transferred, in the event that such property is transferred, the AF and the State have agreed to follow the procedure laid out in Section 2.12.2.1 LUC of this ROD.	All portions of OU 6 groundwater plumes with original sources at N2, N3, and N7 requiring institutional controls	No	NA

Notes:

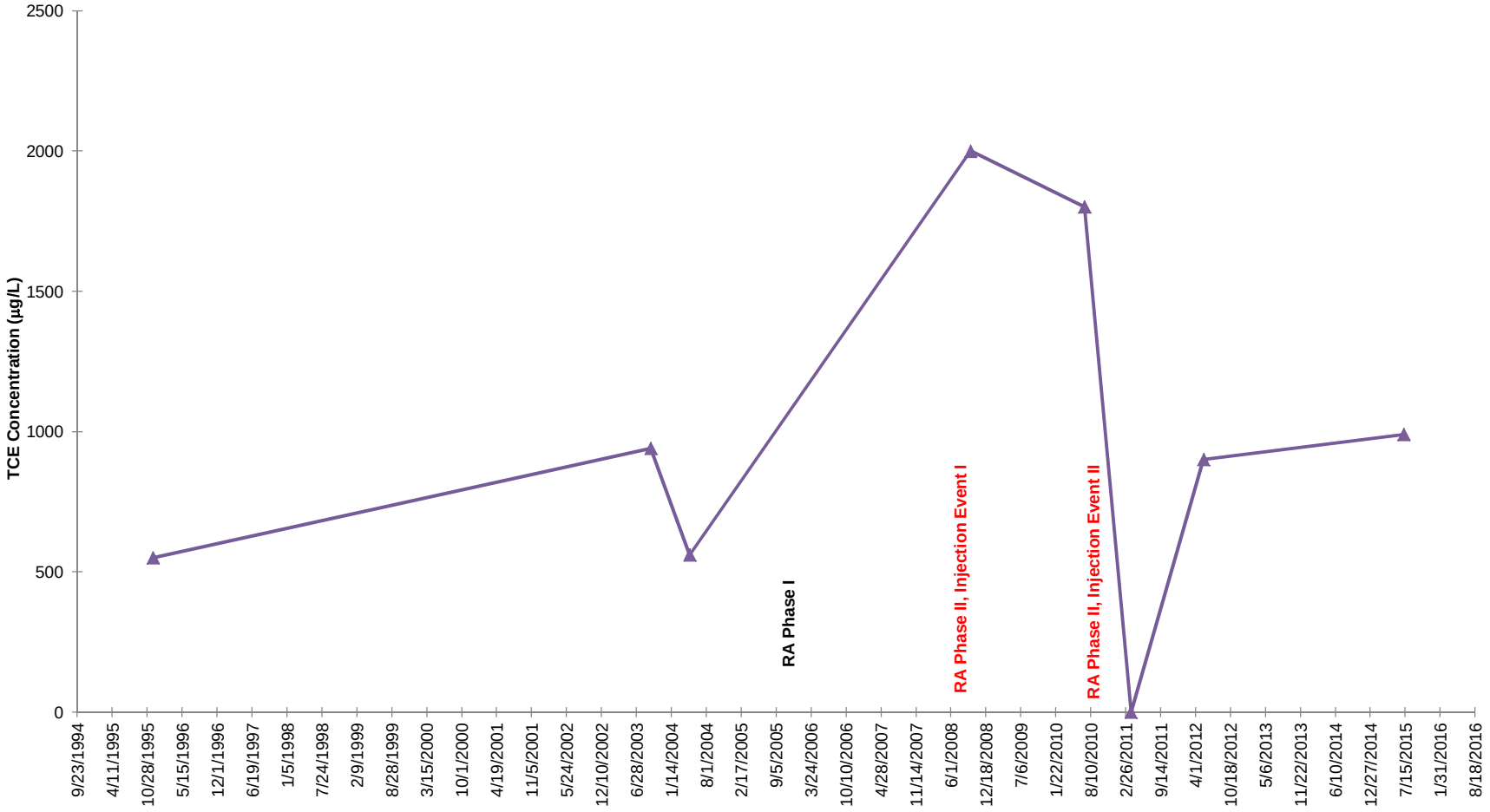
[1]California hazardous waste (as used in this table) is the same as non-RCRA hazardous waste as defined in Section 66261.101 of CCR Title 22.

μg/L	micrograms per liter
AF	Air Force
AFB	Air Force Base
ARARs	Applicable or Relevant and Appropriate Requirements
Basin Plan	Water Quality Control Plan for Lahontan Region
CA	California
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
Ch.	Chapter
COC	contaminant of concern
CWC	California Water Code
Div.	Division
e.g.	*exempli gratia* (for example)
EPA	Environmental Protection Agency
et seq.	*et sequentes* (and the following)
gpd	gallons per day
H&S	health and safety
ID	identification
i.e.	*id est*, that is
LDR	land disposal restriction
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
NA	not applicable
NCP	National Contingency Plan
No.	number
OU	Operable Unit
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision document
RWQCB	Regional Water Quality Control Board
SDWA	Safe Drinking Water Act
STLC	soluble threshold limit concentration
SWRCB	State Water Resources Control Board
TCLP	toxic characteristic leaching procedure
TDS	total dissolved solid
TEFA	Technical and Economic Feasibility Analysis
TTLC	total threshold limit concentration
UIC	Underground Injection Control
U.S.C.	United States Code
UTS	universal treatment standard

APPENDIX G

CONTAMINANT CONCENTRATION TREND GRAPHS

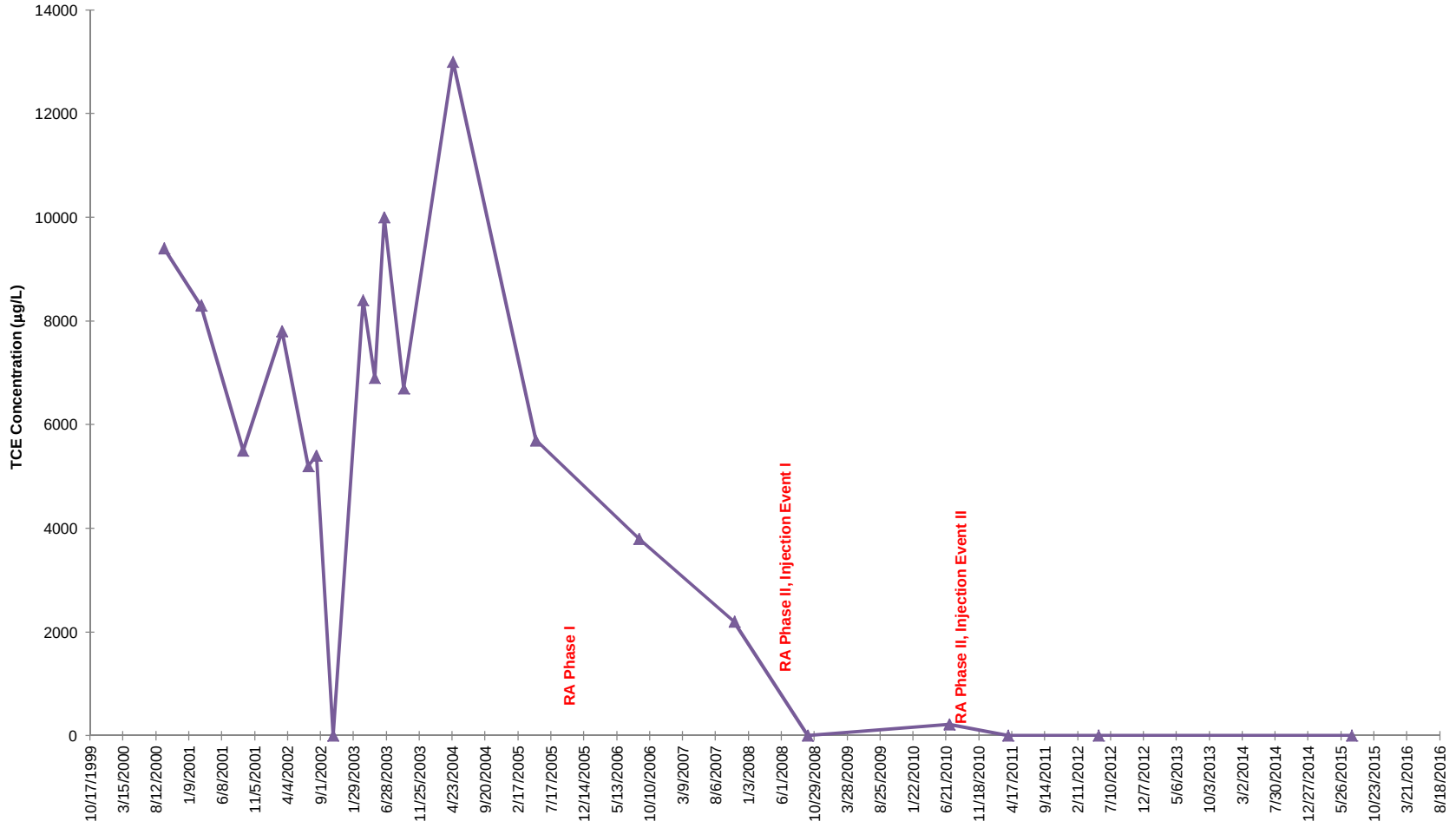
TCE Concentration Trends in ISCO Injection/Monitoring Well N3-MW05
(screened 8 to 33 feet below ground surface)



***Notes*:**
ISCO - *In Situ* Chemical Oxidation
RA - Remedial Action
TCE - Trichloroethene

Red Font Color Indicates Subject Well Used For Injection During Indicated Event
RA Phase I Injection (6/21/05 to 7/14/05)
RA Phase II, Injection Event I (3/3/08 to 3/21/08)
RA Phase II, Injection Event II (8/16/10 to 8/26/10)

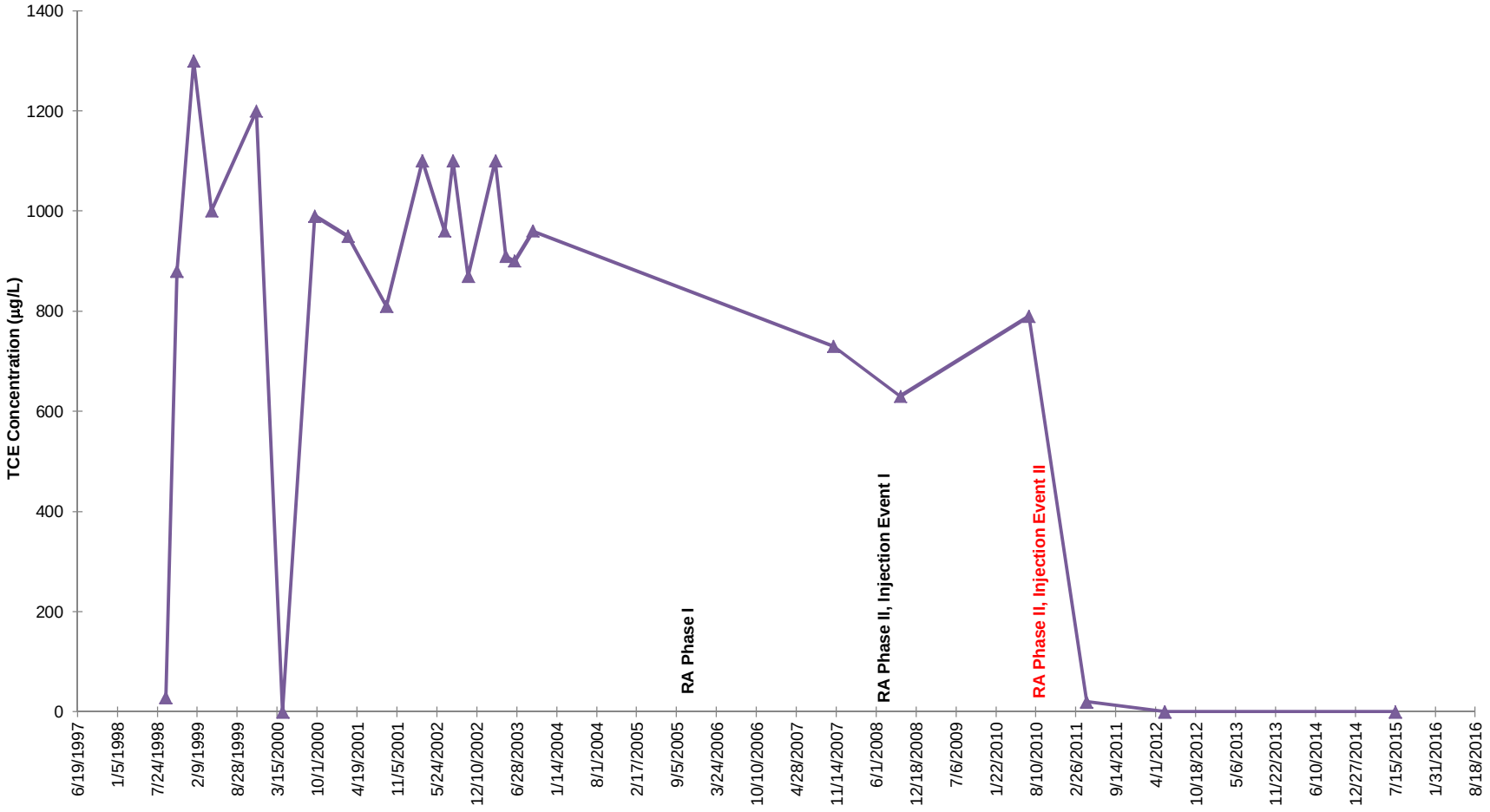
TCE Concentration Trends in ISCO Injection/Monitoring Well N3-MW07
(screened 41 to 51 feet below ground surface)



***Notes*:**
ISCO - *In Situ* Chemical Oxidation
RA - Remedial Action
TCE - Trichloroethene

Red Font Color Indicates Subject Well Used For Injection During Indicated Event
RA Phase I Injection (6/21/05 to 7/14/05)
RA Phase II, Injection Event I (3/3/08 to 3/21/08)
RA Phase II, Injection Event II (8/16/10 to 8/26/10)

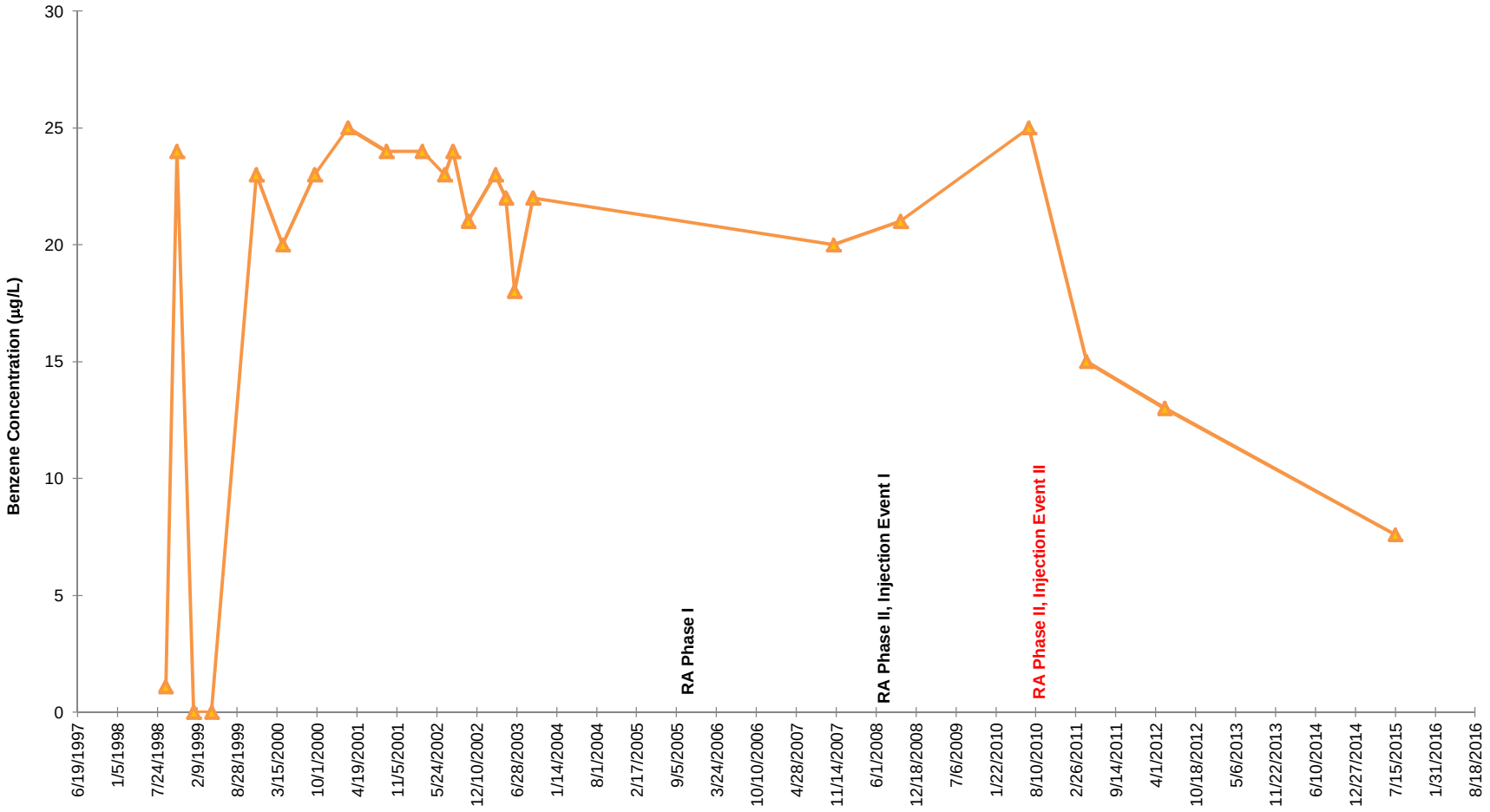
TCE Concentration Trends in ISCO Injection/Monitoring Well N3-MW12
(screened 188 to 210 feet below ground surface)



***Notes*:**
ISCO - *In Situ* Chemical Oxidation
RA - Remedial Action
TCE - Trichloroethene

Red Font Color Indicates Subject Well Used For Injection During Indicated Event
RA Phase I Injection (6/21/05 to 7/14/05)
RA Phase II, Injection Event I (3/3/08 to 3/21/08)
RA Phase II, Injection Event II (8/16/10 to 8/26/10)

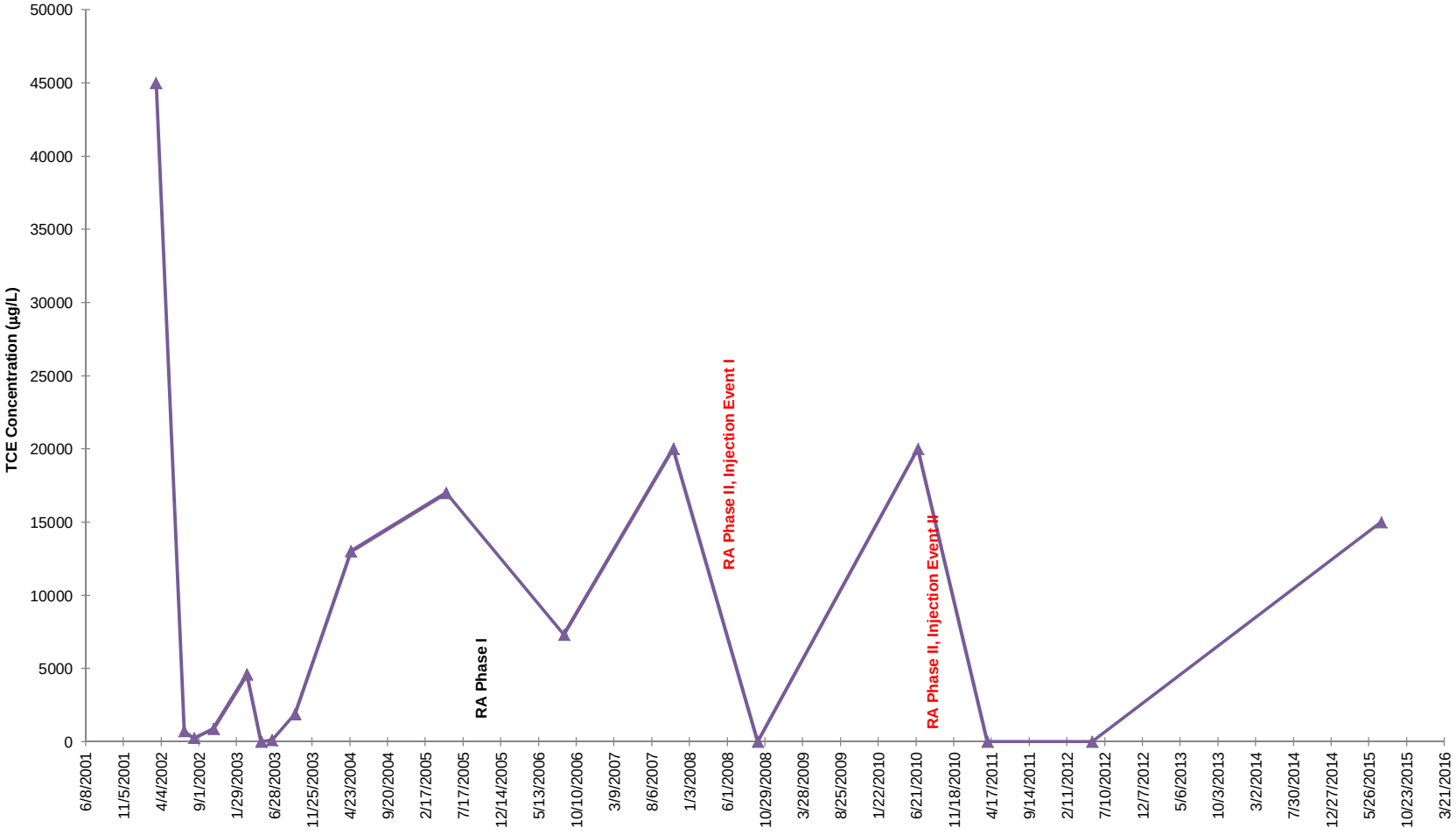
Benzene Concentration Trends in ISCO Injection/Monitoring Well N3-MW12
(screened 188 to 210 feet below ground surface)



***Notes*:**
ISCO - *In Situ* Chemical Oxidation
RA - Remedial Action

Red Font Color Indicates Subject Well Used For Injection During Indicated Event
RA Phase I Injection (6/21/05 to 7/14/05)
RA Phase II, Injection Event I (3/3/08 to 3/21/08)
RA Phase II, Injection Event II (8/16/10 to 8/26/10)

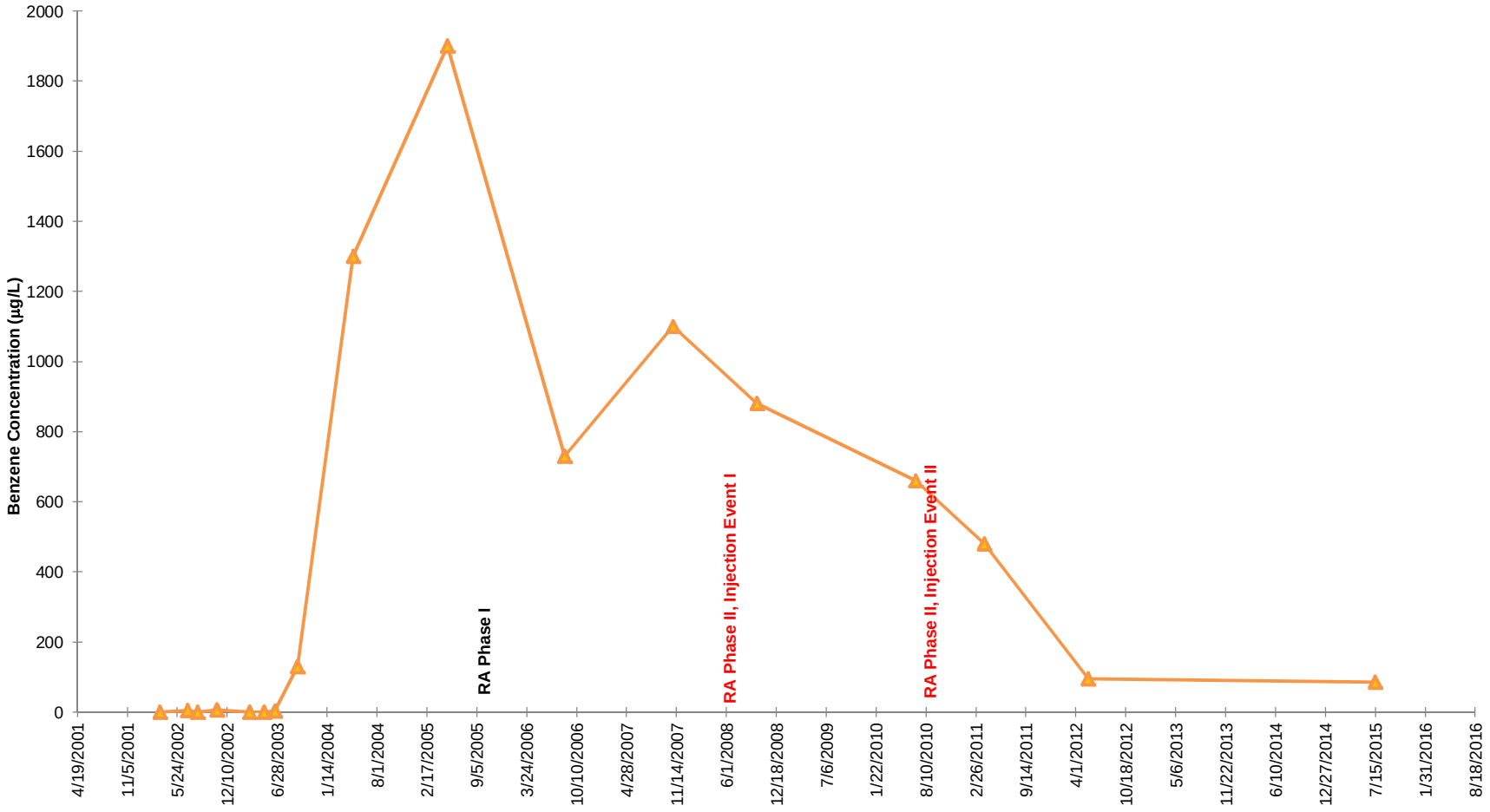
TCE Concentration Trends in ISCO Injection/Monitoring Well N3-MW15
(screened 15 to 100 feet below ground surface)



***Notes*:**
ISCO - *In Situ* Chemical Oxidation
RA - Remedial Action
TCE - Trichloroethene

Red Font Color Indicates Subject Well Used For Injection During Indicated Event
RA Phase I Injection (6/21/05 to 7/14/05)
RA Phase II, Injection Event I (3/3/08 to 3/21/08)
RA Phase II, Injection Event II (8/16/10 to 8/26/10)

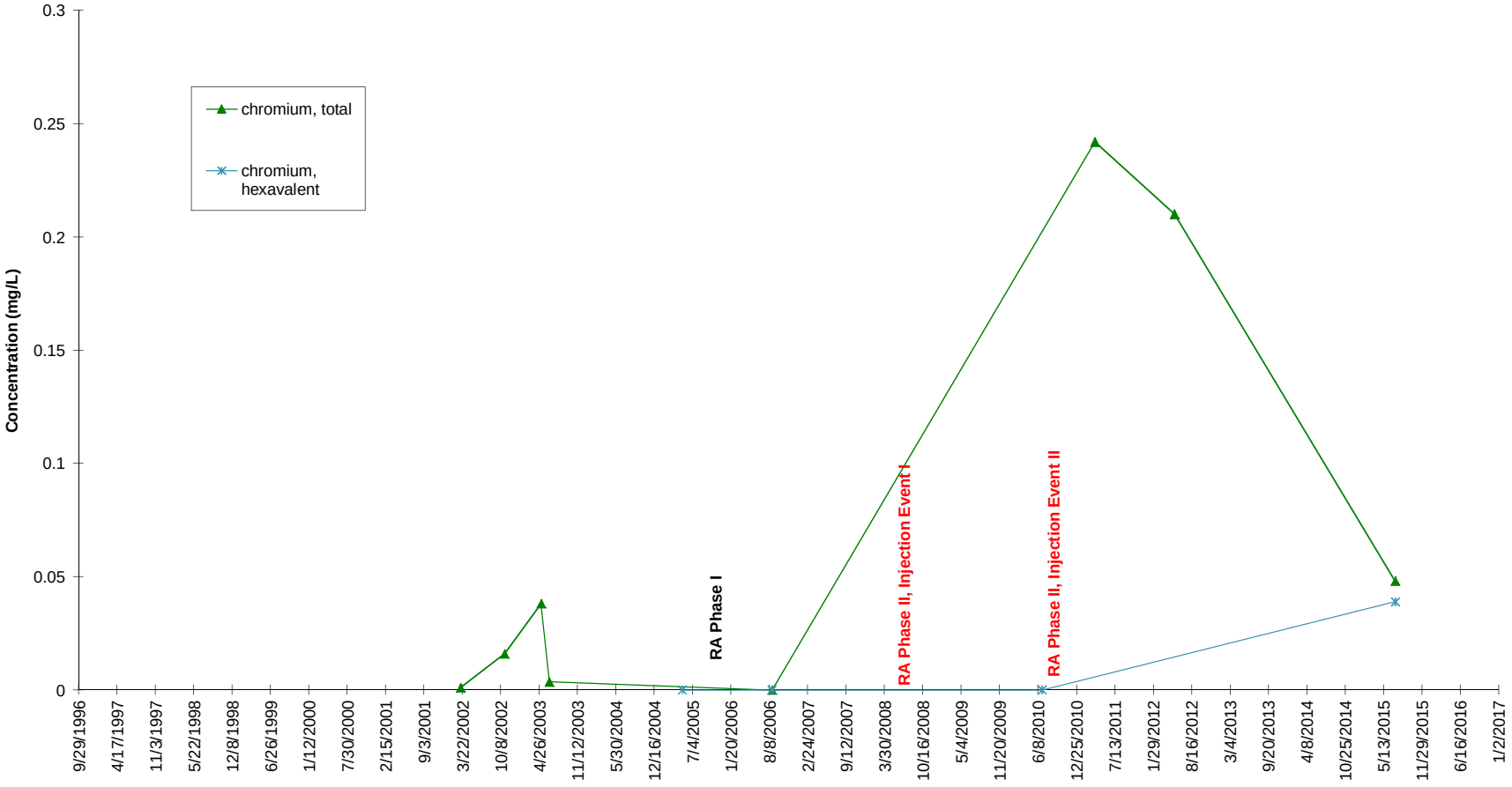
Benzene Concentration Trends in ISCO Injection/Monitoring Well N3-MW15
(screened 15 to 100 feet below ground surface)



***Notes*:**
ISCO - *In Situ* Chemical Oxidation
RA - Remedial Action

Red Font Color Indicates Subject Well Used For Injection During Indicated Event
RA Phase I Injection (6/21/05 to 7/14/05)
RA Phase II, Injection Event I (3/3/08 to 3/21/08)
RA Phase II, Injection Event II (8/16/10 to 8/26/10)

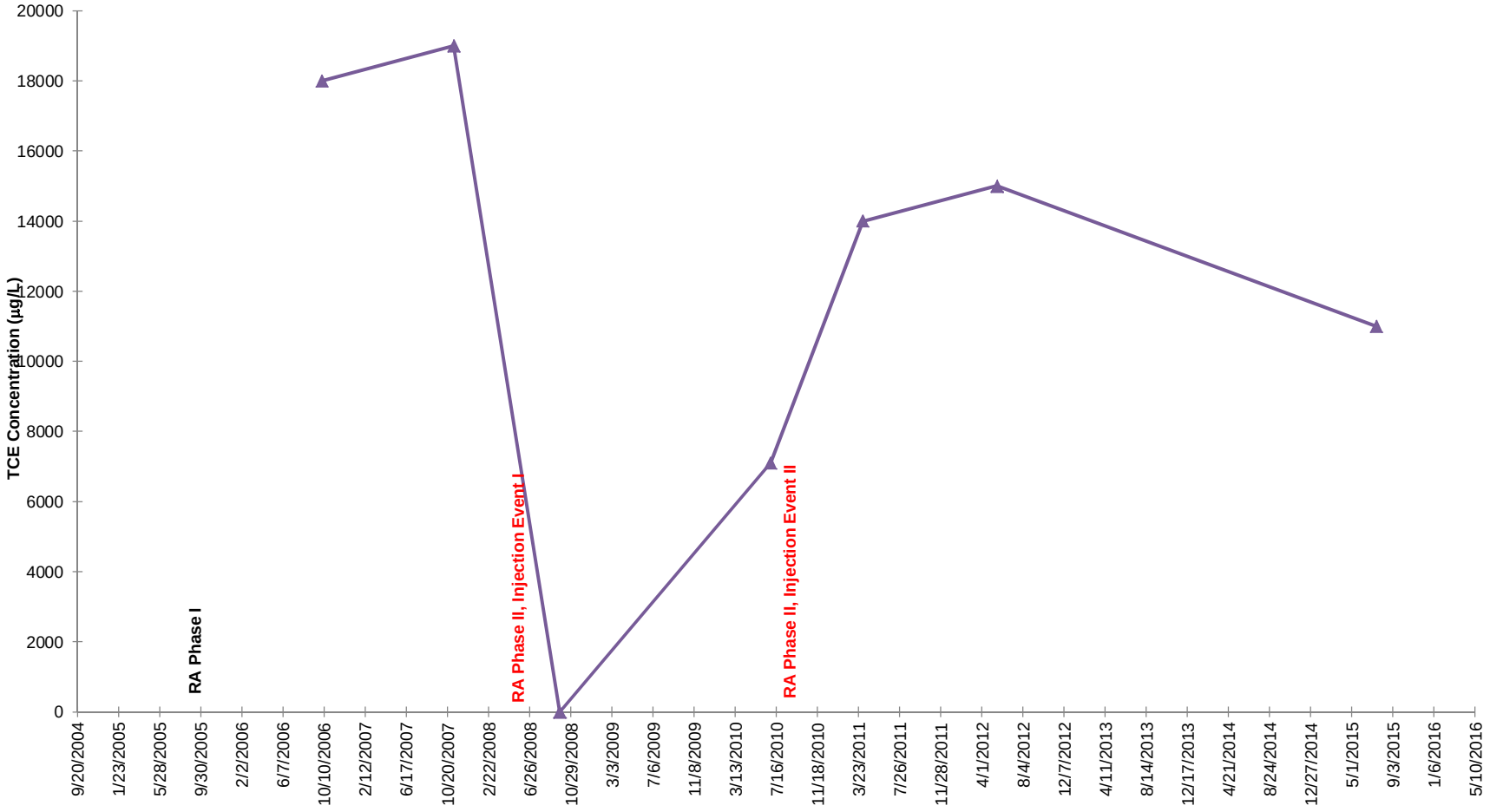
Chromium Concentration Trends in ISCO Injection/Monitoring Well N3-MW15
(screened 15 to 100 feet below ground surface)



***Notes*:**
ISCO - *In Situ* Chemical Oxidation
RA - Remedial Action

Red Font Color Indicates Subject Well Used For Injection During Indicated Event
RA Phase I Injection (6/21/05 to 7/14/05)
RA Phase II, Injection Event I (3/3/08 to 3/21/08)
RA Phase II, Injection Event II (8/16/10 to 8/26/10)

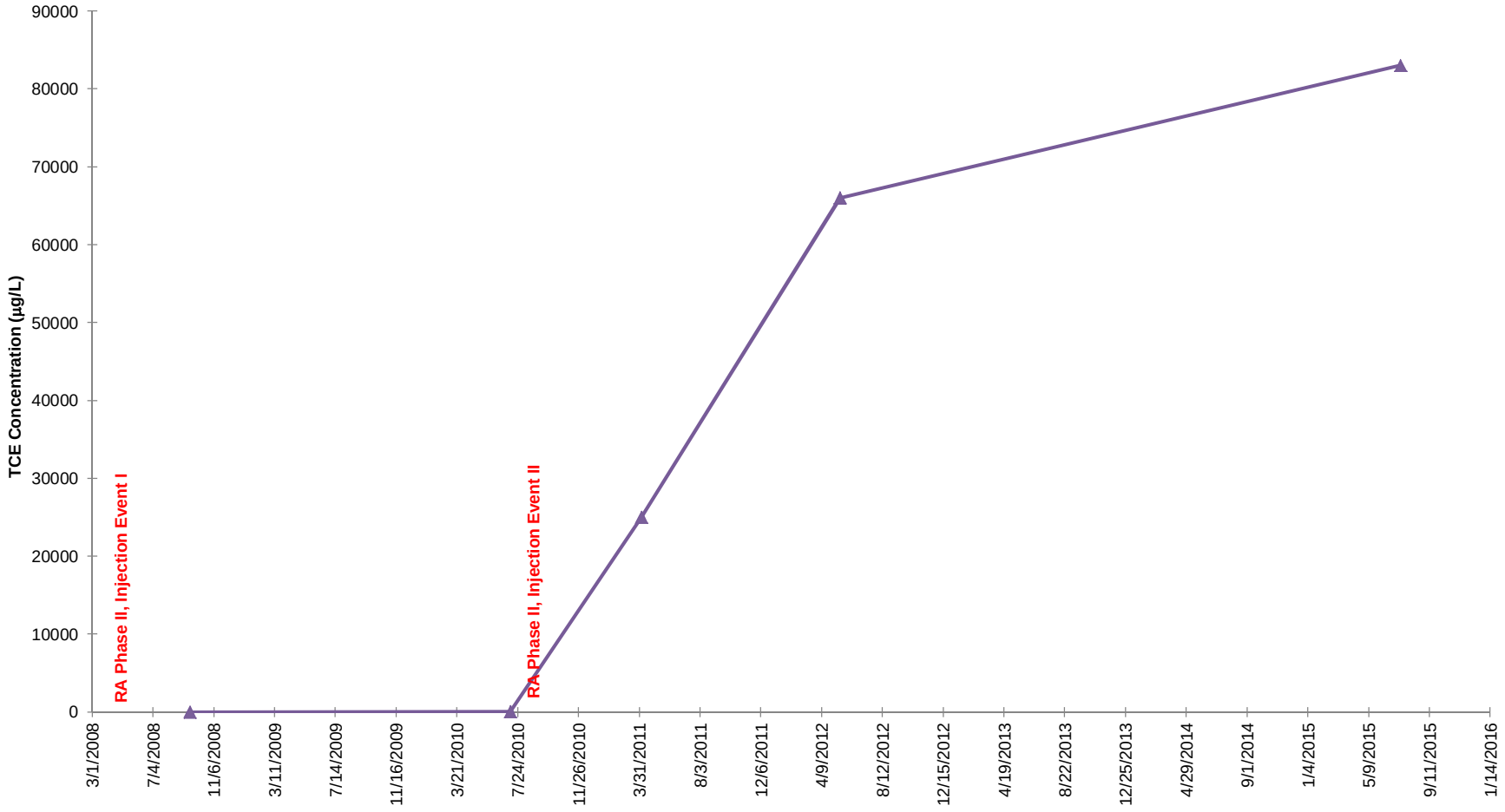
TCE Concentration Trends in ISCO Injection/Monitoring Well N3-MW21
(screened 19 to 99 feet below ground surface)



***Notes*:**
ISCO - *In Situ* Chemical Oxidation
RA - Remedial Action
TCE - Trichloroethene

Red Font Color Indicates Subject Well Used For Injection During Indicated Event
RA Phase I Injection (6/21/05 to 7/14/05)
RA Phase II, Injection Event I (3/3/08 to 3/21/08)
RA Phase II, Injection Event II (8/16/10 to 8/26/10)

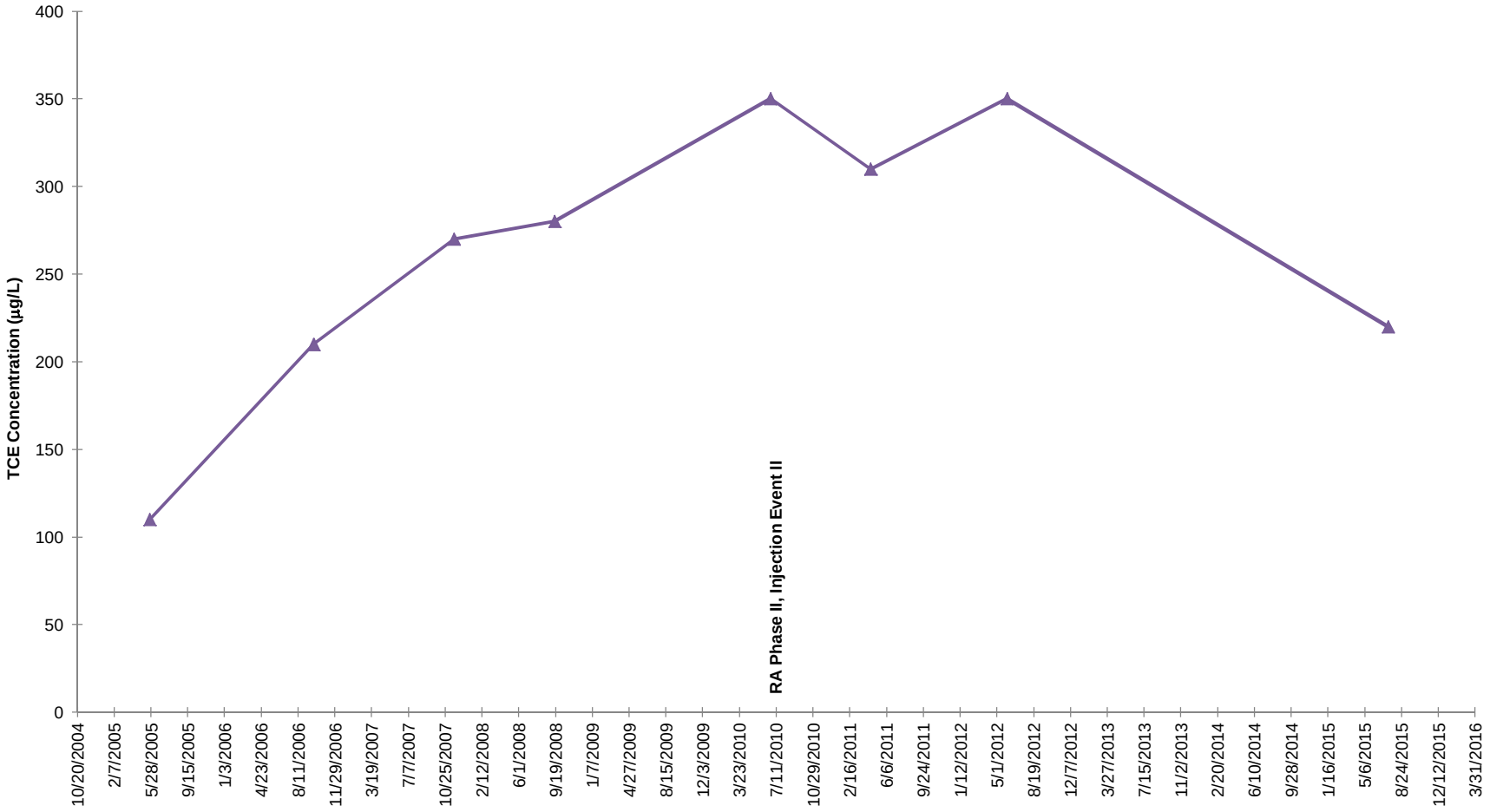
TCE Concentration Trends in ISCO Injection/Monitoring Well N3-MW22
(screened 20 to 100 feet below ground surface)



***Notes*:**
ISCO - *In Situ* Chemical Oxidation
RA - Remedial Action
TCE - Trichloroethene

RA Phase II, Injection Event I (3/3/08 to 3/21/08)
RA Phase II, Injection Event II (8/16/10 to 8/26/10)

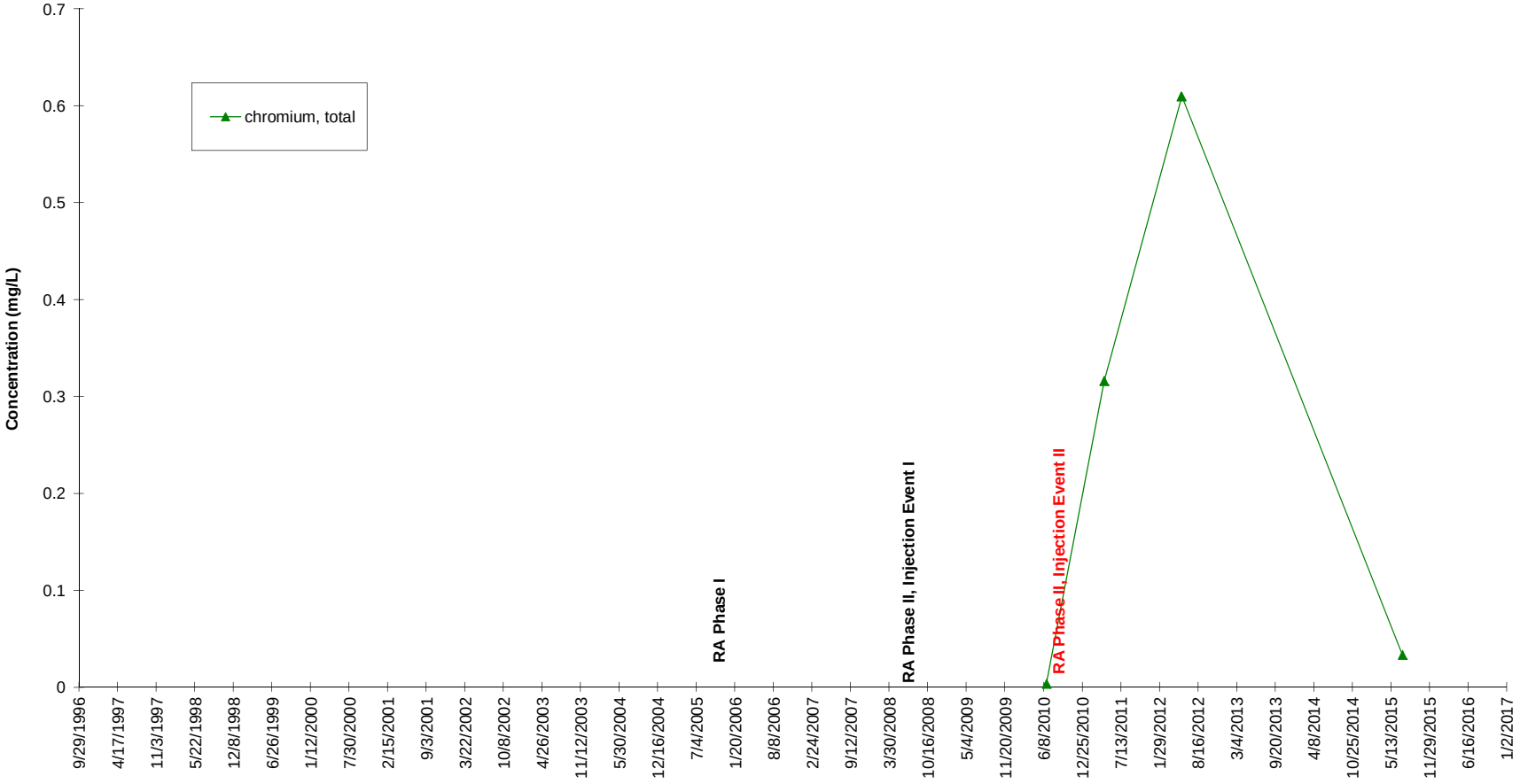
TCE Concentration Trends in Plume Monitoring Well N4-MW06
(screened 5.5 to 20.5 feet below ground surface)



***Notes*:**
ISCO - *In Situ* Chemical Oxidation
RA - Remedial Action
TCE - Trichloroethene

Red Font Color Indicates Subject Well Used For Injection During Indicated Event
RA Phase I Injection (6/21/05 to 7/14/05)
RA Phase II, Injection Event I (3/3/08 to 3/21/08)
RA Phase II, Injection Event II (8/16/10 to 8/26/10)

Chromium Concentration Trends in ISCO Injection/Monitoring Well N4-MW07
(screened 15 to 100 feet below ground surface)



***Notes*:**
ISCO - *In Situ* Chemical Oxidation
RA - Remedial Action

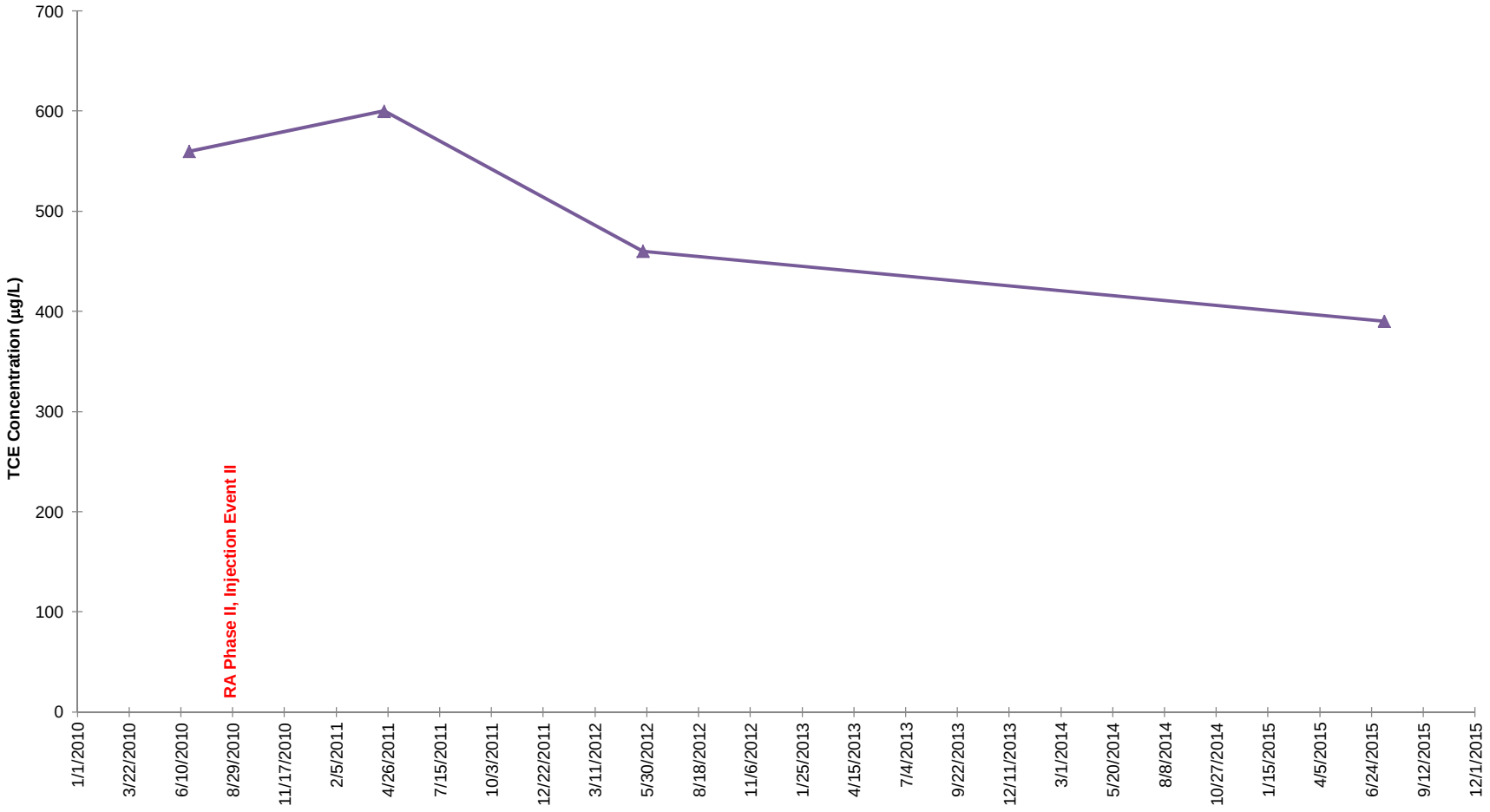
Red Font Color Indicates Subject Well Used For Injection During Indicated Event
RA Phase I Injection (6/21/05 to 7/14/05)
RA Phase II, Injection Event I (3/3/08 to 3/21/08)
RA Phase II, Injection Event II (8/16/10 to 8/26/10)

TCE Concentration Trends in ISCO Monitoring Well N4-MW08
(screened 15 to 100 feet below ground surface)

***Notes*:**
ISCO - *In Situ* Chemical Oxidation
RA - Remedial Action
TCE - Trichloroethene

Red Font Color Indicates Subject Well Used For Injection During Indicated Event
RA Phase I Injection (6/21/05 to 7/14/05)
RA Phase II, Injection Event I (3/3/08 to 3/21/08)
RA Phase II, Injection Event II (8/16/10 to 8/26/10)

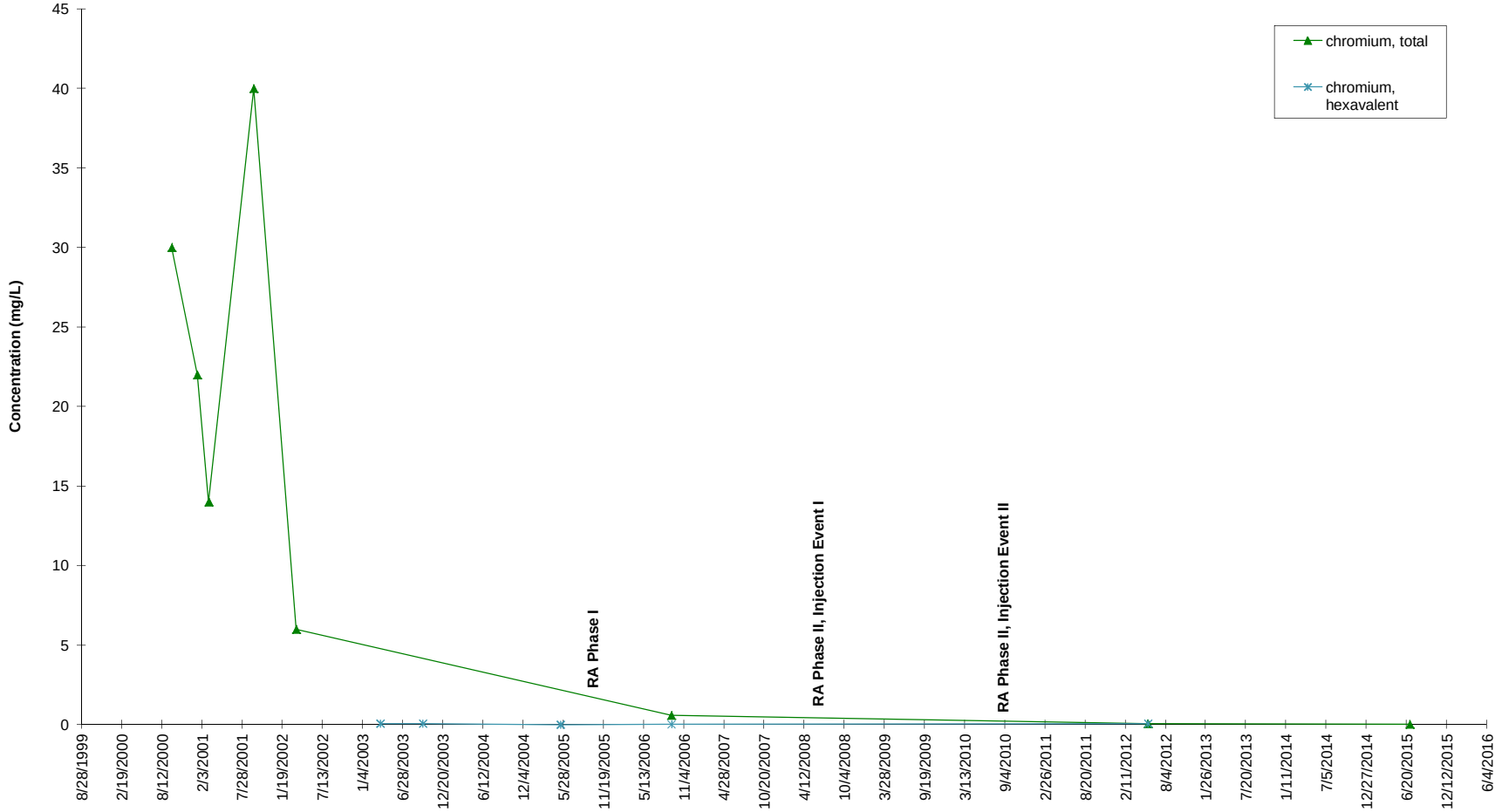
TCE Concentration Trends in ISCO Monitoring Well N4-MW09
(screened 15 to 100 feet below ground surface)



***Notes*:**
ISCO - *In Situ* Chemical Oxidation
RA - Remedial Action
TCE - Trichloroethene

Red Font Color Indicates Subject Well Used For Injection During Indicated Event
RA Phase I Injection (6/21/05 to 7/14/05)
RA Phase II, Injection Event I (3/3/08 to 3/21/08)
RA Phase II, Injection Event II (8/16/10 to 8/26/10)

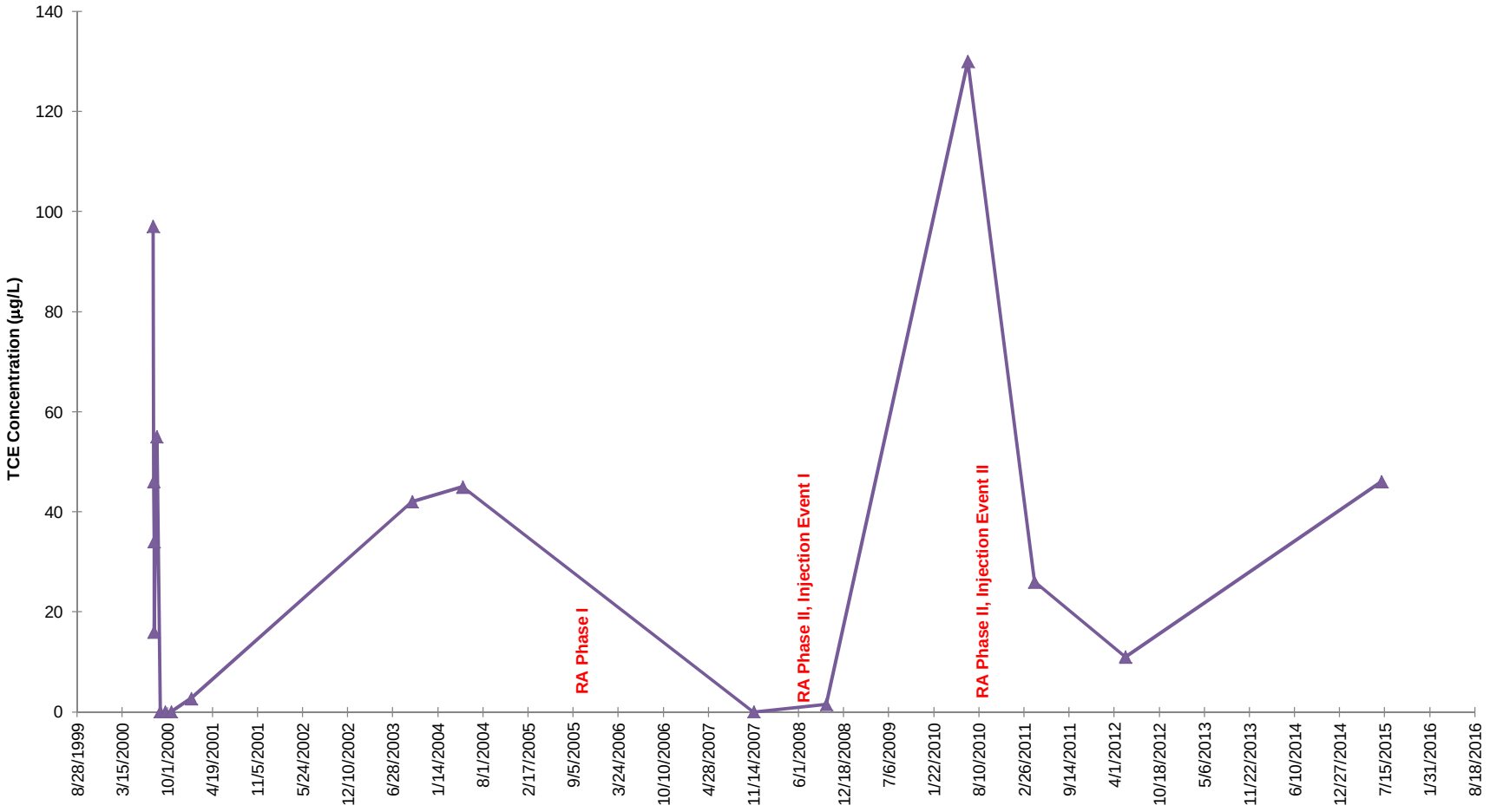
Chromium Concentration Trends in ISCO Monitoring Well N7-MW02
(screened 45 to 55 feet below ground surface)



***Notes*:**
ISCO - *In Situ* Chemical Oxidation
RA - Remedial Action

Red Font Color Indicates Subject Well Used For Injection During Indicated Event
RA Phase I Injection (6/21/05 to 7/14/05)
RA Phase II, Injection Event I (3/3/08 to 3/21/08)
RA Phase II, Injection Event II (8/16/10 to 8/26/10)

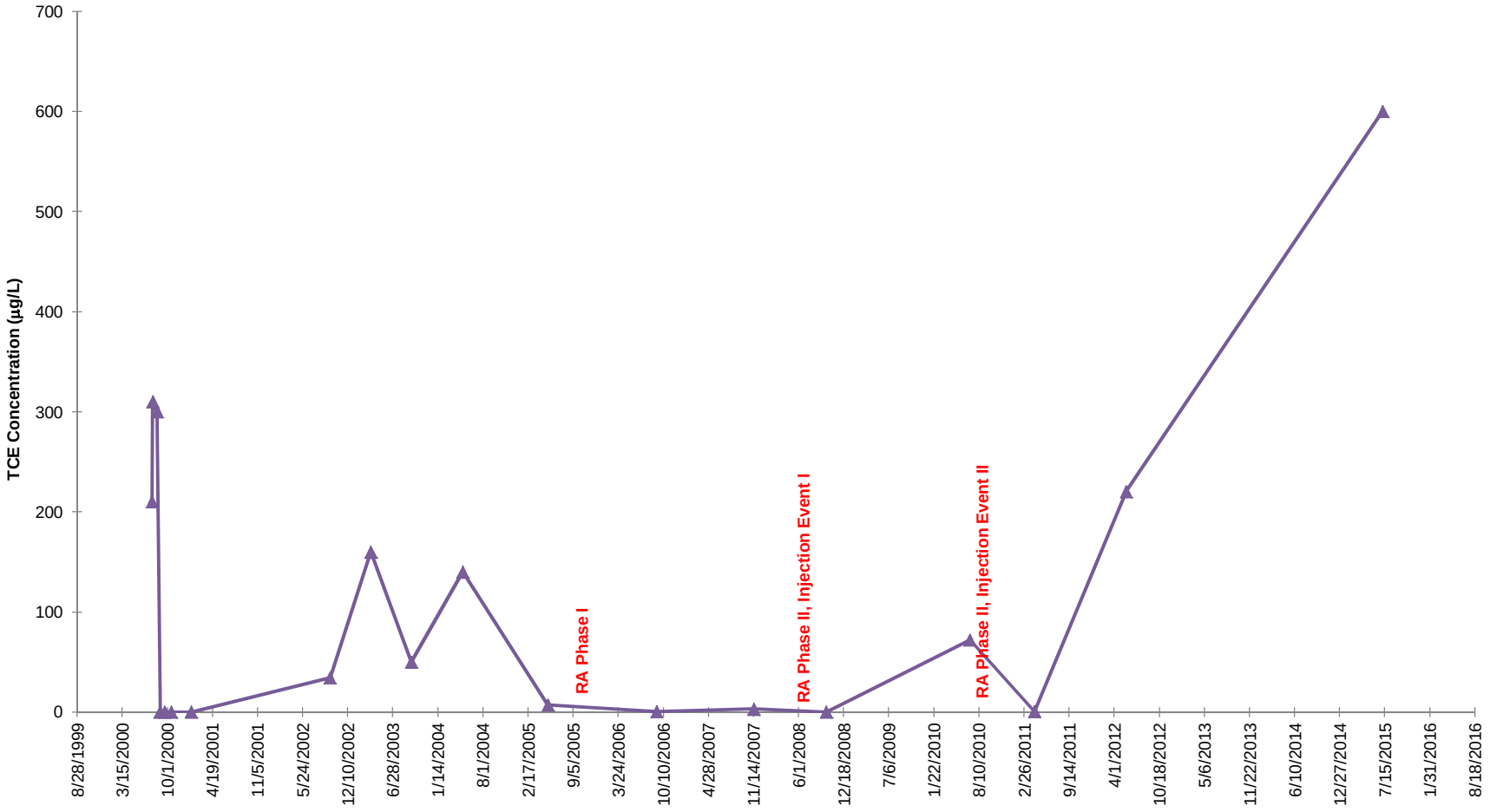
TCE Concentration Trends in ISCO Injection/Monitoring Well N7-MW10
(screened 15 to 35 feet below ground surface)



***Notes*:**
ISCO - *In Situ* Chemical Oxidation
RA - Remedial Action
TCE - Trichloroethene

Red Font Color Indicates Subject Well Used For Injection During Indicated Event
RA Phase I Injection (6/21/05 to 7/14/05)
RA Phase II, Injection Event I (3/3/08 to 3/21/08)
RA Phase II, Injection Event II (8/16/10 to 8/26/10)

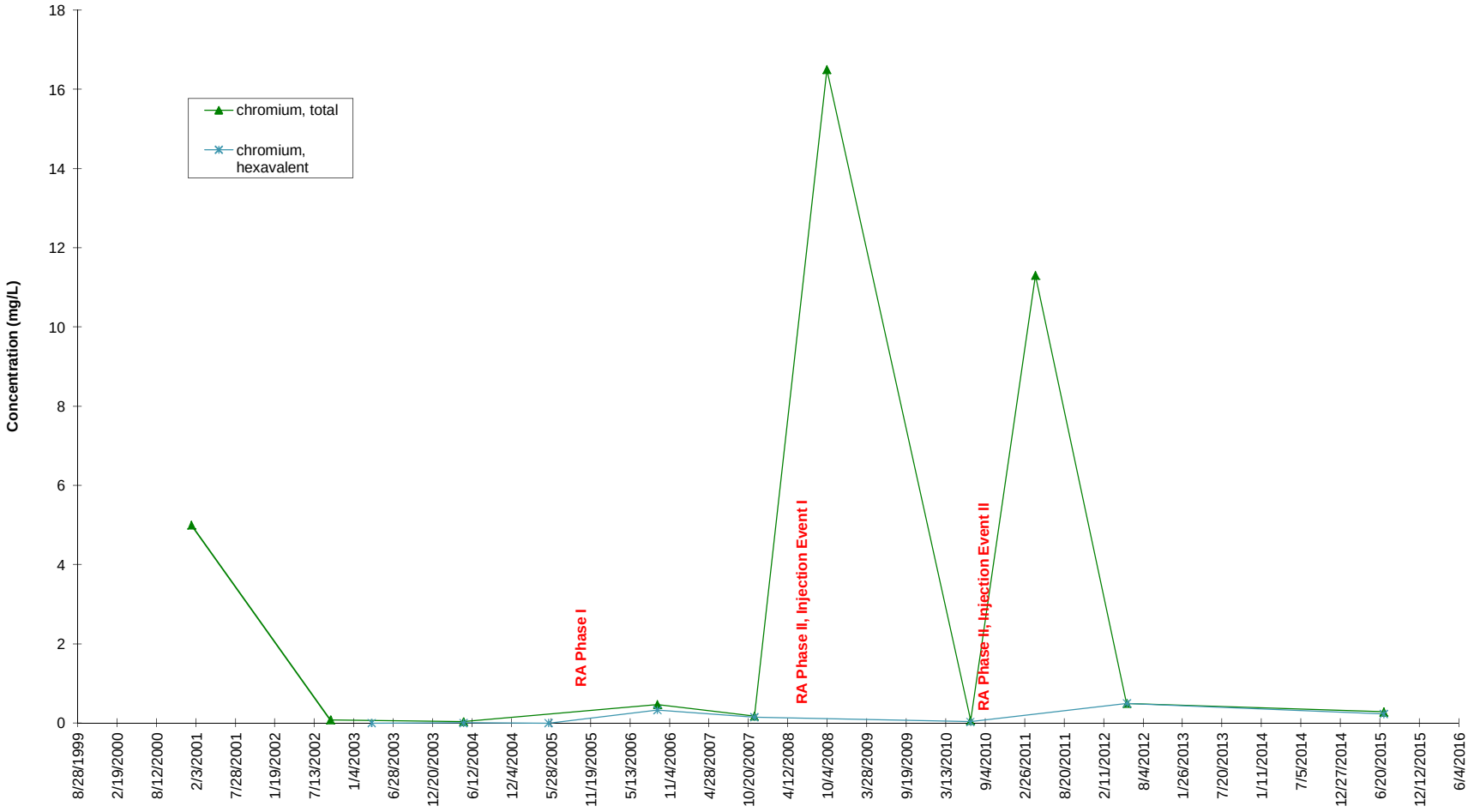
TCE Concentration Trends in ISCO Injection/Monitoring Well N7-MW11
(screened 15 to 40 feet below ground surface)



***Notes*:**
ISCO - *In Situ* Chemical Oxidation
RA - Remedial Action
TCE - Trichloroethene

Red Font Color Indicates Subject Well Used For Injection During Indicated Event
RA Phase I Injection (6/21/05 to 7/14/05)
RA Phase II, Injection Event I (3/3/08 to 3/21/08)
RA Phase II, Injection Event II (8/16/10 to 8/26/10)

Chromium Concentration Trends in ISCO Injection/Monitoring Well N7-MW11
(screened 15 to 40 feet below ground surface)



***Notes*:**
ISCO - *In Situ* Chemical Oxidation
RA - Remedial Action

Red Font Color Indicates Subject Well Used For Injection During Indicated Event
RA Phase I Injection (6/21/05 to 7/14/05)
RA Phase II, Injection Event I (3/3/08 to 3/21/08)
RA Phase II, Injection Event II (8/16/10 to 8/26/10)

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APPENDIX H

SITE INSPECTION REPORT AND WELL NETWORK INSPECTION RESULTS

Five-Year Review Site Inspection Checklist

Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable."

I. SITE INFORMATION	
Site name: Operable Unit 6, NASA AFRC	**Date of inspection:** 17 February 2016
Location and Region: Edwards AFB, EPA Region IX	**EPA ID:** CA1570024504
Agency, office, or company leading the five-year review: AFCEC/CZOW and NASA AFRC SH&E	**Weather/temperature:** cloudy/73°F

Remedy Includes:

Landfill cover/containment
√ Access controls
√ Institutional controls
Groundwater pump and treatment
Surface water collection and treatment
Monitored natural attenuation
Groundwater containment
Vertical barrier walls
√ Other: *in situ* chemical oxidation treatment using permanganate of high-concentration portions of chlorinated hydrocarbon plume, enhanced natural attenuation treatment of high-concentration portions of aromatic hydrocarbon plume, groundwater monitoring to demonstrate and document natural attenuation of low-concentration areas of groundwater plume.

Attachments: √ Inspection team roster attached √ Cost Summary attached √ Site photos attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; _____
   _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; _____
   _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency USEPA Region 9
Contact Kevin Mayer — Remedial Project Manager — 21 April 2016 — (415) 972-3176
Name — Title — Date — Phone no.
Problems; suggestions; Report attached. _____

Agency California DTSC
Contact Bruce Lewis — Remedial Project Manager — 23 April 2016 — (916) 255-6648
Name — Title — Date — Phone no.
Problems; suggestions; Report attached. _____

Agency CRWQCB, Lahontan Region
Contact Christina Guerra — Remedial Project Manager — 6 May 2016 — (760) 241-7333
Name — Title — Date — Phone no.
Problems; suggestions; Report attached. _____

4. **Other interviews** (optional) Report attached.

Additional interviews with onsite NASA AFRC staff and Base Civil Engineering staff are documented in Appendix E.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

O&M manual	Readily available	Up to date	√N/A
As-built drawings	Readily available	Up to date	√N/A
Maintenance logs	Readily available	Up to date	√N/A

Remarks The remedial action utilizes mobile injection equipment and not the standard aboveground treatment system. A work plan and work plan addendum are readily available and up to date at the NASA SH&E office and at the remedial action contractor's field office.

2. **Site-Specific Health and Safety Plan** √Readily available √Up to date N/A

Contingency plan/emergency response plan	√Readily available	√Up to date	N/A

Remarks Copies of the site-specific health and safety plan are readily available and up to date at the NASA SH&E office and at the remedial action contractor's field office.

3. **O&M and OSHA Training Records** √Readily available √ Up to date N/A

Remarks OSHA training records are readily available and up to date at the remedial action contractor's project office.

4. **Permits and Service Agreements**

Air discharge permit	Readily available	Up to date	√N/A
Effluent discharge	Readily available	Up to date	√N/A
Waste disposal, POTW	Readily available	Up to date	√N/A
Other permits_____	Readily available	Up to date	√N/A

Remarks: NASA AFRC issues dig permits. Dig permits are available at the NASA AFRC SH&E office. Ms. Jennifer Flavin (NASA AFRC Environmental Manager) inspected/reviewed dig permits issued during the reporting period. The reviews are documented in the Annual LUC Reports.

5. **Gas Generation Records** Readily available Up to date √N/A

Remarks_____

6. **Settlement Monument Records** Readily available Up to date √N/A

Remarks_____

7. **Groundwater Monitoring Records** √Readily available √Up to date N/A

Remarks Groundwater monitoring records are included in the Remedy Performance and Groundwater Monitoring Reports, copies of which are available and up to date at the NASA SH&E office, Edwards AFB library, and at the remedial action contractor's project office.

8. **Leachate Extraction Records** Readily available Up to date √N/A

Remarks_____

9. **Discharge Compliance Records**

Air	Readily available	Up to date	√N/A
Water (effluent)	Readily available	Up to date	√N/A

Remarks_____

10. **Daily Access/Security Logs** Readily available Up to date N/A

Remarks Site is within NASA AFRC secured area. Full badging is required. Logs are kept at the NASA Security office and not available for review.

IV. O&M COSTS

1. **O&M Organization**

State in-house — Contractor for State
PRP in-house — Contractor for PRP
Federal Facility in-house — √Contractor for Federal Facility

2. **O&M Cost Records**

Readily available — Up to date
√Funding mechanism/agreement in place
Original O&M cost estimate (reporting period) $622,000 — √Breakdown attached

Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
September 2011	September 2012	91,000	√Breakdown attached
September 2012	September 2013	$80,000	√Breakdown attached
September 2013	September 2014	$205,000	√Breakdown attached
September 2014	September 2015	$355,000	√Breakdown attached
September 2015	September 2016	$526,000	√Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Actual costs differed significantly from the original costs developed in 2003 in the FS and as documented in the ROD, primarily due to a difference in the scheduling of field tasks. The total operational cost for 5 years (the second reporting period) is $1,257,000, which is 102 percent higher than estimated. As shown in the attached Cost Summary, increased costs were incurred in 2012, 2014, and 2015 during the reporting period. The original estimated fiscal year (FY) 2012 (Year 6) cost was $3,000 (rounded to the nearest $1,000). The actual operational cost for Year 6 is $80,000. The increase in cost is due to groundwater monitoring, which was not included in the Year 6 operational cost estimate. The original estimated FY 2014 (Year 8) cost was $4,000 (rounded to the nearest $1,000) and the actual operational cost for Year 8 was $355,000. The original estimated FY 2015 (Year 9) cost was $214,000, and the actual operational cost for Year 9 was $526,000. The higher actual costs were due to the costs associated with groundwater monitoring well installation and production of a Five-Year Review Addendum document, which were not originally planned. The estimate documented in the ROD assumed that the groundwater plume had been completely delineated.

V. ACCESS AND INSTITUTIONAL CONTROLS — √Applicable — N/A

A. Fencing

1. **Fencing damaged** — Location shown on site map — √Gates secured — N/A

Remarks No damage observed

B. Other Access Restrictions

1. **Signs and other security measures** — Location shown on site map — N/A

Remarks Motion detectors along fence line on lakebed side.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	Yes	√No	N/A
Site conditions imply ICs not being fully enforced	Yes	√ No	N/A

Type of monitoring (*e.g.*, self-reporting, drive by) site is secured and patrolled daily by NASA AFRC security.
Frequency daily
Responsible party/agency AFCEC/CZOW

Contact	Ai Duong	Remedial Project Manager	reporting period	661-277-1474
	Name	Title	Date	Phone no.

Reporting is up-to-date	√Yes	No	N/A
Reports are verified by the lead agency	Yes	No	√N/A
Specific requirements in deed or decision documents have been met	√Yes	No	N/A
Violations have been reported	Yes	No	√N/A

Other problems or suggestions:
Clarification: Information presented above was obtained by review of Annual LUC Reports prepared by AFCEC/CZOW and submitted to Mr. Joe Healy/Mr. Kevin Mayer (USEPA Region 9, Lead Regulatory Agency). It is unknown if the reports are "verified" after submittal. The GIS was inspected by the inspection team on 17 February 2016. The inspection was performed by accessing OU 6 information by Web Map. The inspection verified that land use restrictions are included in the GIS via hyperlink to LUC ROD sections. Additionally, the GIS is up-to-date regarding the geographic control boundary (boundary based on June-July 2015 benzene, carbon tetrachloride and TCE results) as verified by Mr. Julio Barrios (GIS Manager with 412 CEG/CEVA).

2. **Adequacy** √ICs are adequate ICs are inadequate N/A
Remarks

D. General

1. **Vandalism/trespassing** Location shown on site map √No vandalism evident
Remarks

2. **Land use changes on site** N/A
Remarks During the site inspection, Ms. Kimberly Coleman (USAF and NASA contractor) noted the former location of Building 4810 (building was the subject of 2013 VIP investigations and was demolished in 2014).

3. **Land use changes off site** √N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads √Applicable N/A

1. **Roads damaged** Location shown on site map √Roads adequate N/A
   Remarks_____

B. Other Site Conditions

Remarks _____
_____
_____
_____
_____
_____

VII. LANDFILL COVERS Applicable √ N/A

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Cracks** Location shown on site map Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____
   _____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Holes** Location shown on site map Holes not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

5. **Vegetative Cover** Grass Cover properly established No signs of stress
   Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____
   _____

6. **Alternative Cover (armored rock, concrete, etc.)** N/A
   Remarks_____
   _____

7. **Bulges** Location shown on site map Bulges not evident
Areal extent_____ Height_____
Remarks_____
_____

8. **Wet Areas/Water Damage** Wet areas/water damage not evident
Wet areas Location shown on site map Areal extent_____
Ponding Location shown on site map Areal extent_____
Seeps Location shown on site map Areal extent_____
Soft subgrade Location shown on site map Areal extent_____
Remarks_____
_____

9. **Slope Instability** Slides Location shown on site map No evidence of slope instability
Areal extent_____
Remarks_____
_____

B. Benches Applicable N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** Location shown on site map N/A or okay
Remarks_____
_____

2. **Bench Breached** Location shown on site map N/A or okay
Remarks_____
_____

3. **Bench Overtopped** Location shown on site map N/A or okay
Remarks_____
_____

C. Letdown Channels Applicable N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** Location shown on site map No evidence of settlement
Areal extent_____ Depth_____
Remarks_____
_____

2. **Material Degradation** Location shown on site map No evidence of degradation
Material type_____ Areal extent_____
Remarks_____
_____

3. **Erosion** Location shown on site map No evidence of erosion
Areal extent_____ Depth_____
Remarks_____
_____

4. **Undercutting** Location shown on site map No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____
_____

5. **Obstructions** Type_____ No obstructions
Location shown on site map Areal extent_____
Size_____
Remarks_____
_____

6. **Excessive Vegetative Growth** Type_____
No evidence of excessive growth
Vegetation in channels does not obstruct flow
Location shown on site map Areal extent_____
Remarks_____
_____

D. Cover Penetrations Applicable N/A

1. **Gas Vents** Active Passive
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance
N/A
Remarks_____
_____

2. **Gas Monitoring Probes**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____
_____

3. **Monitoring Wells** (within surface area of landfill)
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____
_____

4. **Leachate Extraction Wells**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____
_____

5. **Settlement Monuments** Located Routinely surveyed N/A
Remarks_____
_____

E. Gas Collection and Treatment Applicable N/A

1. **Gas Treatment Facilities**
   Flaring Thermal destruction Collection for reuse
   Good condition Needs Maintenance
   Remarks_____
   _____

2. **Gas Collection Wells, Manifolds and Piping**
   Good condition Needs Maintenance
   Remarks_____
   _____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   Good condition Needs Maintenance N/A
   Remarks_____
   _____

F. Cover Drainage Layer Applicable N/A

1. **Outlet Pipes Inspected** Functioning N/A
   Remarks_____
   _____

2. **Outlet Rock Inspected** Functioning N/A
   Remarks_____
   _____

G. Detention/Sedimentation Ponds Applicable N/A

1. **Siltation** Areal extent_____ Depth_____ N/A
   Siltation not evident
   Remarks_____
   _____

2. **Erosion** Areal extent_____ Depth_____
   Erosion not evident
   Remarks_____
   _____

3. **Outlet Works** Functioning N/A
   Remarks_____
   _____

4. **Dam** Functioning N/A
   Remarks_____
   _____

H. Retaining Walls Applicable N/A

1. **Deformations** Location shown on site map Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____
   _____

2. **Degradation** Location shown on site map Degradation not evident
   Remarks_____
   _____

I. Perimeter Ditches/Off-Site Discharge Applicable N/A

1. **Siltation** Location shown on site map Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Vegetative Growth** Location shown on site map N/A
   Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____
   _____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Discharge Structure** Functioning N/A
   Remarks_____
   _____

VIII. VERTICAL BARRIER WALLS Applicable √N/A

1. **Settlement** Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Performance Monitoring** Type of monitoring_____
   Performance not monitored
   Frequency_____ Evidence of breaching
   Head differential_____
   Remarks_____
   _____

IX. GROUNDWATER/SURFACE WATER REMEDIES Applicable √N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines Applicable N/A	
1.	**Pumps, Wellhead Plumbing, and Electrical** Good condition All required wells properly operating Needs Maintenance N/A Remarks_____
2.	**Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** Good condition Needs Maintenance Remarks_____
3.	**Spare Parts and Equipment** Readily available Good condition Requires upgrade Needs to be provided Remarks_____
B. Surface Water Collection Structures, Pumps, and Pipelines Applicable N/A	
1.	**Collection Structures, Pumps, and Electrical** Good condition Needs Maintenance Remarks_____
2.	**Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** Good condition Needs Maintenance Remarks_____
3.	**Spare Parts and Equipment** Readily available Good condition Requires upgrade Needs to be provided Remarks_____

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
   Metals removal Oil/water separation Bioremediation
   Air stripping Carbon adsorbers
   Filters_____
   Additive (*e.g.*, chelation agent, flocculent)_____
   Others_____
   Good condition Needs Maintenance
   Sampling ports properly marked and functional
   Sampling/maintenance log displayed and up to date
   Equipment properly identified
   Quantity of groundwater treated annually_____
   Quantity of surface water treated annually_____
   Remarks_____
   _____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A Good condition Needs Maintenance
   Remarks_____
   _____

3. **Tanks, Vaults, Storage Vessels**
   N/A Good condition Proper secondary containment Needs Maintenance
   Remarks_____
   _____

4. **Discharge Structure and Appurtenances**
   N/A Good condition Needs Maintenance
   Remarks_____
   _____

5. **Treatment Building(s)**
   N/A Good condition (esp. roof and doorways) Needs repair
   Chemicals and equipment properly stored
   Remarks_____
   _____

6. **Monitoring Wells** (pump and treatment remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____
   _____

D. Monitoring Data

1. Monitoring Data
   √Is routinely submitted on time √ Is of acceptable quality

2. Monitoring data suggests:
   Groundwater plume is effectively contained √Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
√Properly secured/locked √Functioning √Routinely sampled √Good condition
√All required wells located √Needs Maintenance N/A
Remarks Some well completions require repair (i.e., bolts broken or missing). Brass Well ID tags should be affixed to all routinely sampled monitoring wells or fitted with lids with integral ID stampings .

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
The remedy addresses chlorinated and aromatic hydrocarbon contamination in groundwater. Remedy includes land use controls (LUCs) to prevent current and future human exposure. Physical controls are consistent with the LUCs, and current subsurface activities comply with the permitting procedures established under the remedial action. The remedy includes *in situ* chemical oxidation (ISCO) treatment of hot spot chlorinated hydrocarbon (primarily trichloroethene [TCE]) areas using sodium permanganate as the reagent. The remedy includes bioremediation of hot spot aromatic hydrocarbon (primarily benzene) area by deploying oxygen release compound filter socks in wells. To be implemented following ISCO treatment. The remedy includes groundwater monitoring to document and demonstrate natural attenuation and continual reduction in the overall size of the plume; however, that portion of the remedy is not functioning as designed. Data gaps have been identified at the leading edge of the plume and full delineation is pending.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

Plume delineation should be completed and annual groundwater monitoring should be performed as recommended in the five-year review report to verify that the plume will not migrate to an extent that will impact potential receptors and effect long-term protectiveness. Continued maintenance of the geographic information system is planned and will ensure current and short-term protectiveness.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. Elevated VOC concentrations in groundwater at Sites N1 and N4 indicate that the leading edge of the plume has not been fully delineated.

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Opportunities for optimization of the remedy may exist in the form of employing a stronger oxidant than permanganate to improve the rate of carbon tetrachloride concentration reduction, employing gradual release of reagent instead of pressurized injection, and performing well condition inspections to document required well maintenance.

Inspection Team Roster

Site Inspection conducted 17 February 2016

Team Member	Title	Organization
Tom Merendini	OU 6 Project Manager	AFCEC/CZOW
Kevin Mayer	Remedial Project Manager	USEPA
Bruce Lewis	Remedial Project Manager	California DTSC
Alonzo Poach	Remedial Project Manager	California RWQCB, Lahontan Region
Julio Barrios	GIS Manager	412 CEG/CEVA
Oscar Perez	On-Site Project Manager	Helios (NASA AFRC SH&E Contractor)
Kimberly Coleman	Project Manager	AECOM (AF and NASA Contractor)

Cost Summary

Fiscal Year	Estimated Operational Costs[a]	Actual Operational Costs	Difference	Explanation of Difference Between Actual and Estimated Costs
2011	$196,000	$91,000	$105,000	Monitoring effort was reduced with some funds reallocated to Five-Year Review (periodic cost) effort (performed in FY 2011 [Year 5] as opposed to FY 2012 [Year 6] as originally estimated).
2012	$3,000	$80,000	-$77,000	Monitoring event not estimated.
2013	$205,000	$205,000	$0	Although there is no cost differential, the planned groundwater monitoring was not performed, due to funds being allocated to a vapor intrusion investigation as recommended in the First Five-Year Review.
2014	$4,000	$355,000	-$351,000	First Five-Year Review Addendum and well installation planning documents not estimated.
2015	$214,000	$526,000	-$312,000	Well installations not estimated.
Total	$622,000	$1,257,000	-$635,000	

Notes:

The remedial action does not include traditional operation and maintenance tasks. Estimated and actual operational costs are associated with injection operations, monitoring, and site control activities.
Estimated and actual operational costs are rounded to the nearest $1,000.
[a] Estimated costs as presented in Table 2-6 of the Record of Decision (United States Air Force 2006).
FY = fiscal year

Site Inspection Photos

An example of security fencing and signage for the NASA AFRC complex. Due to the mobile nature of the *in situ* chemical oxidation injection equipment, lack of a permanent treatment compound, and potential impact to mission-critical activities such as aircraft movement, permanent treatment-related signage and fencing are not used. Remedial action activities occur within the NASA AFRC secured area or the secured area maintained by Edwards Air Force Base flightline management. The photograph was taken in 2011 from the controlled movement area of the flightline. The inspection team was not permitted access to the controlled movement area during the February 2016 site visit. An additional inspection of the well field in the flightline controlled movement areas was performed in June 2016.

Building 4806, Site N3, members of the inspection team inside Building 4806. Building 4806 is an aircraft ground equipment vehicle maintenance shop and was the subject of vapor intrusion pathway investigations in 2013 and 2016 due to its proximity to Site N3 benzene and trichloroethene groundwater plumes.

Building 4806, Site N3. This sweeper is an example of an aircraft ground equipment vehicle maintained in Building 4806. Although the project teams attempted to remove any indoor volatile organic compound sources prior to sampling, vehicles such as the sweeper were present at various times during indoor air sampling in 2013 and 2016.

Site N7 (facing northwest). Flush-mount wells are visible and are located within the high trichloroethene concentration area at Site N7.

An example of a flush-mount completion monitoring well. Many of the monitoring/injection wells at Sites N2, N3, and N7 are installed flush with the ground surface in aircraft ramps and taxiways. Monitoring well maintenance issues observed during the inspection included missing bolts and damaged lids as shown in this photo of N2-MW03.

Flush mount monitoring well N3-MW03 shown with concrete pad damage.

Damaged bolts at flush mount monitoring well N3-MW18.

Damaged lid and bolt and missing lock at flush mount monitoring well N3-MW25.

Flush-mount completion monitoring well N7-MW02 with ID tag. The cover is missing a bolt.

Flush mount well N19-MW01 with broken mounting hole.

Well Inspections

Inspection of the monitoring well network at Operable Unit 6 was performed in June 2016. The condition of the protective well boxes and well casings was inspected at 114 of the 120 wells. Dedicated pumps were not inspected or tested and groundwater elevations were not measured during the effort. Six wells were not inspected - five wells were not located and one well was obstructed by parked equipment. Photographic examples of well issues are provided on the preceding pages and the overall results of the inspections and the recommended repairs/maintenance tasks are presented in Table H-1 below.

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TABLE H-1. OPERABLE UNIT 6 WELL INSPECTION SUMMARY
Page 1 of 6

Well	Date Inspected	Secure	Well ID Tag	Condition	Repair Needed	Comment/Recommended Repair
N1-MW01	6/28/2016	Yes	No	E	Yes	Install ID tag.
N1-MW02	6/29/2016	Yes	No	B	Yes	Install ID tag. Replace concrete pad.
N1-MW03	6/28/2016	Yes	No	E	Yes	Install ID tag.
N1-MW04	6/28/2016	Yes	Yes	B	Yes	Repair broken well casing.
N1-MW05	6/28/2016	Yes	No	E	Yes	Install ID tag.
N1-MW06	6/28/2016	Yes	No	B	Yes	Add ID tag. Repair concrete pad crack.
N1-MW07	6/28/2016	Yes	No	E	Yes	Install ID tag.
N1-MW08	6/28/2016	No	No	B	Yes	Install well box.
N1-MW09	6/28/2016	Yes	Yes	E	No	
N1-MW10	6/28/2016	No	No	E	Yes	Install ID tag and well box security bolts.
N1-MW11	6/28/2016	No	Yes	E	No	Install well box security bolts.
N1-MW12	6/28/2016	No	No	B	Yes	Install ID tag. Repair broken well box bolt hole and install well box security bolts.
N1-MW13	6/30/2016	No	Yes	E	No	
N1-NW01	---	---	---	---	---	Unable to locate.
N2-ASW01A/B	6/27/2016	No	No	B	Yes	Broken and to be abandoned.
N2-ASW02A/B	6/27/2016	No	No	G	Yes	Install ID tag. Replace well box cover bolts and install well box security bolts.
N2-MW01	6/27/2016	No	No	B	Yes	Install ID tag. Replace well box with appropriate lockable type.
N2-MW02	6/27/2016	No	No	G	Yes	Install ID tag and locking cap or well box security bolts. Replace well box gasket.
N2-MW03	6/27/2016	No	No	B	Yes	Install ID tag. Replace well box lid and bolts. Install well box security bolts.
N2-MW04	---	---	---	---	---	Unable to locate, located under newly constructed canopy of Building 4823.
N2-MW05	6/29/2016	Yes	No	E	Yes	Install ID tag.
N2-MW06	6/27/2016	Yes	No	E	Yes	Install ID tag.
N2-MW07	6/29/2016	No	No	B	Yes	Install ID tag. Replace missing well box bolts and gasket. Install well box security bolts.

TABLE H-1. OPERABLE UNIT 6 WELL INSPECTION SUMMARY

Well	Date Inspected	Secure	Well ID Tag	Condition	Repair Needed	Comment/Recommended Repair
N2-MW08	6/27/2016	No	No	B	Yes	Install ID tag. Replace missing well box bolts with well box security bolts and replace missing gasket.
N2-NW02	6/27/2016	No	No	B	Yes	Install ID tag. Replace well box with appropriate lockable type. Repair broken casing.
N2-OW01	6/27/2016	No	No	B	Yes	Install ID tag. Replace missing bolts with well box security bolts.
N2-OW02	6/27/2016	No	No	B	Yes	Install ID tag. Replace well box with appropriate lockable type.
N2-PW02	---	---	---	---	---	Entire well head broken and needs repair.
N3-ASW01A/B	6/25/2016	No	No	B	Yes	Install ID tag. Replace well box with appropriate lockable type.
N3-ASW02A/B	6/29/2016	No	No	B	Yes	Install ID tag. Replace well box with appropriate lockable type.
N3-DEW01	6/29/2016	Yes	Yes	G	Yes	Install well box bolts.
N3-DEW02	6/27/2016	No	Yes	G	Yes	Install lock or well box security bolts.
N3-MW02	6/29/2016	Yes	No	G	Yes	Install ID tag. Install well box bolts.
N3-MW03	6/29/2016	Yes	Yes	E	No	
N3-MW04	---	---	---	---	---	Could not access due to parked vehicle obstruction.
N3-MW05	6/28/2016	Yes	Yes	G	Yes	Install well box bolts.
N3-MW06	6/29/2016	Yes	No	B	Yes	Install ID tag. Install missing well box bolts and gasket.
N3-MW07	6/28/2016	No	No	G	Yes	Install ID tag and lock or well box security bolts.
N3-MW08	6/28/2016	No	No	B	Yes	Install ID tag. Repair well box threads and install well box bolts. Replace air lines and connectors.
N3-MW09	6/29/2016	Yes	Yes	B	Yes	Install well box bolts and gasket. Repair concrete.
N3-MW10	6/27/2016	Yes	Yes	E	No	
N3-MW11	6/28/2016	Yes	Yes	E	No	
N3-MW12	6/29/2016	Yes	No	G	Yes	Install ID tag.
N3-MW13	6/27/2016	No	Yes	G	Yes	Install lock or well box security bolts.
N3-MW14	6/27/2016	No	No	B	Yes	Repair well box threads and install lock or well box security bolts.
N3-MW15	6/27/2016	No	Yes	G	Yes	Install lock or well box security bolts.
N3-MW16	6/27/2016	No	Yes	B	Yes	Repair threads and install bolts with lock or well box security bolts.
N3-MW17	6/29/2016	No	Yes	G	Yes	Install lock or well box security bolts and replace well box gasket.

TABLE H-1. OPERABLE UNIT 6 WELL INSPECTION SUMMARY

Well	Date Inspected	Secure	Well ID Tag	Condition	Repair Needed	Comment/Recommended Repair
N3-MW18	6/28/2016	No	No	B	Yes	Bolts damaged. Check/repair well box threads and install bolts with lock or well box security bolts. Install ID tag.
N3-MW19	6/27/2016	Yes	Yes	E	No	
N3-MW20	6/27/2016	Yes	Yes	G	Yes	Check/repair female well box threads and replace bolts. Replace well box gasket and repair asphalt.
N3-MW21	6/27/2016	Yes	No	B	Yes	Check/repair female well box thread and replace bolt.
N3-MW22	6/27/2016	No	No	G	Yes	Install ID tag. Move tubing to seat expandable well cap to enable locking.
N3-MW23	6/29/2016	No	Yes	G	Yes	Install lock or well box security bolts.
N3-MW24	6/29/2016	Yes	Yes	E	No	
N3-MW25	6/28/2016	No	No	B	Yes	Install ID tag. Replace cover and install lock or well box security bolts.
N3-MW26	6/27/2016	No	Yes	G	Yes	Replace well box bolt and install lock or well box security bolts.
N3-MW27	6/27/2016	No	No	G	Yes	Replace well box bolts and install lock or use well box security bolts.
N3-MW28	6/27/2016	No	Yes	G	Yes	Install well box security bolts.
N3-MW29	6/27/2016	No	Yes	G	Yes	Install lock or well box security bolts.
N3-NW03	6/27/2016	Yes	Yes	G	Yes	Replace corroded pump fittings.
N3-NW05	6/27/2016	Yes	Yes	G	Yes	Replace missing well box gasket.
N3-NW06	6/27/2016	Yes	Yes	G	Yes	Replace well box gasket.
N3-NW07	6/28/2016	Yes	No	G	Yes	Install ID tag.
N3-NW08	6/27/2016	No	Yes	G	Yes	Replace bolts and install lock or use well box security bolts.
N4-MW01	6/29/2016	Yes	No	G	Yes	Install ID tag.
N4-MW02	---	---	---	---	---	Unable to locate.
N4-MW03	6/28/2016	Yes	No	G	Yes	Install ID tag.
N4-MW04	6/28/2016	No	Yes	B	Yes	Repair broken locking bracket and install lock.
N4-MW05	6/28/2016	Yes	Yes	E	No	
N4-MW06	6/28/2016	No	No	G	Yes	Install ID tag. Possibly repair small concrete cracks and fix mismatched bolts and retrofit clamp. Install lock.
N4-MW07	6/28/2016	No	Yes	G	Yes	Install lock.
N4-MW08	6/28/2016	No	Yes	G	Yes	Install lock.

TABLE H-1. OPERABLE UNIT 6 WELL INSPECTION SUMMARY

Well	Date Inspected	Secure	Well ID Tag	Condition	Repair Needed	Comment/Recommended Repair
N4-MW09	6/28/2016	No	No	G	Yes	Install ID tag and locking cap.
N4-MW10	6/28/2016	No	No	G	Yes	Install ID tag and locking cap.
N4-MW11	6/28/2016	No	No	G	Yes	Install ID tag and locking cap.
N4-MW12	6/28/2016	No	No	G	Yes	Install ID tag and locking cap, replace damaged bolts and/or fix threads.
N4-MW13	6/28/2016	No	No	G	Yes	Install ID tag and locking cap.
N4-MW14	6/30/2016	No	Yes	E	No	
N4-MW15	6/30/2016	No	Yes	E	No	
N4-MW16	6/30/2016	No	Yes	E	No	
N4-MW17	6/30/2016	No	Yes	E	No	
N4-MW18	6/30/2016	No	Yes	E	No	
N4-MW19	6/30/2016	No	Yes	E	No	
N4-MW20	6/30/2016	No	Yes	E	No	
N4-NW04	---	---	---	---	---	Unable to locate.
N6-MW01	6/29/2016	No	No	G	Yes	Install ID tag and lock.
N6-MW02	6/29/2016	No	No	G	Yes	Install ID tag, lock, gasket, and replace/fix one bolt or threads.
N7-ASW01A/B	6/29/2016	No	Yes	G	Yes	Install lock or well box security bolts.
N7-DEW01	6/29/2016	No	No	B	Yes	Install lock, ID tag, and cap. Replace well box with appropriate lockable type.
N7-MW01	6/29/2016	No	No	G	Yes	Install lock and ID tag. Replace missing bolt.
N7-MW02	6/29/2016	No	Yes	G	Yes	Replace missing bolt.
N7-MW03	6/29/2016	No	No	B	Yes	Install lock, ID tag, and cap. Replace well box with appropriate lockable type.
N7-MW04	6/29/2016	No	No	B	Yes	Install lock and ID tag. Clean sediment out of box and replace well box with appropriate lockable type.
N7-MW05	6/29/2016	No	No	B	Yes	Install lock and ID tag. Replace well box with appropriate lockable type.
N7-MW06	6/29/2016	No	No	B	Yes	Install lock and ID tag. Replace well box with appropriate lockable type.
N7-MW07	6/29/2016	No	Yes	G	Yes	Install lock or well box security bolts.
N7-MW08	6/29/2016	No	Yes	G	Yes	Install lock or well box security bolts.

TABLE H-1. OPERABLE UNIT 6 WELL INSPECTION SUMMARY
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Well	Date Inspected	Secure	Well ID Tag	Condition	Repair Needed	Comment/Recommended Repair
N7-MW09A/B/C	6/29/2016	Yes	No	G	Yes	Install ID tag.
N7-MW10	6/29/2016	No	Yes	G	Yes	Install lock or well box security bolts.
N7-MW11	6/29/2016	No	Yes	G	Yes	Install lock or well box security bolts.
N7-MW12	6/29/2016	Yes	Yes	E	No	
N7-MW13	6/29/2016	Yes	No	G	Yes	Install ID tag.
N7-MW14	6/29/2016	No	Yes	G	Yes	Install lock or well box security bolts.
N7-MW15	6/29/2016	No	Yes	G	Yes	Install lock or well box security bolts.
N7-MW16	6/29/2016	No	Yes	G	Yes	Replace well box gasket and install locking cap or well box security bolts.
N8-MW01	6/29/2016	Yes	No	E	Yes	Install ID tag.
N9-MW01	6/29/2016	No	No	B	Yes	Install ID tag and locking cap. Replace/fix three bolts or threads. Internal monument lockable but need to repair to align holes.
N9-MW02	---	---	---	---	---	Unable to locate - newer asphalt covering area.
N10-MW01	6/29/16	No	No	B	Yes	Install ID tag. Replace/fix three bolts or threads and install locking cap.
N15-MW01	6/29/16	Yes	No	G	Yes	Install ID tag.
N15-MW03	6/27/16	No	No	B	Yes	Install ID tag and lock. Clear out bentonite in annulus to install locking cap.
N15-MW04	6/27/16	Yes	No	G	Yes	Install ID tag.
N18-MW01	6/29/16	No	No	G	Yes	Install ID tag and install lock to internal monument.
N19-MW01	6/29/16	No	No	B	Yes	Repair threads or replace well box. Install ID tag and locking cap.
REPA-MW01	6/29/16	No	No	G	Yes	Replace/fix one bolt or threads and install lock.
RL-MW01A/B/C	6/28/16	No	No	G	Yes	Non-standard well head needs to be water-proofed.
RL-MW02A/B/C	6/28/16	No	No	G	Yes	Non-standard well head needs to be water-proofed.
RL-MW03A/B/C	6/28/16	No	No	G	Yes	Non-standard well head needs to be water-proofed.
RL-MW04A/B/C	6/28/16	No	No	G	Yes	Non-standard well head needs to be water-proofed.

TABLE H-1. OPERABLE UNIT 6 WELL INSPECTION SUMMARY
Page 6 of 6

Notes:

B bad
E excellent
G good
ID identification

APPENDIX I

SAMPLE WELL MAINTENANCE FORM

EAFB OU 6 WELL MAINTENANCE INSPECTION CHECKLIST

Well ID: _____ **Date:** _____

Monument Type and Material: _____

Yes	No	NA	
			Protective monument/vault lockable?
			Monument/vault locked or use security bolts?
			Monument/vault bolts/threads intact? Damage: _____
			Monument/vault labeled with well ID? Label Type: _____
			Monument/vault gasket intact?
			Concrete pad intact? Damage: _____
			Well casing cap intact? Type (lockable?): _____
			Well casing in good condition? Damage: _____
			Well casing (or cap) labeled with well ID? Type: _____
			Well casing measuring point marked/notched? Type: _____
			Dedicated tubing present?
			Dedicated tubing in good condition? Damage: _____
			Dedicated pump present?
			Dedicated pump in working condition? Damage: _____

Suggested maintenance or other comments:

_____

_____

_____

_____

_____

Name (print): _____ Signature: _____

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APPENDIX J

RESPONSES TO REGULATORY COMMENTS

RESPONSES TO COMMENTS

Draft Second Five-Year Review Report
NASA Armstrong Flight Research Center, Operable Unit 6
Edwards Air Force Base, California
June 2016

Reviewer	Comment #	Comment	Response
Kevin Mayer USEPA	Specific 1	The Vapor Intrusion Investigation Report (VIIR) *Consideration of Reasonably Expected Future Conditions* mentions only Buildings 4806, 4807, and 4810 (now demolished) as subjects of a vapor intrusion investigation. However, Figure 3 shows other buildings within or near the footprint of the plume in OU6, which also merit an investigation. Figures 9 (TCE), 10 (Benzene), and 11 (Carbon Tetrachloride (CT)) show groundwater contaminant plumes extend under several buildings (i.e., Buildings 4800, 4802, 4803, 4806, and 4807). The VIIR, FYR, or other citable document should provide or reference authoritative information (e.g., occupancy status, historic/current/future use and operations, potential for residual contamination in the vadose zone, plans for long-term use/re-use or demolition) about <u>all</u> additional buildings and areas reasonably near the plume, for purposes of evaluating whether and where additional building-specific investigations should be recommended in OU6. Please revise the FYR to substantiate that the remedy provides short-term protective of human health and the environment from inhalation of groundwater vapors through the VIP into buildings within or near the footprint of the plumes in OU6.	A new table has been added as Table 2 to the VIIR Addendum (Appendix C) to provide rationale for the selection of buildings to be investigated for VIP risks. The second paragraph of Section 1.3.2 (of Appendix C) has been revised to read: "Because the indoor air risks at OU 6 under the current industrial scenario were assumed to be driven by the inhalation of TCE and benzene volatilized from groundwater into indoor air, groundwater risk-based screening levels (RBSLs) were developed for these chemicals. The selection of buildings to be included in this VIP investigation was based on a screening procedure that conservatively calculated a concentration in groundwater that would be protective of indoor air in buildings overlying the commingled plume. The screening process identified areas of groundwater where TCE and benzene concentrations were above those that may result in unacceptable risk in indoor air and whether there were routinely occupied buildings within those areas. Buildings 4800, 4802, 4806, 4807, 4808, 4810, 4823, and T-20 are occupied and within 100 ft of the TCE and/or benzene concentrations exceeding the selected RBSLs. Of those eight buildings, three buildings (Buildings 4806, 4807, and 4810) were included in the current VIP investigation (4810 has since been demolished). The processes of RBSL development and for determining the buildings

Reviewer	Comment #	Comment	Response
Kevin Mayer USEPA	Specific 1 (continued)		to be included in the VIP investigation is detailed in Appendix A of the *Vapor Intrusion Sampling Plan and Risk Assessment Work Plan (Work Plan*) (AECOM 2013) and an updated building screening summary table is provided in this document as Table 2." The following items have been added to the Executive Summary and Section 4.2 of Appendix C: • Remedy performance and groundwater monitoring reports should include discussion of changes in site conditions (as they relate to COC concentrations and plume delineation) that might complete the VIP in occupied buildings. The reports should provide appropriate recommendations as they relate to such conditions. • LUC reports should include discussion of changes in site conditions (as they relate to new construction or intrusive activities) that might complete the VIP in occupied buildings or otherwise result in exposure of site workers to plume contaminants. The reports should provide appropriate recommendations as they relate to such conditions.

RESPONSES TO COMMENTS

Draft Second Five-Year Review Report
NASA Armstrong Flight Research Center, Operable Unit 6
Edwards Air Force Base, California
June 2016

Reviewer	Comment #	Comment	Response
Kevin Mayer USEPA	Specific 2	In addition to risks posed under current conditions, reasonably expected future risks posed by subsurface contamination warrant consideration, "in order to demonstrate that a site does not present an unacceptable risk to human health and the environment" (EPA 1991a). EPA's 2015 VI Guidance discusses how "the inclusion zone for vapor intrusion … may expand over time and/or current sample concentrations in or beneath a given building may under-estimate the reasonable maximum vapor intrusion condition in the future". Please include a recommendation that all buildings above and near contaminated groundwater are appropriately evaluated for vapor intrusion potential under reasonably expected future conditions. Please recommend future sampling programs for more complete monitoring of the potential for vapor intrusion in OU6.	Please see response to USEPA Specific Comment 1, in particular the revisions to the Executive Summary and Section 4.2 of Appendix C (the VIIR Addendum).
Kevin Mayer USEPA	Specific 3	The VIIR states that "the hypothetical residential scenario is not addressed in this VIIR addendum. An evaluation of the hypothetical residential scenario may be addressed during future projects as appropriate." The first five-year review indicated that "Long-term protectiveness of the remedy will be verified by evaluating future residential indoor air risk" (Section 3.1 of the FYR). Considering EPA guidance (Attachment 1) on evaluation of the vapor intrusion pathway for a residential scenario, please recommend a definite plan and schedule for a VIP residential scenario evaluation, rather than deferral to some uncertain future date and project.	The referenced section in the VIIR Addendum (Appendix C) has been revised as follows: "An evaluation of the hypothetical residential scenario was included in the *Addendum to the First Five-Year Review Report* (included in Appendix B in the Second Five-Year Review Report). Based on the evaluation of the hypothetical residential scenario using 2013 indoor air and sub-slab vapor results, the *Addendum to the First Five-Year Review Report* concluded that the OU 6 remedy is protective of vapor intrusion given the continued implementation of land use controls prohibiting residential development for the foreseeable future."

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Kevin Mayer USEPA	Specific 4	Please explain the derivation and relevance of the VI investigation trigger of 170 µg/L for groundwater concentrations in the TCE plume under the OU 6 buildings.	The second sentence of the third paragraph of Section 5.3.1 of the Second FYRR has been replaced with: "Under the Site 25 program, a risk based screening level for TCE of 170 µg/L for groundwater under the industrial use exposure scenario has been developed. This concentration corresponds to 1 x 10^{-6} cancer risk and will be used as a trigger for identifying potential vapor intrusion impacts associated with that site."
Kevin Mayer USEPA	Specific 4	8/4/16 Meeting Follow-up to Specific Comment 4: What model or method was used to derive the trigger?	The second sentence of the third paragraph of Section 5.3.1 of the Second FYRR has been replaced with: "Under the Site 25 program, a risk based screening level for TCE of 170 µg/L for groundwater under the industrial use exposure scenario has been developed. This concentration was back-calculated using the Johnson and Ettinger model, corresponds to 1 x 10^{-6} cancer risk, and will be used as a trigger for identifying potential vapor intrusion impacts associated with that site."
Kevin Mayer USEPA	Specific 5	The last sentence in Section 1.7.1 of the VIIR is erroneous. The inhalation unit risk (IUR) is <u>not</u> an estimate of excess lifetime cancer risk resulting from continuous exposure to an agent at a concentration of 1 µg/L in <u>water</u>. Because the data available for dose-response assessment varies by substance, it is not true, as suggested by the last sentence in Section 1.7.2, that every inhalation reference concentration "is calculated from the highest long-term exposure level that did not cause adverse effects." Please revise the text of this section of the VIIR.	Although the definition is taken directly from the USEPA Risk Assessment Glossary, the sentence has been deleted.

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Kevin Mayer USEPA	Specific 6	Insufficient information is provided in the Draft Second Five-Year Review Report, National Aeronautics and Space Administration Armstrong Flight Research Center, Operable Unit 6, Edwards Air Force Base, California (FYRR), to substantiate that the remedy at Edwards Air Force Base (AFB) Operable Unit (OU) 6 is protective of human health and the environment. While Section 7.0 (Protectiveness) indicates that unacceptable risks in the short-term are being controlled through institutional controls that are preventing exposure to, and the ingestion of, contaminated groundwater, engineering controls do not exist to address the vapor intrusion pathway (VIP). Figure 6 (Operable Unit 6 Exposure Pathways) indicates that the "Inhalation-VIP" exposure pathway for the Current Industrial worker is currently complete. Similarly, Figures 9 (Site N3, TCE Groundwater Concentration Contours – June-July 2015), 10 (Site N3, Benzene Groundwater Concentration Contours – June-July 2015), and 11 (Site N3, CT Groundwater Concentration Contours – June-July 2015) show trichloroethene (TCE), benzene, and carbon tetrachloride (CT) groundwater contaminant plumes extend under several buildings (i.e., Buildings 4800, 4802, 4803, 4806, and 4807) at concentrations that are unknown. It should be noted that Sections 2.3.1 (Land Use Controls) and 5.2.2 (Changes in Toxicity and Other Contaminant Characteristics; Risk Assessment Methods; and Exposure Pathways) contradict Figure 6 and indicate that no unacceptable VIP risk exists for the current industrial use. Without substantial indoor air data to show that VIP risks do not exist for the current industrial use exposure scenario, it is unclear if the remedy is protective of human health and the environment through the VIP. Please revise the FYRR to provide information to substantiate that the remedy is protective of human health and the environment from inhalation of groundwater vapors through the VIP into buildings or recommend additional sampling.	Please see response to USEPA Specific Comment 1. Disagree that the information provided in Sections 2.3.1 and 5.2.2 indicating that no unacceptable VIP risk exists for the current industrial use are inconsistent with information included on Figure 6 "Operable Unit 6 Exposure Pathways". Figure 6 indicates that the VI Exposure Pathway is complete for the current industrial scenario. This is true for Buildings 4806 and 4807. The 2013 and 2016 VIP investigations indicated that a complete VI pathway exists; however, the results also indicate that the potential VIP risk associated with the complete VI Pathway is within the acceptable range.

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Kevin Mayer USEPA	Specific 7	Section 2.4.2 (Remedial Action Well Installation) indicates that the groundwater plume is not fully characterized. In addition, because the extent of the TCE contaminant plume is unknown, it is not possible to determine whether the plume is migrating or how fast it is migrating. As such, it is unclear if the plume has already migrated significantly toward the groundwater sub-basin and drinking water supply wells or whether the remedy remains protective of current and future receptors. Section 5.1.1.2 (Groundwater Monitoring) also indicates that the groundwater monitoring component is not functioning as designed. This directly impacts the ability to evaluate whether the remedy is protective of human health and the environment. Please revise the text in these sections to explain that the long-term protectiveness of the remedy cannot be determined because the extent of the groundwater plume is currently unknown.	The fifth sentence of the second paragraph of Section 2.4.2 has been revised to read: "These newly-installed wells were sampled during the reporting period and the results indicate that the plume is not fully characterized and long-term protectiveness undetermined." The first sentence of the fourth paragraph of Section 5.1.1.2 has been revised to read: "The TCE plume has not been fully delineated and long-term protectiveness has not been determined; the current estimate indicates that the plume extends eastward into the Rogers Dry Lake area."
Kevin Mayer USEPA	Specific 8	The Protectiveness Statement should emphasize impacts of incomplete plume delineation on short- and long-term protectiveness. Such a revision should be succinct, along the lines of: In order for the remedy to be protective of groundwater resources and occupied buildings above or near the shallow groundwater plume in the long-term, the groundwater contaminant plumes will be completely delineated. Please revise the text of the FYR and add a brief summary to the Section 7.0 Protectiveness Statement, explaining potential impacts on short and long-term protectiveness associated with incomplete plume delineation.	The last sentence of the first paragraph of the Protectiveness Statement has been replaced with: "In order for the remedy to be protective of groundwater resources and occupied buildings above or near the shallow groundwater plume in the long-term, the Operable Unit 6 groundwater contaminant plume will be completely delineated and changes in site conditions will be tracked and evaluated in annual land use control reports and remedy performance and groundwater monitoring reports."

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Kevin Mayer USEPA	Specific 9	EPA generally recommends that plumes of groundwater contaminated with vapor-forming chemicals be shown to be stable or shrinking, and not migrating or rising in concentration, to address the potential of long-term risks from vapor intrusion in the inclusion zone ("Land area within which EPA recommends assessing the vapor intrusion pathway, which extends beyond the aggregate boundaries of the site-specific source(s) of vapor-forming chemicals" (2015 OSWER VI Guide). Section 5.2.3 of the FYR indicates that "Minimal active progress was made toward meeting the first RAO, restoration of groundwater". Section 3.2.2 of the FYR notes that "the plume [in OU6] extends beyond the monitored area." This information does not indicate that the plume in OU6 is stable or shrinking. Please include a recommendation that addresses future steps to assess plume stability within the inclusion zone in relation to the potential risk from the vapor intrusion pathway.	The following recommendation has been added to Section 6.2.3: "Remedy performance and groundwater monitoring reports should include discussion of changes in site conditions (as they relate to COC concentrations and plume delineation and impact to remedy protectiveness) that might complete the VIP in occupied buildings downgradient and generally east of the vapor intrusion differentiation boundary indicated on Figure 5. The reports should provide appropriate recommendations as they relate to such conditions."
Kevin Mayer USEPA	Specific 10	In Section 3.2.7, the meaning of the term "artificial plume boundaries" is not explained. If this indicates that the plume was not delineated to the MCL for the respective COCs. Please explain the term and use of "artificial plume boundaries. Please revise the text to recommend updating the comprehensive Conceptual Site Model, critical to evaluating the effectiveness of contaminant treatment to account for uncertainties in the plume boundary.	The first sentence of the section has been revised to read: "Although plume boundaries were established at Sites N3 and N7 (based on site boundaries and the extents of benzene and TCE concentrations detected above MCLs in groundwater) to allow for consistent contaminant mass estimates, Site N4 was not included as an area with high VOC concentrations, and implementing ISCO in the area was not originally anticipated." The following was added to the end of Section 6.1.1: "The conceptual site model should be updated as delineation investigation data become available."

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Kevin Mayer USEPA	Specific 11	Although the document indicates that access to this area of OU6 is controlled through an LUC, the basis for establishing the current LUC boundary (Figure 4) is unclear. In the absence of a site-specific evaluation/assessment showing that the site is currently suitable for 'unlimited use and unrestricted exposure' additional institutional controls may be warranted, beyond those comprising the selected remedy (which focus on the groundwater ingestion pathway and ensuring groundwater cleanup, but not on vapor intrusion). The OSWER VI Guide provides recommendations for institutional controls and monitoring where a subsurface vapor source is present and has the potential to pose unacceptable human health risks. For example, it recommends: "At undeveloped sites, or at sites where land use may change in the future, ICs may be important to ensure that the vapor intrusion pathway is effectively addressed in the future." In addition, "ICs may also be used to help inform the need for vapor intrusion mitigation for future construction where vapor-forming waste remains in place and may pose unacceptable human health risk due to vapor intrusion" (OSWER VI Guide, Section 8.6). Please review the intent and effectiveness of the LUCs to mitigate future conditions, and consider the impact of the observations, uncertainties and recommendations on Question B of the FYR (*Are the … exposure assumptions … used at the time of the remedy selection still valid?*). Please add recommendations for reevaluating the LUC boundary to take into account uncertainties in plume delineation.	The following recommendation has been added to Section 6.2.1: "Future revisions of the LUC boundary should include a buffer zone to account for uncertainties in plume delineations."
Kevin Mayer USEPA	Specific 12	Figure 4 only depicts the western LUC boundary. A figure or figures should be included to depict the entire LUC boundary, including the eastern portion of OU 6, and the proximity of the plume to existing water supply wells and any potential ecological receptors. Please include a figure that depicts the entire LUC boundary, and make any needed revisions to the Land Use Controls/Institutional Controls Summary Table in Section 2.4.1.	A figure (new Figure 7) depicting the LUC boundary and the nearest water supply wells has been added. The reference to the figure is included in Section 2.4.1. No revisions were made to the Land Use Controls/Institutional Controls Summary Table in Section 2.4.1.

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Kevin Mayer USEPA	Specific 13	The FYR indicates that access to area is controlled through an LUC. Please provide an explanation of the risk evaluation forming the basis for establishing the LUC (a CERCLA action) to control access to the area. Please provide information on the results of the baseline ecological risk assessment and its relationship to the LUCs if any. Please revise section 3.2.2 to clarify whether there is sufficient data to determine whether unacceptable risks are present, since the plume is not delineated.	The LUC boundary is MCL based. As indicated in Section 3.2.4: "An update to the 2003 baseline HHRA (Earth Tech 2003) was performed and included in the *First FYRR Addendum* (Appendix B). The update did not result in recommendations for changes to the RAOs, COCs, or cleanup goals selected in the ROD (USAF 2006) because 1) the re-assessment using current toxicity values, risk assessment methodologies, and chemical concentrations resulted in decreased cancer risk values at a majority of the sites; 2) the increases in non-cancer hazard indices were attributable to TCE (which was already identified as a COC in the ROD); and 3) LUCs prevent residential exposure." The first sentence of the fifth paragraph of Section 1.1 has been revised to read: "Although OU 6 groundwater has been impacted by chlorinated and aromatic hydrocarbons, a decision of No Action for soil based on human health and ecological risk assessments was documented in the ROD (USAF 2006)." The third sentence of Section 3.2.2 has been revised to read: "The data indicated that the plume extends beyond the monitored area and a data gap still exists and; therefore, long-term protectiveness cannot currently be evaluated."

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Kevin Mayer USEPA	Specific 14	Section 4.2.1 (Land Use Control Data Review) indicates that mission-related excavations (i.e., construction and ground-disturbing activities) occurred at OU 6 during the reporting period and Section 5.1.3 (Implementation of Industrial Controls and Other Measures) indicates that land use controls (LUCs) were successfully employed as expected at OU 6 during the reporting period. However, documentation that these mission-related excavations were reviewed and approved in accordance with the LUC is not provided, and specifically for dig permits issued during the reporting period. Please revise the FYR to include documentation that these mission-related excavations were reviewed and approved in accordance with the LUC specified in the OU 6 ROD.	The Land Use Control Data Review consisted of reviewing annual LUC Reports. The LUC Reports are clearly cited throughout the Section 4.2.1 text and identified in Table 5 "Documents Reviewed". The first sentence of Section 4.2 Data Review clearly states that "This FYR included a review of relevant documents as presented in Table 5." To further address the comment, the Annual LUC Reports for the reporting period have been added to Appendix A with references to Appendix A made in Section 4.2.1.
Kevin Mayer USEPA	Specific 15	It is unclear whether the ISCO activities carried out in the Site N4 area are consistent with what is documented in the ROD. Please provide an evaluation whether a modification to the decision document may be needed (Page 2-8. "ISCO Activities were discontinued").	The following has been added as the second paragraph of Section 2.3.2: "An example of changing conditions in the field included identification of a high concentration area at Site N4. As previously stated, the RA documented in the ROD includes ISCO treatment in groundwater plume areas with the highest contaminant concentrations. Site N4 was not identified as a high contaminant concentration area in the ROD based on available groundwater data and subsequent design documents defining high contaminant concentration areas as areas with TCE concentrations exceeding 300 micrograms per liter (μg/L). Samples collected from Site N4 groundwater monitoring wells installed post-ROD indicated the presence of TCE exceeding 300 μg/L and therefore ISCO was implemented at Site N4 in 2010."

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Kevin Mayer USEPA	Specific 16	Please explain whether there may be consequences to delaying implementation of the bioremediation remedy until 20for five more years. (Section 2.4.4.).	The following has been added as the second to last sentence of Section 2.4.4: "No impacts to the RA or protectiveness due to delayed bioremediation implementation are anticipated."
Kevin Mayer USEPA	Specific 17	Page 5-8. Site 25, Industrial cleanup from Groundwater, is inconsistent with EPA's groundwater policy. Groundwater should be returned to beneficial reuse and MCLs should generally be established as the cleanup goals.	No change. Since Site 25 is not part of OU 6 and is managed as a separate project under CERCLA, issues with the RA approach should be raised under that program.
Kevin Mayer USEPA	Specific 18	The text in Section 4.2.2.1 states that evidence of permanganate was present in N3-MW15 in 2015, which contradicts the statement in the previous sentence that the concentration of TCE rebounded by 2015 in well N3-MW15. If permanganate was present, the TCE concentration in this well should not have rebounded to 15,000 μg/L. Please resolve this apparent contradiction.	The fifth and sixth sentences of the fifth paragraph of Section 4.2.2.1 have been revised to read: "The TCE concentration in the sample collected in 2012 from well N3-MW15 was below the reporting limit and increased to 15,000 μg/L in the sample collected from that well in 2015, less than 38 months later. A light brown tint was noted on the 2015 sampling log for N3-MW15."
Kevin Mayer USEPA	Specific 19	CT is also present at Site N3, so it is unclear why Fenton's reagent is only recommended for Site N4 (Section 6.2.2.1, Carbon Tetrachloride Treatment). Please recommend use of Fenton's reagent at Site N3 or explain why permanganate is sufficient to address CT at Site N3 when it is not sufficient at Site N4.	No change. The section currently indicates that the unconsolidated materials of the Site N4 aquifer are more appropriate for proper dispersion of Fenton's reagent or persulfate. Please see response to USEPA Specific Comment 21 regarding a comprehensive technology assessment.

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Kevin Mayer USEPA	Specific 20	In Sections 2.3.2., 2.3.3 and 2.3.4, please discuss monitoring for intermediate degradation chemicals from ISCO and bioremediation, and provide an assessment of any results and assessments.	Since Section 2.3 is intended to present considerations for remedy selection, the comment is addressed under Status of Implementation, Section 2.4. The following text has been added as the last sentence of Section 2.4.3: "RPGMRs will present any ISCO activities performed during the reporting period for which they are submitted and will assess occurrences of dichloroethene or vinyl chloride as potential intermediate degradation compounds." The following text has been added as the last sentence of Section 2.4.4: "Once bioremediation activities are implemented, RPGMRs will present any bioremediation activities performed during the reporting period for which they are submitted and will assess enhanced natural attenuation parameters." The following text has been added as the last sentence of Section 2.4.5: "Future RPGMRs will present any ISCO and bioremediation activities performed during the reporting period for which they are submitted and will assess the performance of these activities."

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Kevin Mayer USEPA	Specific 20 (continued)		The second sentence of Section 6.2.3 has been revised as "Annual groundwater monitoring for NDMA, metals (including total and hexavalent chromium), potential intermediate ISCO degradation compounds and VOCs is recommended."
Kevin Mayer USEPA	Specific 21	In Section 6.2.2.2, Page 6-3, the text discusses potential use of one additional enhanced technology (i.e., Sustained Oxidation and Controlled Oxidant Release Encapsulants) to improve remedial efficiency, but a more comprehensive technology assessment should be conducted. There are a number of other promising new technologies, including Plume Stop® Liquid Activated Carbon, which could be used to minimize the potential for plume migration beneath occupied buildings during future injections. This assessment should be conducted before the next round of injections scheduled for 2017. Please conduct a more comprehensive technology assessment and report on this assessment in the FYRR or include a recommendation for conducting a more comprehensive technology assessment before the next round of injections scheduled for 2017.	The following has been added as the last sentence of Section 6.2.2.2: "A comprehensive technology assessment of the encapsulant technology and other promising ISCO technologies and delivery systems should be developed before the next round of injections scheduled for 2017."
Kevin Mayer USEPA	Specific 22	The text does not provide sufficient justification for the statement on page 6-4 that "it is highly unlikely that groundwater would be mechanically impacted beyond 50 feet from the injection point in areas of fractured bedrock." The volume available in fractured granitic bedrock is relatively small, fractures are already "full" of groundwater, and there are insufficient wells to monitor every bedrock fracture, which suggests that plume displacement during previous injections may have occurred in fractures that were not intercepted by a monitoring well. Fractured granitic bedrock does not behave like a porous medium, so if the water levels in monitored wells did not rise for a period of time during and after the injections, plume displacement must have occurred. Please revise or delete the quoted statement.	The second sentence of Section 6.2.2.3 has been revised to read: "Although the ISCO solution does displace groundwater under pressurized injection, based on historical site-specific observations, it is highly unlikely that groundwater would be mechanically impacted beyond 50 feet from the injection point in areas of fractured bedrock."

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Kevin Mayer USEPA	Specific 22	8/4/16 Meeting Follow-up to Specific Comment 22: Revise based on the uncertainty of the radius of ISCO influence during pressurized injection.	Section 6.2.2.3 has been revised to read: "Evidence for the area influenced by pressurized ISCO was exhibited in two ways, 1) groundwater mounding and surfacing observed at monitoring wells (up to 30 feet from an injection well), and 2) purple or pink water observed in monitoring wells during subsequent groundwater sampling events (up to 50 feet from an injection well). Although gravity-fed injection or passive deployment will be the selected method for future ISCO events, if pressurized injection is considered, to prevent displacement of contaminated groundwater and potential impact to site workers via the VIP, it should not be employed closer than 100 feet (a conservative figure based on the 50-foot maximum radius of influence observed during previous injection events) from occupied buildings. The application of pressurized injection and injection locations relative to occupied building should be further evaluated in the recommended comprehensive technology assessment."
Kevin Mayer USEPA	Specific 23	The FYR does not adequately discuss how the continued migration of the Site 25 plume will affect the protectiveness of the OU 6 remedy. Section 5.3.1 of the FYR states that "Groundwater modeling indicates that the Site 25 plume is expected to reach the current boundary of the OU6 plume in 15 to 25 years." The Site 25 plume contains at least one vapor-forming chemical (trichloroethylene, or TCE), which may serve as a subsurface vapor source. Concentrations of TCE and other contaminants have migrated such that higher concentrations are now present farther downgradient. Also, Section 5.3.1 (Site 25) indicates that the TCE plume is currently beneath six OU 6 buildings,	As the remedy for Site 25 is not expected to be selected until 2019 (projected ROD date), it is the Air Force's intention to address vapor intrusion associated with the Site 25 plume and OU 6 plume separately at least until a remedy is selected for Site 25. Figure 5 has been revised to include a "differentiation boundary." Areas upgradient and generally west of the differentiation boundary are Site 25 areas of

Reviewer	Comment #	Comment	Response
Kevin Mayer USEPA	Specific 23 (continued)	but only two buildings have been sampled for VI. The FYR should recommend a program for VI sampling of all buildings above and near the Site 25 plume because building construction varies and preferential vapor migration pathways along subsurface utilities impacts VI. The Site 25 groundwater and Vapor Intrusion monitoring efforts should be integrated with the overall OU6 monitoring program. Please recommend an appropriate evaluation for vapor intrusion potential under current, as well as reasonably expected future, conditions for all buildings that are over or near the Site 25 TCE plume. Also please recommend an integrated and comprehensive long-term monitoring program for Site 25 and OU6.	vapor intrusion responsibility. Areas downgradient and generally east of the differentiation boundary are OU 6 areas of vapor intrusion responsibility. Regarding the Site 25 plume vapor intrusion assessment, the OU 6 Second FYRR already includes the following recommendations in Section 6.1.2: "Prior to the Site 25 remedy selection in the ROD scheduled for 2019, the following tasks are recommended under the Site 25 CERCLA program: annual groundwater monitoring of the Site 25 VOC plume, well installations (as necessary), and annual evaluations of potential impacts to NASA buildings based on groundwater monitoring data, building occupancy evaluations, and building construction evaluations. If building surveys indicate the potential for increased vapor intrusion risks (based on discussions with regulatory agencies), a VIP-related sampling program should be conducted and, if unacceptable indoor air risks are encountered, seasonal variations should be evaluated and/or mitigation measures should be implemented." This text has been further revised to reference the differentiation boundary shown on Figure 5. Regarding the OU 6 plume vapor intrusion assessment, the OU 6 Second FYRR has been

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Kevin Mayer USEPA	Specific 23 (continued)		revised to include the following recommendations: Section 6.2.1 has been revised to include the following recommendation: "Annual LUC reports should be expanded to include a discussion of changes in site conditions (as they relate to new construction or intrusive activities) that might complete the VIP in occupied buildings downgradient and generally east of the vapor intrusion differentiation boundary indicated on Figure 5 or otherwise result in exposure of site workers to plume contaminants." See also response to USEPA Specific Comment 9 regarding revision to Section 6.2.3.

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Kevin Mayer USEPA	Specific 23	8/4/16 Meeting and 8/12/16 Discussion Follow-up to Specific Comment 23: Differentiate between the OU 6 administrative boundary and the OU 6 plume boundary, clarifying that the latter is the subject of the remedy selected in the OU 6 ROD.	A new figure (Figure 3) has been added showing the Site 25 plume boundary, the OU 6 plume boundary, and the OU administrative boundary. Additionally, the following text replaced the third paragraph of Section 1.0: "Edwards Air Force Base (AFB) (the site) (Figure 1) consists of ten operable units (OUs) defined by administrative boundaries as shown on Figure 2; however, only OU 6 (consisting of the National Aeronautics and Space Administration [NASA] Armstrong Flight Research Center [AFRC]) is addressed in this FYR. The remaining OUs are addressed under separate Records of Decision (RODs) and separate FYRs. The OU 6 ROD documented a final remedial action (RA) approach to remediate groundwater impacted by various chlorinated and aromatic hydrocarbons, and includes the following components: land use controls (LUCs), *in situ* chemical oxidation (ISCO), bioremediation, groundwater monitoring, and FYRs. Although OU 6 is defined by an administrative boundary (the extent of which is based on the NASA lease boundary), the remedy selected in the OU 6 ROD addresses only the OU 6 groundwater contamination plume originating in OU 6. The plume boundary as currently known is shown on Figure 3. Each contaminant source originating outside of the OU 6 administrative boundary will be managed under the OU/Site associated with that source."

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Kevin Mayer USEPA	Specific 24	Please revise the FYR to include a short discussion of near- and long-term mitigation of further contaminant migration of the Site 25 plume in shallow groundwater beneath OU 6. The discussion should include the schedule for the OU8 Site 25 ROD and the Regulatory Agency preference for resuming operation of the Site 25 GETS.	Please see response to USEPA Specific Comment 23. Section 4.1 has been revised to include the following (addition shown in italics): "Mr. Lewis and Mr. Mayer identified the proximity of the Site 25 VOC plume (upgradient of the OU 6 plume) as a potential impact to future OU 6 RA protectiveness *and the RPMs have indicated a preference for restarting the Site 25 groundwater extraction and treatment system (see comments and responses provided in Appendix J)*."
Kevin Mayer USEPA	Specific 25	Prediction of the rate of expansion of the Site 25 plume may be based on models that assume bedrock fractures are an equivalent porous media, which are of questionable use at OU6. Plume arrival times should be based on concentrations and trends in observed contaminant concentrations. Please revise the FYR to include a map that depicts current concentrations in the Site 25 plume near and beneath OU 6. In addition, please delete references to and reliance on groundwater modeling in the FYR.	Figure 5 has been expanded to include the estimated extent of the Site 25 plume based on 2014 TCE groundwater data. The estimated Site 25 plume extent based on 2015 data had not been presented to, or reviewed by, the RPMs when these responses were prepared. Additionally, presentation of the Site 25 2014 TCE contours is consistent with the recently-submitted Draft Site 25 FS. The following sentence has been deleted from Sections 1.1 and 5.3.1: "Groundwater modeling indicates that the Site 25 plume is expected to reach the current boundary of the OU 6 plume in 15 to 25 years (AECOM 2016f)."

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Kevin Mayer USEPA	Specific 26	The text in Section 5.3.1 (lines 1-2) states that if unacceptable indoor air risks are encountered in buildings above the Site 25 plume, a subslab mitigation system could be installed beneath an existing building. It is generally not feasible to retrofit an existing building with an effective subslab mitigation system. Subslab vapor mitigation systems can be installed for new buildings. Please revise the text to delete the suggestion that a subslab vapor mitigation system can be installed beneath an existing building.	References to sub-slab vapor mitigation systems related to the Site 25 plume have been deleted.
Kevin Mayer USEPA	Specific 27	The Protectiveness Determination in Section 7.0 should explicitly indicate that the OU6 remedy is protective in the Short Term. Please make this revision. Please revise the protectiveness statement to include the need to address the Site 25 plume and to evaluate the VIP in the future as additional actions needed to make the remedy protective in the long term.	The first sentence of the Protectiveness Statement has been revised to read: "The remedy at Edwards Air Force Base Operable Unit 6 protects human health and the environment in the short-term because exposure pathways that could result in unacceptable risks are being controlled through institutional controls that are preventing exposure to, and the ingestion of, contaminated groundwater." The last sentence of the first paragraph of the Protectiveness Statement has been replaced with: "In order for the remedy to be protective of groundwater resources and occupied buildings above or near the shallow groundwater plume in the long-term, the Operable Unit 6 groundwater contaminant plume will be completely delineated and changes in site conditions will be tracked and evaluated in annual land use control reports and remedy performance and groundwater monitoring reports." The Air Force disagrees with including Site 25 in the OU 6 Remedy Protectiveness Statement.

Reviewer	Comment #	Comment	Response
Kevin Mayer USEPA	Specific 27 (continued)		It is not appropriate to include a site that is not included in the remedy for which the protectiveness statement is addressing.
Kevin Mayer USEPA	Specific 23 as related to Specific 27	8/4/16 Meeting Follow-up to Specific Comment 23: In the protectiveness statement there should be a differentiation between the OU 6 administrative boundary and the area addressed by the remedial action - the OU 6 plume boundary.	The protectiveness statement has been revised (with changes since the OU 6 Second FYRR noted in *italics*) as follows: "The remedy *identified* ~~at~~ *in the* Edwards Air Force Base Operable Unit 6 *Record of Decision* ~~currently~~ protects human health and the environment *in the short-term, in the area impacted by the Operable Unit 6 contamination,* because exposure pathways that could result in unacceptable risks ~~in the short term~~ are being controlled through institutional controls that are preventing exposure to, and the ingestion of, ~~contaminated~~ *contamination in* groundwater. ~~However,~~ In order for the remedy to be protective *of groundwater resources and occupied buildings above or near the shallow groundwater plume* in the long-term, *the Operable Unit 6* ~~the leading edge of the~~ groundwater contaminant plume will be completely delineated *and changes in site conditions will be tracked and evaluated in annual land use control reports and remedy performance and groundwater monitoring reports*. The remedy *for the* ~~at~~ Operable Unit 6 *contamination* is expected to be protective of human health and the environment upon

Reviewer	Comment #	Comment	Response
Kevin Mayer USEPA	Specific 23 as related to Specific 27 (continued)		completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks. *Other areas within the Operable Unit 6 administrative (lease) boundary are impacted by groundwater contamination from Site 25. Site 25 is undergoing a remedy selection process. Recommendations have been provided in this report to address protectiveness to areas within the Operable Unit 6 administrative boundary impacted by the Site 25 groundwater contamination.*
Kevin Mayer USEPA	Specific 28	Please add a discussion in the FYR of the intention and future schedule for combining FYRs basewide rather than OU-specific reports, to utilize our resources more efficiently and provide the public a comprehensive picture of the protectiveness of the entire site.	The following discussion has been added at the end of Section 1.1: "As additional RODs are signed for Edwards AFB OUs, the Air Force will begin concurrently documenting FYRs, as appropriate."
Kevin Mayer USEPA	Specific 29	The FYR template was not designed for Federal Facilities. Future FYRs may be able to follow updated templates for FF FYRs.	No change. The verbiage in the cover letter to the template may be interpreted to indicate that it was not designed for federal facilities; but, that is not explicitly stated. Per the 13 July 2016 RPM meeting discussion the OU 6 Second FYRR will use the template. Future Edwards AFB's five-year reviews will use the 2001 guidance template or a Federal Facility FYR template if available.

Reviewer	Comment #	Comment	Response
Kevin Mayer USEPA	Specific 30	Section 1.0 indicates that the FYRR was evaluated in accordance with the Five-Year Review Guidance; however, other applicable five-year guidance documents are not referenced. Specifically, the Guidance on Assessing Protectiveness at Sites for Vapor Intrusion - Supplement to the "Comprehensive Five-Year Review Guidance," OSWER Directive 9200.2-84, dated November 2012 and Clarifying the Use of Protectiveness Determinations for Comprehensive Environmental Response, Compensation, and Liability Act Five-Year Reviews, OSWER 9200.2-111, dated September 13, 2012 are not referenced. Please revise Section 1.0 to reference all applicable five-year review guidance.	Guidance documents referenced in Section 5 have been added to Section 1.
Kevin Mayer USEPA	Specific 31	Section 5.2.2 states the toxicity criteria for isopropanol and tetrahydrofuran have been updated. However, their toxicity values were not used in the baseline human health risk assessment (HHRA) and a comparison was not made in the Draft Second Five-Year Review Report, Operable Unit 6, dated June 2016. It is unclear why the updated toxicity criteria for the chemicals mentioned above is not warranted. Please revise the text to discuss the impact of the updated toxicity criteria or to provide a rationale to clarify this exclusion.	This section of the report discusses the comparison of the toxicity values for chemicals assessed in the baseline HHRA to subsequent vapor intrusion assessments. Isopropyl alcohol and tetrahydrofuran were not reported during the investigations used for the baseline HHRA. The sixth sentence of the second paragraph of Section 5.2.2 has been revised as follows: "Although the toxicity criteria for isopropanol and tetrahydrofuran have been updated (the most recent toxicity values for all the chemicals, including isopropyl alcohol and tetrahydrofuran, were used in the 2013 and 2016 VIP assessments) their toxicity values were not used in the baseline HHRA; therefore, there is no comparison to be made."

Reviewer	Comment #	Comment	Response
Kevin Mayer USEPA	Specific 32	Table 6 is potentially misleading in listing the California EPA inhalation unit risk for naphthalene as though it were an EPA-derived value published in EPA's Integrated Risk Information System (IRIS). Likewise, it is potentially misleading to list the ATSDR reference concentration for acetone as though it were an EPA-derived value published in IRIS. In addition, Table 6 might benefit from having an extra column listing the publication or revision dates for the toxicity values derived by the California EPA. Please revise Table 6 to clarify and correct to distinguish IRIS values from other sources of toxicity information.	Footnotes in Table 6 provide the sources of the values and the column headings have been revised to: "USEPA-Recommended Cancer IUR" and "USEPA-Recommended Non-cancer RfC". Extra columns listing the publication/revision dates for the toxicity values derived by the California EPA have been added to Table 6.
Kevin Mayer USEPA	Specific 33	The FYR does not discuss perfluorinated compounds (PFCs), which are a significant emerging contaminant. Since it has been documented that PFC releases occurred in OU 6, the FYR should be revised to discuss this emerging contaminant under Question C, Has any other information come to light that could call into question the protectiveness of the remedy? The FYR should also discuss how the potential extent of PFC contamination will be assessed, including recommendations and a timeframe to address the recommendations. Please revise the FYRR to discuss PFCs as an emerging contaminant, including recommendations and a timeframe for addressing the recommendations.	A discussion of PFCs has been added to Section 5.3.2.

Reviewer	Comment #	Comment	Response
Kevin Mayer USEPA	Specific 34	The text of Section 4.2.1.1 states, "Of the five mission-related excavations conducted in 2011, one occurred within the LUC boundary and groundwater was encountered. The mission-related excavation activities did not impact the remedy;" however, the depth of the excavation is not specified. Please revise Section 4.2.1.1 to specify the depth of the mission-related excavation conducted within the LUC boundary where groundwater was encountered.	The second sentence of Section 4.2.1.1 has been replaced with: "Of the five mission-related excavations conducted in 2011, one task occurred within the LUC boundary. Various manholes were excavated throughout OU 6 to a depth of 12 feet bgs and groundwater was encountered. Appropriate personal protective equipment was worn." In response to USEPA Specific Comment 14, the Annual LUC Reports for the reporting period have been added to Appendix A with references to Appendix A made in Section 4.2.1. The LUC Reports include detailed tables identifying excavation location, type, and depth.
Kevin Mayer USEPA	Specific 34	8/4/16 Meeting Follow-up to Specific Comment 34: Include text that indicates that excavations are not causing new preferential pathways, impacting the VIP, or otherwise invalidating the VIP investigation results and conclusions.	The following has been added as the last sentence of Section 4.2.1.5: "Excavation activities performed since the completion of the March 2013 VIP investigation at Buildings 4806 and 4807 did not result in new preferential pathways, impact the VIP, or otherwise invalidate the VIP investigation results or conclusions."
Kevin Mayer USEPA	Specific 35	Table 1 has not been updated to include activities since 2010. At a minimum the various vapor intrusion and groundwater investigations and groundwater monitoring events should be included. Please update this table to include activities that have occurred since 2010.	The table has been updated as requested.
Kevin Mayer USEPA	Specific 36	Table 2 does not include hexavalent chromium. Based on Section 6.2.4 (Hexavalent Chromium as a Contaminant of Concern), hexavalent chromium is recommended as a constituent of concern (COC). Please revise Table 2 to include hexavalent chromium as a COC.	No change. Although a recommendation is included in the document, the inclusion of hexavalent chromium as a COC has not yet been agreed to by RPMs.

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Bruce Lewis DTSC	Specific 1	Page 3-2, Section 3.2.1, Line 20. "Current protectiveness of the OU 6 remedy has not been affected by the Site 25 plume." While the OU6 remedy may not be affected by the Site 25 plume because the plumes have not yet commingled, the Site 25 plume does impact groundwater within OU6 and the trichloroethene (TCE) concentrations pose a potential vapor intrusion risk to the health of personnel within OU6. In a letter to the Air Force (AF) dated 18 April 2016, the United States Environmental Protection Agency (USEPA), DTSC, and Lahontan Regional Water Quality Control Board (RWQCB) expressed our collective belief that the Site 25 TCE groundwater plume at concentrations greater than the 170 μg/L risk-based cleanup level (the concentration modeled to result in a $1x10^{-6}$ vapor intrusion risk) has migrated further downgradient beneath OU6 than is currently depicted in figures presented in the Draft 2013 and 2014 Groundwater Monitoring Report for Site 25 (AECOM, May 2016). The agencies belief is based on the absence of groundwater monitoring wells delineating the downgradient extent of the Site 25 TCE plume and supporting the location of the 170 μg/L contour currently shown in those figures. Based on the downgradient extent of TCE in groundwater at concentrations above 170 μg/L, as interpreted by the agencies, a VI assessment appears warranted for Buildings 4828, 4857, and 4876.	Please see response to USEPA Specific Comment 23.

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Bruce Lewis DTSC	Specific 2	Page 4-7, Site N3, 1st Complete Paragraph, Last Sentence, Lines 13 through 16. "The TCE concentration of 30 μg/L detected in the sample collected from well N3-MW28 supports the interpreted location of the 5- and 50-μg/L concentration contours relative to Building 4800 (Figure 5), as previously reported using 2012 sampling date." That the detection of 30 μg/L TCE in well N3-MW28 supports the interpreted location of the 5- and 50-μg/L contours based on the 2012 data is fortuitous. Since well N3-MW28 was not present in 2012, it is unknown whether the 30 μg/L TCE concentration detected in 2015 is indicative of stable, increasing, or decreasing TCE concentrations at that location. However, TCE concentrations in monitoring well N3-MW03, near the southwest corner of Building 4802, increased from 130 μg/L in 2012 to 450 μg/L in 2015 and the iso-concentration contours on Figure 5 show that TCE concentrations at or above 100 μg/L may be present in groundwater beneath the southwest corner of Building 4802. The TCE concentration at 450 μg/L in monitoring well N3-MW03 is well above the modeled TCE concentration of 170 μg/L for the Site 25 plume being used as the trigger point for a VI assessment of any building overlying groundwater with TCE at that concentration. The increasing TCE concentration observed in groundwater in monitoring well N3-MW03 could result in a VI issue for Building 4802 if not addressed and negatively affect the long-term protectiveness of the OU6 remedy. Monitoring well N3-MW30 should be included in the in-situ chemical oxidation (ISCO) injection program.	Please see responses to USEPA Specific Comments 1 and 23.

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Bruce Lewis DTSC	Specific 3	Page 5-6, Section 5.2.2, 1st Paragraph, Lines 8 through 15. Please clarify in the text that the results of the 2013 VI investigation are presented in the Final Vapor Intrusion Investigation Report (VIIR) dated June 2016 that is included as Attachment B to Appendix C of the Addendum to the First Five-Year Review Report (Appendix B) and the results of the 2016 VI investigation are presented in the Vapor Intrusion Investigation Report Addendum (Appendix C).	The last sentence of Section 5.2.2 has been replaced with: "Additionally, changes in the extent of benzene in relation to the occupied buildings (representing a potential change in the exposure pathway) necessitated the collection and inclusion of building sub-slab soil gas and indoor air data during the re-assessment. Results of the 2013 VI investigation are presented in the Final *Vapor Intrusion Investigation Report* dated June 2016 that is included as Attachment B to Appendix C (the Final *Human Health Risk Assessment Addendum*) of the *Addendum to First Five-Year Review Report* (Appendix B of this *Second Five-Year Review Report*). Results of the 2016 VI investigation are presented in the *Vapor Intrusion Investigation Report Addendum* (Appendix C of this *Second Five-Year Review Report*)."
Bruce Lewis DTSC	Specific 4	Page 5-6, Section 5.2.2, Table 6. Include revision dates for Office of Environmental Health Hazard Assessment (OEHHA) toxicity criteria. The OEHHA reference concentration (RfC) for benzene was revised in July 2014 and should therefore be highlighted in bold on this table.	The table has been updated as requested.

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Bruce Lewis DTSC	Specific 5	Page 5-8, Section 5.3.1, Site 25, 1st Paragraph, Last Sentence, Lines 5 and 6. "Because the Site 25 plume has not impacted OU6 groundwater, the current protectiveness of the OU 6 remedy has not been affected." This statement is incorrect. According to figures presented in the Draft 2013 and 2014 Groundwater Monitoring Report for Site 25 (AECOM, May 2016), the Site 25 TCE plume has migrated at least 2,000 feet beneath OU6 and the agencies believe it to be even further (See Specific Comment 1). Please revise this statement for accuracy and provide further explanation why the presence of groundwater beneath OU6 that has been impacted with TCE from Site 25 does not affect the current protectiveness of the OU6 remedy.	Section 5.3.1 has been revised to read: "The remedy selected in the OU 6 ROD addresses the OU 6 groundwater plume originating from OU 6 and does not include plumes originating from outside the OU 6 boundary. Because the Site 25 plume has not commingled with the OU 6 groundwater plume (Figure 5), the current protectiveness of the OU 6 plume remedy has not been affected." Figure 5 has been expanded to include the estimated extent of the Site 25 plume based on 2014 TCE groundwater data.
Bruce Lewis DTSC	Specific 6	Page 5-8, Section 5.3.1, Site 25, 3rd Paragraph, Lines 19 through 21. As noted in Specific Comment 1, the agencies believe that groundwater contain in TCE concentrations greater than 170 μg/L (the concentration modeled to result in a 1 x1 o- vapor intrusion risk) is already present beneath Buildings 4828, 4857, and 4876. Please provide further discussion regarding the decision making process and criteria that will be used to determine whether the installation of groundwater monitoring wells upgradient of the Buildings 4828, 4832, 4857 and 4876 is necessary.	Since these buildings may be impacted by the Site 25 groundwater contamination, the upcoming Site 25 documents (Monitoring Reports, FS, PP, ROD) will provide the decision making process and criteria that will be used to determine whether the installation of groundwater monitoring wells upgradient of Buildings 4828, 4832, 4857 and 4876 is necessary. Please also see response to USEPA Specific Comment 23 regarding the inclusion of a "differentiation boundary" on Figure 5. Areas upgradient and generally west of the differentiation boundary are Site 25 areas of vapor intrusion responsibility. Areas downgradient and generally east of the differentiation boundary are OU 6 areas of vapor intrusion responsibility.

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Bruce Lewis DTSC	Specific 7	Page 6-1, Section 6.1. Please add text to this section acknowledging that an increase in the extent and concentrations of benzene in groundwater beneath Buildings 4806 and 4807 could also affect future protectiveness.	Because Section 6.1 is intended to address the leading edge of the plume and not the Site N3 area, the comment will be addressed by adding the following text to Section 6.2.3: "Remedy performance and groundwater monitoring reports should include discussion of changes in site conditions (as they relate to COC concentrations and plume delineation and impact to remedy protectiveness) that might complete the VIP in occupied buildings downgradient and generally east of the vapor intrusion differentiation boundary indicated on Figure 5. The reports should provide appropriate recommendations as they relate to such conditions."
Bruce Lewis DTSC	Specific 8	Page 6-2, Section 6.1.2, Lines 12 through 16. See Specific Comment 1 regarding VI assessments for other buildings in OU6 that overlie the Site 25 TCE plume. Please explain how data from annual building occupancy evaluations, a building construction evaluation, and surveys will be used to determine the potential for increased vapor risks. The FYR should recommend a program that includes the collection and analysis of indoor air samples to confirm the presence or absence of TCE in buildings that overlie the Site 25 plume.	Please see response to DTSC Specific Comment 6.

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Bruce Lewis DTSC	VIIRA General 1	Due to the relatively short and critical timeframe for review and completion of the Second Five-Year Review Report (2nd FYRR), DTSC believes that this document, which presents data crucial to the 2nd FYRR, should have integrated the results of the vapor intrusion (VI) sampling performed in March and August 2013 at Buildings 4806 and 4807 with that collected in February 2016. Doing so would have more effectively communicated the cumulative potential vapor intrusion risk to workers in Buildings 4806 and 4807; thereby simplifying review of the data and expediting the resolution of concerns related to the vapor intrusion risk component.	A comparison of the August 2013 event (representing the Summer event) and the February 2016 (the Winter event) was included in the Draft VIIR Addendum (Appendix C to the 2nd FYRR) in Table 4 and Sections 3.1.1.1, 3.1.1.2, 3.1.2.1, 3.1.2.2, 3.6.2.1, 3.6.2.2, and 4.2. Additionally, Table 7, consisting of a summary of Maximum Cumulative Indoor Air Risk from Vapor Intrusion Pathway-Related Chemicals per building for all three vapor sampling events, was provided in the main text of the Draft 2nd FYRR in an effort to simplify the review. Additional revisions have been made to the VIIR Addendum per the response to HERO's General Comment 3.
Bruce Lewis DTSC	VIIRA General 2	DTSC does not concur with the conclusion, presented as a recommendation in Section 4.2, that the results of the VI investigation at Buildings 4806 and 4807 indicates that an indoor air monitoring program is not needed at any other NASA buildings in the path of the benzene and trichloroethene (TCE) plumes. While we agree that Buildings 4806 and 4807 are currently the most likely buildings to be impacted via the vapor intrusion pathway (VIP), DTSC notes that the TCE iso-concentration contours presented in Figure 4 of the 2015 Remedy Performance and Groundwater Monitoring Report (AECOM, April 2014) indicate that TCE concentrations at or above 100 μg/L may be present in groundwater beneath the southwest corner of Building 4802. Additionally, the increase in TCE concentration in N3-MW03 near the southwest corner of Building 4802 from 130 μg/L in 2012 to 450 μg/L in 2015 suggests that the plume in the area of Building 4802 may be expanding. The need to conduct a VI investigation for other NASA buildings in the future can only be made on a case by case (building by building) basis considering such variables as the types and concentrations of chemicals in the groundwater	A new table has been added as Table 2 to provide rationale for the selection of buildings to be investigated for VIP risks. The second paragraph of Section 1.3.2 has been revised to read: "Because the indoor air risks at OU 6 under the current industrial scenario were assumed to be driven by the inhalation of TCE and benzene volatilized from groundwater into indoor air, groundwater risk-based screening levels (RBSLs) were developed for these chemicals. The selection of buildings to be included in this VIP investigation was based on a screening procedure that conservatively calculated a concentration in groundwater that would be protective of indoor air in buildings overlying the commingled plume. The screening process

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Bruce Lewis DTSC	VIIRA General 2 (continued)	plume, location of the groundwater plume(s) with respect to the building, lithology of the vadose zone, building construction, building occupancy, potential preferential pathways, and operation of the heating, ventilating, and air conditioning (HVAC) system.	identified areas of groundwater where TCE and benzene concentrations were above those that may result in unacceptable risk in indoor air and whether there were routinely occupied buildings within those areas. Buildings 4800, 4802, 4806, 4807, 4808, 4810, 4823, and T-20 are occupied and within 100 ft of the TCE and/or benzene concentrations exceeding the selected RBSLs. Of those eight buildings, three buildings (Buildings 4806, 4807, and 4810) were included in the current VIP investigation (4810 has since been demolished). The processes of RBSL development and for determining the buildings to be included in the VIP investigation is detailed in Appendix A of the *Vapor Intrusion Sampling Plan and Risk Assessment Work Plan (Work Plan*) (AECOM 2013) and an updated building screening summary table is provided in this document as Table 2." The following items have been added to the Executive Summary and Section 4.2: ■ Remedy performance and groundwater monitoring reports should include discussion of changes in site conditions (as they relate to COC concentrations and plume delineation) that might complete the VIP in occupied buildings. The reports should provide appropriate recommendations as they relate to such conditions.

Reviewer	Comment #	Comment	Response
Bruce Lewis DTSC	VIIRA General 2 (continued)		■ LUC reports should include discussion of changes in site conditions (as they relate to new construction or intrusive activities) that might complete the VIP in occupied buildings or otherwise result in exposure of site workers to plume contaminants. The reports should provide appropriate recommendations as they relate to such conditions.
Bruce Lewis DTSC	VIIRA Specific 1	Page 1-1, Section 1, 1st Paragraph, 1st Sentence. Please provide text clarifying that the Final Vapor Intrusion Investigation Report (VIIR) dated June 2016 presenting the results of the VI sampling performed in 2013 is included as Attachment B to Appendix C of the Addendum to the First Five-Year Review Report (Appendix B). Also, revise the date in the reference from 2014 to 2016. This comment also applies to the sentence presented in the Executive Summary (page vii).	The first sentence of Section 1.0 has been revised to read: "Under the Environmental Restoration Program (ERP), the United States Air Force (USAF) and the National Aeronautics and Space Administration (NASA) conducted a vapor intrusion pathway (VIP) investigation at Buildings 4806, 4807, and 4810 within Operable Unit (OU) 6, Edwards Air Force Base (AFB), California (Figure 1) in March and August 2013. The results of the 2013 VIP investigation are presented in the Final *Vapor Intrusion Investigation Report* that is included as Attachment B to Appendix C (the Final *Human Health Risk Assessment Addendum*) of the *Addendum to First Five-Year Review Report* (Appendix B of the *Second Five-Year Review Report*)." The reference for the *Vapor Intrusion Investigation Report* has been changed to reflect the 2016 Final version in the Reference section.

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Bruce Lewis DTSC	VIIRA Specific 1 (continued)		The referenced sentence in the Executive Summary has been changed to: "Under the Environmental Restoration Program, the United States Air Force (USAF) and the National Aeronautics and Space Administration conducted a vapor intrusion pathway (VIP) investigation at Buildings 4806, 4807, and 4810 within Operable Unit (OU) 6 in March and August 2013 as reported in the *Vapor Intrusion Investigation Report* (*VIIR*) included as Attachment B to Appendix C (the Final *Human Health Risk Assessment Addendum*) of the *Addendum to First Five-Year Review Report* (Appendix B of the *Second Five-Year Review Report*)."
Kimberly Gettmann DTSC HERO	VIIRA General 1	Building Occupancy. Please clearly state in the Report whether Building 4806 and 4807 are currently occupied, and whether they will be occupied up until the buildings are demolished.	The following sentence has been added to the Executive Summary and Section 1.0: "Buildings 4806 and 4807 are currently occupied and will be occupied until they are demolished."

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Kimberly Gettmann DTSC HERO	VIIRA General 2	Executive Summary and Section 4.2 -Recommendations. The potential vapor intrusion risk for Building 4806 is within the risk management range due to the detection of benzene in the indoor air. Both Buildings 4806 and 4807 sit above a benzene groundwater plume that is, and will continue to migrate beneath the buildings. A vapor intrusion monitoring program is not recommended for either building since both buildings are slated for demolition as early as 2018. What is the contingency plan if the buildings are not demolished and are occupied? While Buildings 4806 and 4807 are the most likely buildings to be impacted by the vapor intrusion pathway (VIP) due to their proximity to the benzene and TCE groundwater plumes, not all buildings are the same and whether other buildings near the plume could also be impacted via the VIP will also depend on building construction, potential preferential pathways, and running conditions of the HVAC, as demonstrated in this Report. These factors should be kept in mind before making the conclusion that VIP will not be of concern at any other NASA buildings in the path of the benzene and TCE plumes. There is the potential for additional cancer risk to occupants of the buildings sampled, the risk is just in the risk management range, and whether mitigation is necessary, is a risk management decision.	Please see response to Bruce Lewis VIIRA General Comment 2.

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Kimberly Gettmann DTSC HERO	VIIRA General 3	Please provide a comprehensive table listing the indoor/outdoor air and sub-slab analytical results and vapor intrusion risks/hazards for all three rounds of sampling conducted in Buildings 4806 and 4807 (March and August 2013 and February 2016). Additionally, a comprehensive discussion should be included in this Report. The discussion should include but not limited to the range of potential indoor air risks over the sampling' events and seasons, range of chemical concentrations detected in the samples comparing the various sampling events and time periods, and any spatial and temporal variability between two winter and one summer sampling events. A more detailed discussion is warranted than the brief text in Sections 3.6.2.1 and 3.6.2.2. The VIP-related risk is within the risk management range and the recommendation for both buildings is for no further action to address the VIP. HERO acknowledges that these buildings are slated for demolition; however, until they are actually demolished the Report should reflect current status. Note that demolition for these buildings has already been delayed.	Appendix E has been added to include tables listing the results of the 2013 investigations at Buildings 4806 and 4807. The data include analytical results for indoor air, sub-slab vapor, and outdoor air samples as well as indoor air risks and hazards. Additional text was added to Section 2.3 to include the depth and height of sample collection in order to clarify that sample locations were consistent across events. Sections 3.2 and 3.3 have been revised to include a discussion of the indoor air and sub-slab VIP-related analytes and references to new Tables 7 and 8 which present the maximum concentrations of those analytes for each of the three sampling events at both buildings. Table 13 and reference to that table has been added to Section 3.6 with a discussion of the range of calculated maximum VIP-related indoor air risks between sampling events. Section 3.6.3.1 has been revised to include a discussion of the time of day samples were collected and variability between events. A reference to Table 13 has also been made in Section 4.0.

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Kimberly Gettmann DTSC HERO	VIIRA General 4	Building 4807. tetrachroroethene (PCE) was detected in an indoor air sample at a concentration of 2.1 $\mu g/m^3$ during the February 2016 sampling event. The detection of PCE was not considered VIP-related as benzene is reported as the only VIP-related detected COC. The indoor air concentration is the DTSC-recommended screening level. At the very least, this detection needs to be discussed and the reason as to why it is not considered VIP-related needs to be provided. Additionally, if PCE was detected in the indoor air during either the March or August 2013 sampling events that should also be discussed.	The following text has been added to Section 3.3.2: "PCE was detected at a concentration of 2.1 $\mu g/m^3$ in the indoor air sample N3-4807IA1, equal to the CA-IASL. PCE was not detected in indoor air at that location during the 2013 investigations." The following text has been added to the sixth paragraph of Section 3.6.1: "PCE was detected at a concentration equal to the CA-IASL (2.1 $\mu g/m^3$) in the indoor air sample N3-4807IA1; however, since the concentration was higher in the indoor air sample than in the corresponding sub-slab vapor sample (1.6 $\mu g/m^3$), the source of the PCE is likely inside the building and not VIP-related."
Kimberly Gettmann DTSC HERO	VIIRA General 5	VIP-Related COCs for Buildings 4806 and 4807 -Tables 10, 11, 12, and 13. a. Building 4806 (Tables 10 and 11). Benzene is only considered to be VIP-related at one sampling location, N3-4806IA2 and not considered VIP-related at sampling locations N3-48061A1, N3-4806IA3, N3-48061A4, and N3-48061A5. The building sits above a benzene groundwater plume and since it was determined that benzene is VIP-related at one location, it should also be VIP-related at all sampling locations. 1,2,4-trimethylbenzene, m,p-xylenes, and n-hexane are also determined to be VIP-related at one or more sampling locations but not at all sampling locations. b. Building 4807 (Tables 12 and 13). Benzene is only considered to be VIP-related at one sampling location, N3-48071A2, and not VIP-related at sampling locations N3-48071A1, N3-48071A3 and N3-48071A4. The building sits above a benzene groundwater plume and since it was determined that benzene is VIP-related at one location, it should also be	There is no evidence to support the assumption that if an analyte was detected at one indoor air sample location in the building and determined that it is VIP-related then all detections must also be VIP-related. For example, benzene may be present in a room where it is utilized as part of the building activities, resulting in indoor air concentrations. This is why sub-slab vapor samples were collected at locations which correspond to the indoor air samples and the sub-slab vapor concentrations compared to the indoor air concentrations to determine if they are VIP-related at each point. Additionally, groundwater analytical data from monitoring wells adjacent to Buildings 4806 and 4807

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Kimberly Gettmann DTSC HERO	VIIRA General 5 (continued)	VIP-related at all sampling locations.	indicate that the benzene plume extends only under the northern corner of Building 4806 and does not extend beneath Building 4807. Although, the plume extents are inferred and may extend further beneath the buildings than interpreted, it is reasonable to conclude that the benzene distribution beneath the buildings is not uniform due to the occurrence of groundwater in fractured bedrock and, therefore, benzene concentrations in sub-slab vapor samples, if attributable to groundwater, would also vary. Further, given the history of benzene use in Building 4806, the source of benzene in sub-slab vapor samples could be the maintenance activities occurring in Building 4806. To account for these considerations, the VOCs detected in the indoor air samples were assessed on a point by point basis to determine the likelihood of originating from the subsurface via the VIP based upon the interpretation of several lines of evidence as described in Section 3.6.2.1 and documented in the final *Vapor Intrusion Sampling Plan and Risk Assessment Work Plan*. No change.
Kimberly Gettmann DTSC HERO	VIIRA General 6	Section 4.1 -Conclusions. The text under the third bullet addresses whether Objectives 3 and 4 have been met during this sampling event. Please provide more details for the sub bullets as to what the risk range is for each building. The current text is too general.	The sub-bullets in the Executive Summary and Section 4.1 have been revised to present the risk ranges for individual buildings.

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Kimberly Gettmann DTSC HERO	VIIRA Specific 1	Section 1.5.1 and References. For Information Only. a. Please note that the Advisory-Active Soil Gas Investigations from Cal EPA was updated in July 2015 and can be found at: http://www.dtsc.ca.gov/SiteCleanup/upload/VI ActiveSoilGasAdvisory FINAL.pdf. b. Please note that the Office of Solid Waste and Emergency Response (OSWER) Final Guidance for Assessing and Mitigating the Vapor Intrusion to Indoor Air Pathway from Subsurface Sources to Indoor Air has been finalized and was released in June 2015. (https://www.epa.gov/vaporintrusion/technical-guide-assessing-and-mitigating-vapor-intrusion-pathway-subsurface-vapor)	Comment noted. No change.
Kimberly Gettmann DTSC HERO	VIIRA Specific 2	Section 3.2 -Sub-Slab Analytical Results. For Information Only. Sub-slab soil vapor screening levels (SVSLs) were derived by dividing the indoor air screening level (IASL) by the attenuation factor (alpha} of 0.05. DTSC currently recommends using an alpha of 0.05 when evaluating sub-slab while US EPA recommends using an alpha of 0.03, as discussed in their June 2015 vapor intrusion guidance document.	Comment noted. No change.
Kimberly Gettmann DTSC HERO	VIIRA Specific 3	Table 1 -Volatile Organic Compounds Detected above MCLs or RSLs in Groundwater Near Buildings 4806 and 4807 from 2006 to 2015. The table lists the USEPA tap water regional screening level (RSL). For completeness, please also list the recommended DTSC-screening level (SL) for those chemicals that DTSC recommends a different screening level than the RSL as discussed in our HHRA Note 3 (http://www.dtsc.ca.gov/AssessingRisk/upload/HHRA Note 3 -2016-06.pdf). The chemicals include but are not limited to: benzene, carbon tetrachloride, methylene chloride, PCE, and vinyl chloride.	A column has been added to Table 1 as requested.

RESPONSES TO COMMENTS

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Alonzo Poach CRWQCB	General 1	Despite additional plume delineation efforts since the First FYR, lateral plume delineation continues to be an issue in the second FYR period. The OU6 plume shows an estimated plume extent that is approximately 2500 longer than originally estimated in 2010 (First FYR). It is unclear how effective the land-use control component of the remedy was/is in protecting worker safety considering the lack of lateral delineation of the plume. Please clarify in the FYR if land use controls and administrative processes ("dig-permits") include buffer zones to protect worker safety when excavating in areas of potential contamination. Given that the extent of the plume and the lack of lateral control the Air Force should consider a more conservative LUC boundary to protect worker safety in the downgradient portion of the plume especially if excavations are expected to encounter groundwater.	Section 6.2.1 has been revised to include the following: "Future revisions of the LUC boundary should include a buffer zone to account for uncertainties in plume delineations."
Alonzo Poach CRWQCB	General 2	Plume delineation efforts are planned utilizing direct push technology as identified in Section 6 of the FYR. Figure 8 presents proposed direct push locations. Presumably the full scope of future delineation effort will presented in a future work plan; however, it is unclear why direct push locations are not proposed past the current leading edge of the plume and how feasible direct-push technologies will be considering shallow bedrock that occurs beneath Rogers Dry Lake.	The following note is included on Figure 9 (old Figure 8): "Additional groundwater grab locations may be advanced downgradient based on the analytical results from the samples collected at the 25 proposed locations shown." The Air Force is currently re-evaluating the placement of some proposed direct push groundwater sample locations shown on Figure 9 based on the results of the OU 1 CPT investigation near OU 6.

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Alonzo Poach CRWQCB	General 3	The FYR Report acknowledges that Site 25 plume and selected remedy (ROD currently scheduled for 2019) may affect the long-term protectiveness of the remedy for OU6. Based on figures provided in the FYR the leading edge of the Site 25 plume is approximately 800 feet up-gradient of the OU6 commingled plume. Several data gaps exist to the north and south of well cluster 25-MW87 through 25-MW90. Recent Site 25 groundwater monitoring reports do not include recommendations for new wells to address data gaps. Data gap analysis and proposals to fill data gaps have been differed to upcoming long-term monitoring optimization plans (Basewide Groundwater Monitoring Sampling and Analysis Plan, Volume V (Site 25), Long Term Monitoring Optimization Report). Those data gaps need to be addressed to more definitively illustrate that the Site 25 plume has not comingled with the OU6 plume. The regulatory agencies (EPA, DTSC and Water Board) have requested that the Site 25 groundwater extraction system be resumed and optimized to contain plume migration.	Figure 5 has been expanded to include the estimated extent of the Site 25 plume based on 2014 TCE groundwater data. Please include Site 25 data gap concerns in comments on Site 25 documents, such as the recently released Draft Site 25 FS. Regarding resumption of the Site 25 GETS, Section 4.1 has been revised to include the following (addition shown in italics): "Mr. Lewis and Mr. Mayer identified the proximity of the Site 25 VOC plume (upgradient of the OU 6 plume) as a potential impact to future OU 6 RA protectiveness *and the RPMs have indicated a preference for restarting the Site 25 groundwater extraction and treatment system (see comments and responses provided in Appendix J)*."
Alonzo Poach CRWQCB	Specific 1	Section 4.2.1, Land Use Data Review - It is unclear how the lack of plume delineation has affected LUC component of the remedy (Especially on Rogers Dry Lake). Section 4.2.1 and subsequent sub-sections describe all construction /ground-disturbance activity per calendar year. Water Board staff is aware that Rogers Lake has additional restrictions for construction, etc. due to mission related activities and that most ground disturbance is more likely to happen closure to the infrastructure near the NASA Armstrong Complex. Please clarify the administrative process for construction/digging permits and clarify what iteration of the LUC boundary was used to summarize excavation activities per calendar year (i.e. back dated review of ground disturbance activities to evaluate exposures).	Thus far intrusive activities on the lakebed and in the vicinity of OU 6 have consisted of CERCLA and OU 6 remedy well installations. Intrusive activities outside of the NASA fenceline on the lakebed are governed by the Base Dig Permit process. Section 4.2.1 has been revised to indicate what iteration of the LUC boundary was used per calendar year.

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Alonzo Poach CRWQCB	Specific 2	Section 4.2.2.1, TCE analytical results - Well N3-MW21 reportedly accepted twice the amount of reagent (permanganate) volume during the 2008 event versus the 2010 event. Manganese oxide is commonly formed with use of permanganate. The manganese oxide forms a sort of scale and effectively clogs well screens. An ISCO injection well at Operable Unit 2 (South Base) was successfully de-scaled with acetic acid and hydrogen peroxide solution to restore well screens. The Air Force should evaluate redevelopment of wells as necessary to ensure effective delivery of reagent in future injection events. Please add discussion to Section 6.2.3 regarding redevelopment of wells as part of maintenance.	The following has been added to Section 6.2.2.2: "Re-development and/or acid de-scaling of potential injection wells as necessary to ensure effective delivery of reagent in future injection events is recommended.
Alonzo Poach CRWQCB	Specific 3	Section 5.1.1.1 *In situ* Chemical Oxidation - The Air Force did not carry out ISCO operations during this FYR period. During the First FYR period, ISCO had proven to be an effective method in "knocking down" concentrations of chlorinated hydrocarbons in high concentration areas. In addition to evaluating other oxidants, please discuss alternate delivery methods (e.g. direct-push injection) and additional monitoring points that may be needed to adequately monitor the remedy. The Air Force should consider alternate injection/delivery techniques (e.g. direct-push injections). Direct-push injections may be a cost effective way to deliver reagent to additional hot spots in the plume.	The following sentence has been added to Section 6.2.2.2: "A comprehensive technology assessment of the encapsulant technology and other promising ISCO technologies and delivery systems should be developed before the next round of injections scheduled for 2017."
Alonzo Poach CRWQCB	Specific 4	Section 5.1.1.2 Groundwater Monitoring - The Second FYR states that the groundwater monitoring component of the remedy is not functioning as designed because of the lack of plume delineation and faster than expected rebound of contaminants of concern in areas of ISCO. Water Board staff agrees with the recommendation to increase biannual groundwater monitoring to an annual schedule in order to facilitate and target future treatment/injection events and expedite site cleanup.	Comment noted. No change.

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Alonzo Poach CRWQCB	Specific 5	Section 5.1.1.2 Groundwater Monitoring - This section states that the nearest receptor (North Edwards production well) is approximately 25,000 feet away from the leading edge of the OU6 plume. Please add a larger scale site plan that shows the locations of all the nearest production wells in the area north of Edwards AFB. Please also add a larger scale site plan that shows the actual locations of monitoring wells RL-MW01 and RL-MW04 in relation to the OU6 plume and any other geographic references (e.g. lakebed runways).	A figure (new Figure 7) has been added to depict the locations of wells RL-MW01 and RL-MW04 as well as the area north of Edwards AFB in which production wells exist.
Alonzo Poach CRWQCB	Specific 6	Section 6.2.2.2 *In situ* Chemical Oxidation - Water Board staff agrees that the Air Force should continue ISCO in the areas with highest VOC concentrations. Recommendations for additional injection areas are absent from the recommendations. Analytical results from monitoring wells installed since 2012 identified new areas with high concentrations of chlorinated solvents. Please discuss recommendations for additional injection areas given the updated plume extent and discuss future implementation of ISCO to control plume migration as stated in Section 6.1.	Please see response to USEPA Specific Comment 15. Sites N3, N4, and N7 have been identified as high concentration areas. Section 2.4.3 indicates that ISCO will resume at Sites N3 and N7 in 2017 and provides an explanation as to why ISCO was discontinued at Site N4.
Alonzo Poach CRWQCB	Specific 6	8/4/16 Meeting and 8/12/16 Discussion Follow-up to Specific Comment 6: Indicate treatment/injection locations will be re-visited as part of the comprehensive technology assessment.	The third paragraph of Section 6.2.2.2 has been revised as indicated below. Additions/revisions are underlined. "A comprehensive technology assessment of the encapsulant technology and other promising ISCO technologies and delivery systems <u>will</u> be developed before the next round of injections scheduled for 2017. <u>The technology assessment (with regulatory input) will make recommendations for the 2017 treatment event including treatment locations, application, and reagent type and volumes."</u>
Alonzo Poach CRWQCB	Specific 7	Global change for site plan figures- Leader lines on several figures are very faint and hard to follow. Please darken/thicken faint gray/black leader lines (typically for well ID labels) on all applicable figures.	Leader lines have been darkened as necessary.

Notes:

μg/L	micrograms per liter
AF	Air Force
AFB	Air Force Base
CA-IASL	California indoor air screening level
Cal EPA	California Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminant of Concern
CT	carbon tetrachloride
DTSC	Department of Toxic Substances Control
EPA	Environmental Protection Agency
ERP	Environmental Restoration Program
GETS	groundwater extraction and treatment system
DTSC	Department of Toxic Substances Control
FF	Federal Facilities
FYR	five-year review
FYRR	Five-Year Review Report
HERO	Human and Ecological Risk Office
HHRA	human health risk assessment
HVAC	heating, ventilating, and air conditioning
IASL	indoor air screening level
IRIS	Integrated Risk Information System
ISCO	*in situ* chemical oxidation
IUR	inhalation unit risk
LUC	land use control
MCL	maximum contaminant level
NASA	National Aeronautics and Space Administration
OEHHA	Office of Environmental Health Hazard Assessment
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PCE	tetrachloroethene
PFC	perfluorinated compound
RAO	remedial action objective
RfC	reference concentration
ROD	Record of Decision
RPM	remedial project manager
RSL	regional screening level
RWQCB	Regional Water Quality Control Board
SVSL	soil vapor screening level
TCE	trichloroethene
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
VI	vapor intrusion
VIIR	Vapor Intrusion Investigation Report
VIIRA	Vapor Intrusion Investigation Report Addendum
VIP	vapor intrusion pathway
VOC	volatile organic compound