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18 March 2016

Melanie Morash
Remedial Project Manager
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street (SFD-7-1)
San Francisco, CA 94105

RE: Response to EPA Comments Received 8 March 2016 Regarding Building Visits, RES084/085 Mitigation Plan, RES084/085 O&M Plan, and QAPP Addendum Offsite Operable Unit, Sunnyvale, California

Dear Ms. Morash:

This letter is submitted on behalf of Philips Semiconductors Inc (Philips) in response to the comments received on 8 March 2016 with regard to building visits on 26 February, the RES084/085 mitigation plan, the O&M Plan for RES084/085, and the QAPP Addendum. The O&M Plan for RES084/085 and the QAPP Addendum were first submitted on 12 February, and for these two documents, these are the first comments received.

As discussed with you on 11 March, this latest set of comments from EPA presents some concerns as far as proceeding with the mitigation system implementation in a timely manner. The final RES084/085 mitigation plan was submitted on 5 February 2016 following four rounds of revisions. EPA issued approval of this plan on 8 February. Subsequently, the RES084/085 mitigation access agreement was signed by the property owner and was fully executed by all parties as of 29 February. The approved mitigation plan was attached to the mitigation access agreement as Exhibit A. Locus had already begun implementation of this plan before receiving the 8 March comments from EPA. However, requested changes in the 8 March EPA comments will now require revision to the mitigation plan, and consequently revision to the executed mitigation access agreements. This increases the time and cost of implementing mitigation to all parties, including the property owners.

A second general concern regarding the 8 March EPA comments is that there are several EPA comments that either repeat or directly contradict EPA comments provided during earlier rounds of revision. EPA has solicited many technical experts to provide review and comment of the plan, with the intent of improving the mitigation plan. However, as this latest round of EPA comments clearly demonstrates, there are many valid approaches to these mitigation systems, and there appears to be a deficiency of internal coordination and consensus on comments within the EPA team

prior to external transmittal. Specific instances of these contradictions are noted within the responses provided below. Additionally, Locus has selected a qualified mitigation installer with a strong and directly-relevant resume to the mitigation of VOCs in indoor air in the State of California. Locus has consulted this installer throughout the development of the mitigation plans and in preparation of responses to EPA comments, in order to make sound decisions based on thorough technical consideration prior to plan revisions and re-submittals. Locus respectfully requests that EPA extend the same courtesy in evaluation of Locus' mitigation plan revisions, such that EPA's approval of a plan revision can be confidently interpreted by Locus to indicate the ability to move forward without the risk of substantial changes after critical project phases have begun (e.g. access agreement signatures or purchase of materials).

In light of EPA's mitigation plan review process, it is also recommended that site visits with Locus' mitigation installer and EPA representative(s) occur prior to Locus' submittal and EPA's review of mitigation plans and prior to circulation of access agreements for signature. Once the owner has signed the access agreement, which includes the mitigation plan as Exhibit A, there is limited opportunity for further revision to the plans. Scheduling site visits prior to mitigation plan submittal to EPA and prior to obtaining access agreement signatures will better enable all parties involved to move forward efficiently and transparently with mitigation plan development, approval, and installation. For the homeowner, the site visit would entail a general explanation (verbal) of the intended plan and solicitation of feedback. The owner would then be able to consider in detail and in writing the EPA-approved (and finalized) mitigation plan prior to committing signature to an access agreement.

Responses to comments provided below indicate the intended revisions to the subject documents. Once these intended revisions have been approved by EPA, Locus will revise and re-submit the subject documents for final EPA approval. Proposed mitigation plan revisions that would entail re-execution of the access agreement are noted in the responses provided.

February 26, 2016 Site Walk

Comment 1: RES084/085—It was noted during the site walk on February 26, 2016, that potential surface water intrusion into the crawlspace exists. Water that accumulates on the membrane will have nowhere to go and could potentially increase the likelihood of mold growth in the crawlspace if left in the crawlspace on the membrane. Addressing the potential water intrusion should be added to the Mitigation Plan.

Response: It is recommended that the evident water intrusion problem be addressed from the exterior, preventing entry of water into the crawlspace. The owner may have addressed the problem with a concrete barrier to surface water flow. However, it appears that the owner's solution (concrete on concrete) has not been sealed and, therefore, may not be fully providing the intended effect. Prior to indoor air mitigation installation, Locus recommends the concrete barrier be sealed to the horizontal surface with a water-tight seal. Although there are internal solutions such as a sump, pump, and minor grading to prevent collection of water on the membrane, the exterior remedy would most effectively prevent adverse effects on the home.

Comment 2: For dirt-floor crawlspaces where a barrier cannot be installed, no alternative mitigation approach is listed in the Mitigation Plan.

Response: For the residences where mitigation plans have been developed, there have not yet been any dirt-floor crawlspaces over which a barrier cannot be installed. If a barrier is found unable to be installed, mitigation planning for the residence will not be abandoned; the residence will still be fitted with best available mitigation techniques using an alternative approach, evaluated on an individual basis per the specific limitations of the residence(s). The plan will be subject to EPA approval and post-mitigation sampling to determine system effectiveness. Therefore, no change is proposed.

Comment 3: Several of the crawlspaces, primarily at the school, had rat slabs in the crawlspace (a very thin layer of non-structural concrete poured over the dirt floor of a crawlspace, intended primarily to prevent the intrusion of pests into the area below a building). The mitigation for these rat slabs should be approached via sub-slab depressurization until it is determined whether the slabs are thick enough to act as a barrier. If during diagnostic testing it is determined that a vacuum field cannot be established due to porosity of the slab, then a membrane system should be considered and applied.

Response: Locus has already begun preliminary planning and evaluations for these buildings consistent with this comment.

Comment 4: For the buildings at which a potential sub-slab depressurization system is being considered, a detailed diagnostic testing work plan should be provided, so it can be reviewed prior to work starting.

Response: Where diagnostic testing is feasible and would not significantly impact the building use, a work plan will be provided prior to work starting. However, in order to move forward promptly in concert with our mitigation installer's expertise, Locus recommends that the diagnostic testing work plan will not be subject to EPA approval.

Comment 5: It was discussed during the walk-through that keeping the exhaust portions of the system piping on the exterior of the building was preferable. Generally, it is preferred to mitigate a building from the center of the building rather than from a side or end, but it really depends on the materials under the slab. Keeping the piping on the exterior of the building has several disadvantages: the piping is exposed to all, it must be clearly labeled for all to view, it is subject to vandalism and/or inadvertent damage, and it provides a location for the blower to be near the edges of the building, which can create a noise issue. Keeping the piping on the exterior of the building has advantages: Piping is generally easy to install, cheap to install, and easy to inspect during O&M.

Response: Per published EPA guidance¹, Fans should not be installed in basements, other potential living spaces, or any enclosed portion of the building that can potentially communicate with the living space, since a leak on the positive pressure

¹ EPA, October 2008. Engineering Issue: Indoor Air Vapor Intrusion Mitigation Approaches. EPA/600/R-08-115.

side of the fan could introduce contaminants into the basement or living space (e.g., not in or under a living space. Refer to the system design diagram included in each of the six approved residential mitigation plans, which Locus adapted to indicate that Exhaust Option 2 is not available per the noted guidance. Although this recommendation may not necessarily preclude putting the fan on the roof and running the negative pressure side of the vent stack through the interior of a building, intuitively it is not protective of human health to run elevated VOC concentrations from soil-gas through the occupied space in case of any unintended leaks. In addition, the EPA's noted ease of inspections on exterior piping would also benefit building occupants, reducing disturbance to occupants during ongoing O&M inspections. Therefore, no change is proposed.

Comment 6: EPA prefers mitigating from the centers of buildings, running pipe up through the centers (where applicable) of the building, and installing blowers away from the edges of the building, especially in schools.

Response: Refer to response to Comment 5.

Mitigation Plan for RES084/085 (Note: Some Comments Address the O&M Plan)

Comment 1: Page 1, first paragraph (¶), Implementation Plan—What is this document, and can it be reviewed? Or is the Mitigation Plan the Implementation Plan?

Response: The mitigation plan is the implementation plan. Therefore, no change is proposed.

Comment 2 (O&M Plan): Page 1, System Inspections—The inspection entry on the O&M Inspection Field Form for check of the system manometer has been left out.

Response: System measurements are included on the field form including vacuum and flow to be measured at the dedicated vent stack port using mobile instrumentation. The Checkpoint IIa alarm by RadonAway, or similar, will sound when vacuum is below 0.25" WC. The mitigation system does not have a dedicated manometer because they are generally recommended for depressurization systems that lack an air-tight barrier above suction points (e.g. sub-slab systems). In the case of RES084/085, a membrane is proposed, which provides an aggressive, practically air-tight barrier (seal specifications are provided in response to Comment 13 in this section). Loss of vacuum for a membrane system is associated with fan failure, which is why the alarm system is already included as described. Therefore, no change to the O&M field form or mitigation plan is proposed.

Comment 3 (O&M Plan): Page 1, System Inspections—Entry lines to record that performance check samples have been collected have also been left off. A revised O&M Inspection Field Form is provided as Attachment 2 to serve as an example for revisions.

Response: Sampling events may not occur on the same date and do not occur at the same frequency as system inspections, and they will likely be conducted by different personnel. Performance sampling location, dates, and times (the noted information that is excluded from the field form) will be recorded on the chain of custody (COC) per the project QAPP. The monitoring plan (to be included directly in the O&M Plan) will be revised to include that fan status must be documented upon arrival at each sampling event. No other change is proposed.

Comment 4 (O&M Plan): *Page 2, Monitoring—References to sections in the Mitigation Plan are not user-friendly. Text that is cited from the Mitigation Plan for the O&M Plan should appear in the O&M Plan.*

Response: The O&M Plan will be revised to directly include the monitoring plan (rather than by reference).

Comment 5 (O&M Plan): *Page 2, Monitoring—Copies of applicable standard operating procedures (SOPs) for monitoring should be included in the O&M Plan, e.g., passive sampling, Summa canister sampling, or other.*

Response: Relevant sampling methods are already included in the parent QAPP (Section 3.2) and, as applicable, the QAPP Addendum (Section 3.1), which are incorporated by reference in the O&M Plan. No additional documentation was required of EPA for approval of the parent QAPP. Therefore, no change is proposed.

Comment 6 (O&M Plan): *Page 2, Operational Failure Analysis and Plans to Prevent Reoccurrence—Placard and contact information should be duplicated within the O&M Plan. With time, placard information may become illegible, and the O&M Plan will need to be the information source for contacts about failures. A project team contact list maintains transparency for all associated with the mitigation going forward.*

Response: The O&M Plan will be revised to include contact information in the event of system alarm or other questions or concerns.

Comment 7: *Page 2, Final Mitigation Plan—No details were provided as to how the conduits are to be sealed.*

Response: Refer to response to Comment 8 below.

Comment 8: *Page 2, Final Mitigation Plan—Sealing around these conduits does not necessarily improve the system effectiveness, but is a good practice.*

Response: Locus agrees that sealing conduit pathways will not do anything to enhance the system since the system provides a practically air-tight seal. Additionally, it is acknowledged that providing an effective seal between the crawlspace and the living space has limited likelihood of success, and it may be impractical to identify and access all utility pathways. Therefore, Locus proposes to remove the activity of sealing conduit pathways from the mitigation plan. It will remain an option for re-

evaluation, a Potential Alternative in the mitigation plan, in the case that the SMDS does not initially meet effectiveness criteria. Depending on legal review, this change may require re-execution of the mitigation access agreement.

Comment 9: Page 2, Description ¶—Again, no details were provided as to how the utility pathways are to be sealed. Using a different term (pathway vs. conduits) could be confusing.

Response: “Utility conduit” will be replaced with “utility pathway”, where applicable. Also refer to response to Comment 8. Depending on legal review, this change may require re-execution of the mitigation access agreement.

Comment 10: Page 2, Description ¶—Recommend re-wording for clarity; describe that individual mitigation plans will be created for each building and state what details will be included in these plans. EPA recommends briefly listing the various mitigation design possibilities, and to what scenarios each might apply. Include performance objectives, design specifications, details of system checks, and criteria for initiating corrective action.

Response: The RES084/085 mitigation plan is written for one specific residence. It is not a general work plan for multiple residences. Therefore, mention of other buildings is beyond the scope of this plan. Additionally, Locus has provided the best mitigation design for the known site constraints. The Potential Alternatives section of the plan identifies other possible design scenarios in the case that the chosen scenario does not initially meet effectiveness criteria. The mitigation plan identifies performance objectives via indoor air concentration targets. Indoor air concentration targets are also identified as criteria for initiating corrective action. The mitigation plan identifies design specifications under the heading Specifications. Details of system checks and additional criteria for corrective action are addressed in the O&M Plan. Therefore, no change is proposed.

Comment 11: Page 2, Description ¶—Perforated pipe stated as 4-inch in diameter. There are other products available if height of crawlspace is an issue. Using 3-inch is acceptable, but may need additional sub-membrane runs, or using a venting mat could work as well.

Response: Locus agrees that 3-inch piping would be sufficient, however EPA previously stated (without technical justification) that the piping diameter must four inches in comments provided on 1 December 2015. It has also come to Locus’ attention that a venting mat could work in lieu of piping for cases where crawlspace height is an issue. This material will be considered and may be included in mitigation plans for other buildings, as necessary, and subject to EPA review.

Comment 12: Page 2, Description ¶—The membrane specified is actually a sub-slab vapor retarder, not necessarily a crawlspace liner. This type of membrane is harder to seal and is much smoother than other liners, which could potentially be an issue long-term. When used below a slab, the liner does not move; therefore, the integrity of the seams or perimeter seals are not affected. If used in a crawlspace, then movement of the liner could possibly disrupt the seals. EPA suggests considering a 12-mil Dura Skrim® for the crawlspace liner or its equivalent.

Response: The 12-mil Dura Skrim® membrane was previously included in the mitigation plan for this residence dated 4 December 2015. However, in the EPA comments dated 21 December 2015, EPA requested selection of another membrane due to durability concerns. Therefore, the VaporBlock 10 liner (ASTM E1745 Class A membrane) was selected as an alternative. Based on the above concerns which have been echoed by our mitigation system installer, however, Locus would prefer to use the 12-mil Dura Skrim® liner as originally proposed and will change the plan accordingly. Depending on legal review, this change may require re-execution of the mitigation access agreement.

Comment 13: *Page 2, Description section, first ¶—Again, no details were provided as to how the membrane is to be sealed at the seams, the foundation, or at support posts. Details and specifications should be provided. The seams should be sealed with caulk and seaming tape. The foundation seals should be caulked, and the membrane should be mechanically fastened to the foundation to keep it from pulling away.*

Response: The mitigation plan will be revised to include these specifications. Depending on legal review, this change may require re-execution of the mitigation access agreement.

Comment 14: *Page 2, Description section, first ¶—Sealants should be low volatile organic compounds; however, no product description or Material Safety Data Sheet was provided.*

Response: Refer to response to Comment 13.

Comment 15: *Page 3, General Note—The use of the words “pressure” and “vacuum” should be clarified as they are confusing. When discussing depressurization systems, vacuum will be monitored and recorded, not pressure. If negative pressure is used, that is fine, but could be confusing.*

Response: The use of these terms will be revised for clarity. Depending on legal review, this change may require re-execution of the mitigation access agreement.

Comment 16: *Page 3, Description section, first ¶—“Two feet” is used as the height above the roofline for the system discharge. Typically 12 inches above the roofline is listed in guidance; however, no rationale was provided for the 2-foot height.*

Response: The mitigation plan will be revised to indicate that the suction fan will exhaust one foot above the roofline. Depending on legal review, this change may require re-execution of the mitigation access agreement.

Comment 17: *Page 3, Description section, first ¶—“Pressure test” under the membrane is confusing, and no details are provided as to how this will be accomplished. Installing a penetration in the membrane to take a pressure-differential test or vacuum extension test is not generally done. EPA does not have a problem with installing and measuring at this penetration, but some kind of detail and specification should be provided to ensure the integrity of the membrane is not compromised.*

Response: Locus agrees that a pressure field extension test is not generally necessary for membrane systems. They are generally recommended for depressurization systems that lack an air-tight barrier above suction points (e.g. sub-slab systems). In the case of RES084/085, a membrane is proposed, which provides an aggressive, practically air-tight barrier. Therefore, upon system installation, pressure readings will be taken below the fan to evaluate suction pressure and no sub-membrane pressure field extension test will be conducted. The plan will be revised accordingly. Depending on legal review, this change may require re-execution of the mitigation access agreement.

Comment 18: *Page 3, Description section, second ¶—Alarm includes a flashing light; this is not correct. The alarm shown has a green (vacuum > 0.25" water column (w.c.) indicator light and a red (vacuum < 0.25" w.c.) indicator light, neither one of them flash.*

Response: The mitigation plan will be revised to remove the word “flashing”. Depending on legal review, this change may require re-execution of the mitigation access agreement.

Comment 19: *Page 3, Description section, second ¶—The alarm shown is not designed to be located in an outdoor environment; it should be located indoors. EPA is under the impression that your contractor is going to install the alarm outdoors under the fan shroud to keep it out of the weather; however, this will dampen the sound, and make it impossible for anyone to see the indicator lights.*

Response: The alarm location was discussed with the owner, as provided for in the EPA-approved mitigation plan. An explanation for soliciting owner input was provided in the response to comments letter dated 21 December 2015:

Signage and alarm options will be discussed with owners in order to gauge and accommodate their preferences instead of over-specifying these elements in the work plan. Outdoor signage and alarm, as currently described, are the minimum option to the owner, in the case that alarm communications are exclusively local rather than remote. Additional, more intrusive options will be available if requested by the owner.

If the system alarm is inaudible from inside the building, the property owner will be presented with the option to install a remote alarm unit on the property to alert occupants more effectively. If weather-proof covering is needed, a cover will be selected that allows viewing of the indicator lights through a window or clear covering. These options will be added to the mitigation plan. Depending on legal review, this change may require re-execution of the mitigation access agreement.

Comment 20: *Page 3, Description section, second ¶—No mention of having a manometer on the system. At a minimum, a U-tube manometer should be conspicuously located so anyone can visually see the system is operational and how much vacuum is being applied by the fan. If the vacuum level is low, then the U-tube manometer should be replaced by a magnahelic gauge.*

Response: No system manometer nor magnahelic gauge is proposed. Refer to response to Comment 2 in this section for information on the equipment and checks involved in the system inspections. No change is proposed.

Comment 21: *Page 3, Description section, second ¶—Discusses a carbon dioxide detector as “if warranted,” without an explanation of how that will be determined is confusing.*

Response: A detailed explanation was provided in the response to comments letter dated 21 December 2015:

It is Locus’ understanding that a risk of backdrafting is applicable to homes with an old furnace with a gravity flue (generally, older than the 1980s). Furnaces built in the 1980s forward are designed to prevent this effect. Even in the case of a pre-1980s furnace, it is an extremely remote possibility that the mitigation system could cause sufficient backdraft in the living space to reverse the flow of the gravity flue because the crawlspace is ventilated; drawing outdoor air into the crawlspace would be the path of least resistance if there were a consequential break in the membrane. Ultimately, until the mitigation installer (who is also an HVAC contractor) can visit the residence, the flue configuration cannot be determined with confidence. Even in pre-1980s homes, pre-1980s furnaces are not expected to be encountered often. If a carbon monoxide detector is warranted and is not already installed, a battery-operated carbon monoxide detector will be installed in residences with these furnaces pending owner consent. Additionally, when sealing pathways between the crawlspace and living space, Locus and the mitigation contractor will also ensure that sources of low combustion air (replacement oxygen for the burner, coming from below the burner) and return air are maintained.

The mitigation plan identifies that a carbon monoxide detector will be provided, if warranted. The mitigation installer is a licensed HVAC contractor and is aware of the concerns and considerations related the decision of whether or not a carbon monoxide detector is warranted. Because the specific considerations are generally stated in the in the mitigation plan (*depending on furnace configuration*) and the details may not be relevant to all residences, the details of the quoted text in the preceding paragraph were not included in the individual mitigation plan. Therefore, no change is proposed.

Comment 22: *Page 4, Specifications section, first ¶—The mitigation installer is noted as being a licensed heating, ventilating, and air conditioning and general contractor; however, no specific qualifications for installing these types of mitigation systems are provided. This should be corrected – the contractor should have extensive experience with these types of systems and/or be certified in radon mitigation.*

Response: The mitigation installer is licensed by the California State License Board #617021 and is certified and listed by California for radon mitigations as well as the National Environmental Health Association #101023RMT and National Radon Safety Board #NRSB G31163, and is an active member of the American Association of Radon Scientists and Technologists (AARST). Mitigation plan text will be updated accordingly. Depending on legal review, this change may require re-execution of the mitigation access agreement.

Comment 23: *Page 4, Specifications section, first ¶—Discusses “potential adverse effects.” It would be helpful to clarify what some of those effects could be, and their potential remedies.*

Response: EPA's earlier comments regarding the need to address "potential adverse effects" had specifically mentioned back draft of combustion appliances. Refer to response to Comment 21. Other potential adverse effects are also specific to individual residences and the qualifications of the mitigation installer should provide EPA confidence that potential adverse effects will be identified during the site visit, installation, and ongoing inspections. The mitigation installer will bring these findings to Locus' and EPA's attention.

Comment 24: *Page 4, System Component List, second bullet—EPA suggests consideration of a different membrane, see above comment.*

Response: Refer to response to Comment 12.

Comment 25: *Page 4, System Component List, third bullet—The Checkpoint II alarm does not have flashing light; it has two lights: one green for proper operation and one red for non-proper operation. Again, it is highly recommended that this be installed in a conspicuous location inside the building.*

Response: Refer to response to Comments 18 and 19.

Comment 26: *Page 4, System Component List—The component list is missing a listing for a manometer to visually indicate the system is operational, and to show the vacuum being applied to the system. Need to add this information. This information should also be located in a conspicuous interior location.*

Response: Refer to response to Comment 2.

Comment 27: *Page 4, Specifications section, third ¶—The term "Pressure" is used and should be replaced by "vacuum."*

Response: Refer to response to Comment 15.

Comment 28: *Page 5, Implementation Schedule section, first bullet—90 days seems like a long time to get this started.*

Response: An explanation was provided in the response to comments letter dated 4 December 2015:

The estimated time to install the mitigation system (1-3 days) is not the only factor to be considered for the period required between plan approval and the dates of the install. The installation date is dependent upon many factors including, but not limited to:

- *Obtaining plan approval from the owner(s) and tenant(s) entailing a meeting onsite*
- *Providing a site visit for the mitigation installer (which may coincide with the owner/tenant meeting) for obtaining additional building-specific measurements and making final design decisions*
- *Gathering all site-specific installation materials*
- *Scheduling with the owner(s) and tenant(s) to minimize inconveniences associated with power interruption and any potential noise during installation*

- *Scheduling in accordance with all parties involved, including the mitigation installer, the owner(s), the tenant(s), Locus, EPA, and EPA's contractors*
- *Preparation of final O&M Plans for the property owner(s)*

With the number of stakeholders involved in this project, it will not be feasible to complete the implementation within 14 days. However, in the interest of expediting the installation, Locus has revised the installation period in the mitigation plans from 120 to 90 days contingent on availability of system components, any permits required, and scheduling with the occupants and contractors. Locus will work as quickly as possible, but given the potential for delays, a 90 day period will allow the project to proceed on the predetermined schedule.

In addition, the EPA comments addressed in this response letter were received 8 March 2016, one month after EPA's approval of the "final mitigation plan" (8 February 2016), which has been approved by the property owner as Attachment A of the fully executed access agreement. The timing for EPA's approval (and re-approvals and, as necessary, re-execution of the access agreement by all parties) cannot be determined by the mitigation installation team. Therefore, no schedule change is proposed.

Comment 29: Page 5, Justification Section, first ¶—"Mechanical system" wording is used, which is very confusing and should be replaced with "vapor mitigation system," "building control system," or "engineering control system," etc.

Response: "Mechanical system" will be revised to "mitigation system". Depending on legal review, this change may require re-execution of the mitigation access agreement.

Comment 30: Page 6, Post Mitigation Sampling section, first ¶—Sampling is to be done using passive samplers. Please ensure that samples are 24-hour with rapid turnaround.

Response: In accordance with the project QAPP, the turnaround time (TAT) will be standard. If the sample is taken to confirm an elevated TCE result from the preceding sample, 24-hr TAT may be implemented.

Comment 31: General Comments—The overall document is concise; however, it lacks details for many specific components of the mitigation system and how they are to be implemented.

Response: Please refer to responses to more specific comments provided on this topic.

O&M Plan for RES084/085 (Some Comments Appear to Address the QAPP Addendum)

Comment 1: Page 1, Components of the Mitigation System section, first paragraph (¶)—The system has not been installed, and this section lists dimensions, materials, models, layout, as-built, etc. This information should be included once the mitigation system has been installed.

Response: The O&M Plan has been submitted prior to installation to comply with EPA's request. Any changes made during the installation process will be reflected in the final O&M Plan. Locus expects that the RES084/085 O&M Plan will serve as a template and that O&M Plans for all other installations will be submitted after implementation in accordance with the schedule noted within the individual mitigation plans. To date, in all six mitigation plans submitted to EPA, the schedule for submittal of the O&M Plan is within 30 calendar days of completion of mitigation activities.

Comment 2: Page 1, Components of the Mitigation System section, first bullet—Add more details of the perforated pipe used and its layout.

Response: Once the installation is complete, the as-built drawing is expected to provide this detail. Therefore, no change is proposed.

Comment 3: Page 1, Components of the Mitigation System section, second bullet— EPA disagrees with the choice of the membrane chosen. The chosen membrane is designed as a sub-slab vapor retarder and not a crawlspace liner.

Response: Refer to response to Comment 12 in the previous section.

Comment 4: Page 1, Components of the Mitigation System section, fifth and sixth bullets— Additional details of the sampling port should be provided.

Response: Once the installation is complete, the as-built drawing is expected to provide this detail. Therefore, no change is proposed.

Comment 5: Page 1, Components of the Mitigation System section—The manometer and seals are missing from the list of components for the mitigation system. Need to add this information. A membrane system is only as good as the seals that make the membrane a barrier, and these should be included in this list.

Response: Regarding a dedicated system manometer, refer to response to Comment 2 in the previous section. The O&M plan will be revised to include specifications for the membrane seals.

Comment 6: Page 1, System Inspections section, first ¶—The fan operation should not only be checked for velocity; vacuum and fan amperage should also be documented during routine O&M visits.

Response: In accordance with the field form, vacuum will be documented during inspections. The field form will be revised to include fan amperage.

Comment 7: Page 1, System Inspections section, first ¶—Additional items are listed (i.e., seals on utility conduits, etc.) in this paragraph and should be included in the bullet list in the previous paragraph.

Response: The O&M Plan will be revised to state that the components on the bulleted list will be inspected. Regarding the sealing of utility pathways, refer to response to Comment 8 in the previous section.

Comment 8: *Page 2, Operational Failure Analyses...*, first ¶—ALARM AND MANOMETER MUST BE LOCATED INSIDE THE BUILDING IN A CONSPICUOUS LOCATION IF YOU ARE TO RELY ON THE RESIDENTS TO NOTIFY SOMEONE WHEN THE SYSTEM GOES DOWN.

Response: Refer to response to Comment 19 in the previous section.

Comment 9 [QAPP Addendum]: *Page 5, Item 15—The canister can be stopped at a much lower vacuum than the 5"Hg to 3"Hg as described. The mitigation system is applying roughly 2" w.c., and the canister vacuum is measured in inches of mercury. This is roughly 13.6 times the vacuum; therefore, a final vacuum of 0.2"Hg is still more vacuum than the system can exert and be unable to remove sample from the canister.*

Response: It is standard practice to leave some vacuum (e.g. 5"Hg to 3"Hg) in the canister prior to sample shipping to ensure sample integrity, even in the case where a vacuum is not applied to the sampling stream. Therefore, no change is proposed.

Comment 10: *Page 8, Section 3.5—All manometers, micromanometers, and anemometers should be measured with factory-calibrated equipment where appropriate. Those calibration certificates should be supplied in the O&M Plan.*

Response: The QAPP Addendum includes protocol for calibration. Calibration certificates will be filed with O&M inspection records in accordance with the note included on the field form.

General Comment 11: *Stand-Alone Document—The installed mitigation system is considered part of the building as long as the mitigation system is there. If the building is sold or transferred while the mitigation system is in place, there needs to be a document that will travel with the transfer. References to a separate Mitigation Plan in the O&M Plan are insufficient for the traveling record. Referral between documents is arduous and probably not practical. The O&M Plan must be user-friendly. It must be a stand-alone document that travels with the house and serves as a reference to the current occupants and those who may need to understand the mitigation system in the future.*

A useful go-by for the format of such a document is available from the U.S. Environmental Protection Agency (EPA): Residential Vapor Intrusion Mitigation System Operations and Maintenance Plan 52nd Street Motorola Superfund Site Operable Unit 1 Area, Phoenix, Arizona, Freestone Semiconductor, Inc., published in 2013.

Response: Refer to response to Comment 4 in the previous section regarding the standalone nature of the O&M Plan. The placard that will be posted on the mitigation system will provide sufficient summary information for future occupants on the operation of the mitigation systems, and contact information will allow new occupants to obtain copies of the O&M Plan. If requested by the property owner, a fact sheet

similar to the sample occupant information sheet provided will be prepared for the property owner to distribute to their tenants.

Specific Comment 1: System Inspections:

- *The inspection entry on the O&M Inspection Field Form for check of the system manometer has been left out.*
- *Entry lines to record that performance check samples have been collected have also been left off.*

Response: Refer to response to Comments 2 and 3 in the Mitigation Plan section.

Specific Comment 2: Monitoring:

- *References to sections in the Mitigation Plan are not user-friendly. Text that is cited from the Mitigation Plan in the O&M Plan should appear in the O&M Plan.*
- *Copies of applicable SOPs for monitoring should be included in the O&M Plan, e.g., passive sampling, Summa canister sampling, or other.*

Response: Regarding document references in the O&M Plan, refer to response to Comment 4 in the Mitigation Plan section and response to General Comment 11 above. Regarding copies of applicable SOPs for monitoring, refer to response to Comment 5 in the Mitigation Plan section.

Specific Comment 3: *Operational Failure Analyses and Plan to Prevent Reoccurrence—Placard and contact information must be duplicated within the O&M Plan. With time, placard information may become illegible, and the O&M Plan will need to be the information source for contacts about failures. A project team contact list maintains transparency for all associated with the mitigation going forward.*

Response: Refer to response to Comment 6 in the Mitigation Plan section.

Specific Comment 4: Health and Safety:

- *The HASP for the installation should be included in the O&M Plan.*
- *This section mentions that O&M activities are the exclusive purview of the Responsible Party, but no mention has been made of restrictions on access to the crawlspace. Questions that may arise and should be addressed up front include whether the occupants can store belongings in the crawlspace, or whether it is safe for them to even look into the crawlspace to satisfy their curiosity. This issue can be addressed, and the O&M Plan will be more user-friendly by the addition of a Sample Occupant Information Sheet.*

Response: Similar to the QAPP (refer to EPA's conclusions in Specific Comment 5 below), the HASP is written for a number of applications for the entire project site [the Offsite Operable Unit (OOU)], and needs to be a separate reference document readily accessible for those using the O&M Plan. Therefore, Locus will include the HASP with

the individual building O&M Plan by reference. A copy of the HASP will be made available to property owners upon request.

See General Comment 11 in this section regarding the occupant fact sheet.

Specific Comment 5: *Quality Assurance/Quality Control:*

- *The QAPP Addendum should be included in O&M Plan. The parent QAPP applies to a number of properties/buildings and needs to be a separate reference document, readily accessible for those using the O&M Plan.*
- *Credentials—There is no mention in the O&M Plan about inspection by a qualified radon or soil gas mitigation professional, although these qualifications currently exist in the proposed standard for Soil Gas Mitigation Standards for Existing Homes^[1]. While this issue has not been resolved in current regulations, the proposed American National Standards Institute/American Association of Radon Scientists and Technologists standard does present a level of professional conduct and should be recognized.*

Response: The QAPP Addendum is not a stand-alone document, it needs to be read in concert with the parent QAPP to obtain relevant information even for mitigation activities. Locus agrees with EPA's conclusions that the QAPP is best incorporated by reference. Therefore, Locus will include the parent QAPP and QAPP Addendum with the individual building O&M Plan by reference. A copy of the parent QAPP and QAPP Addendum will be made available to property owners upon request.

The inspector is the same as the mitigation installer and is licensed by the California State License Board #617021 and is certified and listed by California for radon mitigations as well as the National Environmental Health Association #101023RMT and National Radon Safety Board #NRSB G31163, and is an active member of the American Association of Radon Scientists and Technologists (AARST). O&M Plan text will be updated accordingly.

Specific Comment 6: *Retention of Records—There is no mention in the O&M Plan about retention of records, yet this may become important in escrow transactions for the sale or transfer of the property in years to come.*

Response: Note that the parent QAPP addresses document retention requirements for this project. The O&M Plan will be revised to include the following statement of records retention: *"All records associated with O&M of the mitigation system will be stored in accordance with the QAPP and made available for future transfers of property ownership or mitigation system operation when requested."*

^[1] ANSI/AARST, 2015, *SGM-SF Soil Gas Mitigation Standards for Existing Homes*, Proposed Standard SGM-SF, AARST Consortium on National Radon Standards, www.radonstandards.us, standards@aarst.org, September.

QAPP Addendum Review

General Comment 1: *Page 8, Section 3.5—All manometers, micromanometers, and anemometers should be measured with factory-calibrated equipment where appropriate. Those calibration certificates should be supplied in the O&M Plan.*

Response: Refer to response to Comment 10 and Specific Comment 6 in the previous section.

Specific Comment 1: *Section 1, Introduction—Recommend that the purpose of the Addendum be described. Also, a sentence(s) should be included to state that all sections, sampling activities, data quality objectives, quality control requirements, and acceptance limits from the parent QAPP remain applicable to the task.*

Response: The purpose in the introduction will be revised for clarity. The following statement will also be added for clarity: *“All elements of the original QAPP remain in effect for indoor air mitigation activities.”*

Specific Comment 2: *Section 2.2, Problem Definition and Background—The problem specifically addressed by the Addendum should be specified.*

Response: It is unclear what EPA believes is lacking. Section 2.2 currently reads: *“In addition to the problem definition and background as stated in the original QAPP, this project seeks to mitigate residences and school buildings with indoor air concentrations that exceed EPA’s requirements, which indicates a potential for unacceptable vapor intrusion.”*

Specific Comment 3: *Section 2.3, Project/Task Description—Each separate mitigation system installation requires a separate stand-alone O&M Plan. If the building is sold or transferred, the O&M Plan travels with the building; new occupants in multi-occupant dwellings must have access to the O&M Plan and should be advised about the mitigation system.*

Response: Refer to response to Comment 4 in the Mitigation Plan section. The O&M Plan will be provided to the owner as stated in the Mitigation Plan. Additionally, EPA has been diligent in sending all documentation to the tenants as well. Locus will continue to support these efforts.

Specific Comment 4: *Recommend including performance objectives, design specifications, details of system checks, and criteria for initiating corrective action.*

Response: Refer to response to Comment 10 in the Mitigation Plan section.

Specific Comment 5: *Section 2.4, Quality Objectives and Criteria—State the primary goal of the mitigation activities, e.g., to prevent vapors from entering the structure above EPA’s trichloroethene target concentration of 0.48 microgram per cubic meter, thereby reducing*

indoor air concentrations to at or below the target air concentration. Also include a data-set completeness goal.

Response: The primary numerical goal of mitigation at each building is specified in the individual mitigation plans and varies by resident. The data quality objective for dataset completeness is specified in Section 2.5 of the parent QAPP. The completeness requirement is 90% for air sampling. Therefore, no changes are proposed.

Specific Comment 6: Section 3.1, Sampling Methods: Recommendations:

- a. *Step 1: Replace “back-to-back” with “sequential.”*
- b. *Step 3: Include an accurate description of labeling system.*
- c. *Step 13: Determine whether flow rate is a critical variable for grab samples.*
- d. *Step 15: Recommend stating this more strongly that the Summa canister not be allowed to reach 0”Hg vacuum, since the system being sampled is under vacuum and will draw out sample if the Summa canister is allowed to deplete vacuum too far.*

Response: The QAPP Addendum will be revised as recommended in Item a. Regarding Item b, the language in the QAPP Addendum is the same as approved by EPA in the Work Plan for Additional Vapor Intrusion Evaluation submitted to EPA 7 January 2015. Therefore, no change is proposed. Regarding Item c, the flow rate is not a critical variable for grab samples, but the flow controller’s in-line gauge will allow the sampler to close the canister prior to the vacuum reaching 0” Hg. The following sentence will be revised as indicated: *“However, since this is a grab sample, corrective action ~~may~~ will not be necessary if the filling speed varies in this manner.”* Please note EPA’s contradiction between item d above and Comment 9 in the O&M Plan section. Refer to response to Comment 9 in the O&M Plan section.

Specific Comment 7: Section 3.3, Quality Control

- a. *Third sentence—“However, if results are similar, there will be greater confidence in the precision of the results...” Suggest “accuracy” was meant, instead of “precision.”*
- b. *Third sentence continued: “... and, if soil gas concentrations are time-variable, greater confidence in the representativeness of the results.” This sentence appears incomplete, but further, it is not understood: Are the mitigation system contractors measuring soil gas concentrations over time? How does this relate to vent stack results, and how is representativeness affected?*

Response: Regarding Item a, precision was intended. As stated in the EPA-approved parent QAPP, precision measures the agreement between repeat measurements made under the same conditions, such as the reproducibility of a set of duplicate results. Regarding Item b, the sentence will be revised as follows: *“... and, if soil gas concentrations are time-variable, the back-to-back samples will provide greater confidence in the representativeness of the results.”* The use of the word time-variable is a statement that soil gas concentrations may not be static over time. Samples taken

sequentially will technically capture two different time intervals, which increases the representativeness of the analytical results, if soil gas concentrations are not static. This relates to vent stack exhaust because vent stack exhaust is soil gas. Note that the critical component of Section 3.3 is the establishment of sequential sampling in the attempt to get as close to a field duplicate as possible for the purposes of evaluating precision.

Specific Comment 8: Section 3.4, Instrument Testing, Inspection, Maintenance

- a. *Section cites a 25% vacuum criterion, but details regarding flow rates or other parameters are not included. Have sufficient operational/performance criteria details been included?*
- b. *The QAPP Addendum should state what specific instrumentation is to be used, and include SOPs for testing and maintenance of those instruments within appendices for documentation to create a complete administrative record.*

Response: Regarding Item a, the 25% vacuum criterion originated in the EPA-recommended O&M field form template although no automatic action items are expressed nor implied. Sufficient operational/performance criteria details have been included because the interpretation of findings (including all that is noted on the field form) cannot be committed to a set of numeric criteria and automatic action item triggers. The expert mitigation installer is more than qualified for the task of interpreting inspection findings to determine if and when system adjustments, repairs, or other corrections are necessary. Regarding Item b, the QAPP Addendum will be revised to state what specific instrumentation for O&M inspections will be used and will include the manufacturer's SOPs for testing and maintenance.

Specific Comment 9: Section 3.5, Instrument Calibration and Frequency

- a. *This section discusses calibration in a general way; EPA recommends providing details of what instruments are to be used, their calibration procedures, their acceptance criteria, and how calibration records are to be maintained.*
- b. *This section includes the statement: "Deficiencies affecting field readings will be addressed through re-measurement, if necessary and possible." This appears to be inadequate; recommend a statement enumerating corrective actions, including instrument recalibration and/or replacement.*

Response: Regarding Item a, refer to response to Comment 8 in this section regarding identifying specific instruments to be used. Refer to response to Comment 10 in the O&M Plan section with regard to the documentation and maintenance of calibration records. Regarding calibration procedures, the QAPP Addendum addresses calibration procedures and acceptance criteria to the same level of detail as approved by EPA in the parent QAPP. Therefore, no change is proposed regarding statements of calibration procedures.

Regarding Item b, the QAPP Addendum will be revised as follows: "Deficiencies affecting field readings will be addressed *first* through *proper instrument recalibration*."

maintenance, and/or replacement, to be followed by re-measurement, if necessary and possible.

Specific Comment 10: *Section 4, Assessment & Oversight.*

- a. *Audits to be performed by the Project Manager; recommend audits to be assigned to the Quality control Manager, or other, to provide an independent evaluation.*
- b. *This section is very brief and refers to the individual mitigation work plans. EPA recommends including in this section the overall corrective action approach, reporting requirements, and notification conditions/pathways.*

Response: Regarding Item a, the Locus Project Manager is authorized to conduct performance audits per the EPA-approved parent QAPP. Additionally, the parent QAPP states: *“The Philips Project Manager and EPA Project Manager are also authorized to conduct audits and have the authority to issue stop work orders, if necessary.”* Regarding Item b, Section 4 Assessment and Oversight of the EPA-approved parent QAPP also refers to the relevant EPA-approved work plan rather than making re-statements. Corrective action approaches and post-installation reporting requirements are already included in the individual mitigation plans. Section 4.2 of the parent QAPP addresses reporting and notification to EPA. Therefore, no changes are proposed.

Specific Comment 11: *Section 5, Data Validation and Usability—No information is provided on the validation approach or usability criteria for the analytical data; this section only addresses field measurement.*

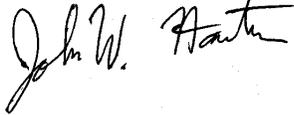
Response: Refer to Section 5 of the EPA-approved parent QAPP.

Specific Comment 12: *Additional Comment—This document should include a statement regarding project completion or duration, including closing operations and recordkeeping.*

Response: Project completion and duration are dependent upon achieving mitigation termination criteria, as described in the mitigation plans. Closing operations will depend on the owner’s decision to continue to operate the system at the owner’s expense, turn the system off and leave it in place, or request that it be disassembled and removed. Refer to Section 2.7 Documentation and Records of the parent QAPP. Therefore, no changes are proposed.

If you have any questions regarding this correspondence, please call me at (415) 799-9937.

Sincerely,

A handwritten signature in black ink that reads 'J. Wesley Hawthorne'.

J. Wesley Hawthorne, PE, PG
Senior Vice President

JWH/njl

cc: (electronic copies)
Shau-Luen Barker, Philips Semiconductors
Leslie Lundgren, CB&I
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