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Mr. Roger Papler
Engineering Geologist
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
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ENVIRONMENT

Subject:

Work Plan Addendum for Vapor Intrusion Evaluation of the Former Teledyne Semiconductor Building Located at 1300 Terra Bella Avenue, Former Spectra-Physics Lasers and Former Teledyne Semiconductor Sites, Mountain View, California

Date:
October 21, 2014

Dear Mr. Papler:

ARCADIS U.S., Inc. (ARCADIS) has prepared this letter as an additional Work Plan Addendum to the September 24, 2010 "Work Plan to Evaluate Potential Vapor Intrusion in the Off-Property Study Area and at 1250 West Middlefield Road for the former Teledyne Semiconductor and former Spectra-Physics Lasers Sites" ("2010 Work Plan"). ARCADIS prepared the 2010 Work Plan and this Work Plan Addendum on behalf of TDY Industries, LLC, for the former Teledyne Semiconductor ("Semiconductor") Site, and Thermo Fisher Scientific, Inc., for the former Spectra-Physics Lasers, Inc. ("Spectra-Physics") Site, located respectively at 1300 Terra Bella Avenue and 1250 Middlefield Road, in Mountain View, California (Figure 1). TDY Industries, LLC, and Thermo Fisher Scientific, Inc., are collectively referred to as "the Companies." The scope of work discussed in this Work Plan Addendum applies only to the building located at the former Semiconductor property (referred to as "the Semiconductor Site"; Figure 1).

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Our ref:
EM001727.0070

This Work Plan Addendum was prepared in accordance with several communications with representatives of the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) and the United States Environmental Protection Agency (USEPA) regarding additional sampling to evaluate potential vapor intrusion in the building with the heating, ventilation, and air conditioning (HVAC) system(s) turned off. Those communications included (1) discussions during the May 15, 2013 meeting between representatives of the RWQCB, the USEPA, the Companies, and ARCADIS; (2) the April 30, 2013 RWQCB letter titled "Requirement for Workplan Addendum for Vapor Intrusion Evaluation for the Former Teledyne Property at the Former Teledyne/Spectra-Physics Site, 1300 Terra Bella Avenue and 1250 Middlefield Road, Mountain View, Santa Clara County" (RWQCB 2013); (3) the

Imagine the result

July 25, 2013 meeting between representatives of the RWQCB, the USEPA, the Companies, and ARCADIS; and (4) the July 9, 2014 USEPA letter titled "USEPA Region 9 Response Action Levels and Recommendations to Address Near-Term Inhalation Exposures to TCE in Air from Subsurface Vapor Intrusion" ("USEPA Region 9 Guidelines"; USEPA 2014b).

Indoor air sampling at the former Semiconductor property has been conducted in accordance with the June 24, 2011 "Indoor Air and Soil Gas Sampling Plan for the Building Located at 1300 Terra Bella Avenue, Former Teledyne Site, Mountain View, Santa Clara County" ("June 2011 Sampling Plan"; Attachment A). Previously collected indoor air sample locations at the former Semiconductor property are shown on Figure 2. Indoor air samples collected to date confirm that volatile organic compounds (VOCs) are not present in indoor air at or above current screening criteria under current HVAC operating conditions. Soil gas and indoor air monitoring programs related to the methane mitigation system are currently ongoing (ARCADIS 2013).

Additional indoor air monitoring is proposed to evaluate the potential for vapor intrusion to occur under various building operating conditions, including with the HVAC system on (in portions of the building not previously sampled), with the HVAC system off, and with the HVAC system on and off following a significant building remodel or changes in occupancy patterns. Sampling indoor air concentrations with the HVAC system off can be a diagnostic tool to evaluate whether soil gases are capable of entering the building under worst case conditions. However, such results are not representative of actual exposure conditions.

Updated Roles and Responsibilities

The 2010 Work Plan outlined the project team's roles and responsibilities, including RWQCB and USEPA Region 9 Superfund Division oversight. Only one change has been made to the project team since submittal of the 2010 Work Plan: Ms. Melanie Morash now serves as the USEPA Project Manager and Technical Lead for implementation of the work detailed in the 2010 Work Plan and this Work Plan Addendum.

Data Evaluation and Reporting Updates

Field analytical methods, sample documentation, quality assurance, and data evaluation and reporting methods will be conducted as described in the 2010 Work

Plan (ARCADIS 2010). The tiered data evaluation approach has been updated to incorporate the most recent published screening criteria. Specifically, breathing zone sample results for HVAC on and HVAC off will be assessed using the following tiered approach:

- Tier 1: Indoor air sample results will be compared to outdoor air concentrations to evaluate whether indoor air quality may be affected by sources unassociated with vapor intrusion.
- Tier 2: Indoor air sample results will be compared to the most current long-term screening criteria and site-specific exposure scenarios (currently the May 2014 Regional Screening Levels; USEPA 2014a; Table 1).
- Tier 3: Indoor air sample results will be compared to the most current short-term screening criteria (currently the July 2013 Agency for Toxic Substances and Disease Registry [ATSDR] Minimal Risk Levels and USEPA Region 9 Guidelines [ATSDR 2013; USEPA 2014b; Table 1]). If indoor air concentrations exceed short-term screening levels, immediate interim action may be implemented as appropriate and feasible, including changing the building's HVAC system operation (i.e., to run continuously or at new operating standards) as an interim response action until a permanent path forward is determined. This action should be implemented within 72 hours of receiving the indoor air sample results. Long-term mitigation measures will be handled as described in the following sections.

The tiered screening level assessment for breathing zone samples collected with the HVAC system turned off and for pathway samples will not provide a direct indication of exposure, but will be used to indicate the potential for vapor intrusion to occur. Throughout the duration of the study, changes in screening levels will be evaluated and incorporated, as appropriate.

Sampling and Mitigation Plan Updates

ARCADIS has completed sampling in the majority of the former Semiconductor building in accordance with the June 2011 Sampling Plan (ARCADIS 2011; Attachment A). These prior sampling events were conducted during normal operating hours with the HVAC systems operational. The southeastern quadrant of the building has not yet been sampled with the HVAC system operational, and the southwestern quadrant of the building has been renovated but has not been reoccupied.

In consideration of the potential scenarios that may occur for HVAC on and HVAC off breathing zone sample results obtained during future indoor air sample events, the following additional sampling and mitigation plans were developed:

- An indoor air sampling plan was developed for areas that have not been sampled with the HVAC system turned on and for areas previously sampled but recently remodeled and reoccupied (starting on Figure 3A).
- An indoor air sampling and mitigation plan was developed for areas of the building with indoor air concentrations in exceedance of Tier 2 screening criteria with the HVAC system operational (Figure 3B).
- An indoor air sampling and mitigation plan was developed for areas of the building that were not remodeled (or were remodeled but then resampled) in which indoor air concentrations were less than screening criteria with the HVAC system operational (Figure 3C).

The tiered evaluation approach is not applicable to pathway samples. Rather, elevated pathway sample results may be indicative of a vapor intrusion pathway. Typical response actions, which will be developed based on discussions with the property owners/tenants, RWQCB, and USEPA, may include a detailed pathway building inspection using a portable gas chromatogram/mass spectrometer, limited pathway sealing, and/or confirmation sampling.

Revised sample plans for responding to elevated breathing zone sample results are described below.

Indoor Air Sampling Plan for Areas of the Building that Have Not Been Sampled with HVAC System Turned On and Previously Sampled Areas that Have Been Remodeled and Reoccupied

Areas of the building not previously sampled and areas previously sampled that have been remodeled and reoccupied will be handled as described commencing on Figure 3A. ARCADIS will conduct the building survey and walk-through with HVAC maintenance staff and USEPA representatives, identifying discrete ventilation zones, unique building features, and pathway and breathing zone sample locations. Some significant VOC effects on indoor air quality may come from the use of consumer products, building materials, and personal activities. If identified, indoor sources of

VOCs will be removed from the building, if feasible. The area will then be sampled during normal business hours under normal HVAC operating conditions in accordance with the 2010 Work Plan (ARCADIS 2010).

Response actions will be determined based on the following screening level evaluation results:

- If indoor air concentrations measured under normal HVAC operating conditions are greater than long-term screening levels (Tier 2), the area of the building will be handled as described on Figure 3B. This process is described in more detail below in the subsection titled *“Indoor Air Sampling and Mitigation Plan in Areas of the Building with Indoor Air Concentrations Greater than Screening Criteria with HVAC Operational.”*
- If indoor air concentrations measured under normal HVAC operating conditions are less than long-term screening levels (Tier 2), the area will be handled as described on Figure 3C. This process is described in more detail below in the subsection titled *“Indoor Air Sampling and Mitigation Plan in Areas of the Building with Indoor Air Concentrations Less than Screening Criteria with HVAC Operational.”*

Indoor Air Sampling and Mitigation Plan in Areas of the Building with Indoor Air Concentrations Greater than Screening Criteria with HVAC Operational

Response actions in areas of the building with indoor air concentrations with HVAC system operational exceeding long-term screening levels (Tier 2) will be determined based on the following screening level evaluation results (as shown on Figure 3B):

- If indoor air concentrations measured under normal HVAC operating conditions are greater than long-term criteria (Tier 2) but less than short-term criteria (Tier 3), the area will be further evaluated to determine if potential exposure scenarios assumed during development of the screening criteria are present (USEPA 2014a; Table 1). ARCADIS will then work with the Companies, property owners/tenants, RWQCB, and USEPA to evaluate whether mitigation is recommended (Attachment B). If mitigation is not recommended, the area will be sampled with the HVAC system off as described on Figure 3C and discussed below in the section titled *“Indoor Air Sampling and Mitigation Plan in Areas of the Building with Indoor Air Concentrations Less than Screening Criteria with HVAC Operational.”*

- If indoor air concentrations measured under normal HVAC operating conditions are greater than short-term screening levels (Tier 3), immediate interim action may be implemented as appropriate and feasible, including optimizing the building's HVAC system as an interim response action pending further building evaluation. Optimization of the HVAC system would typically focus on providing effective and appropriate air exchange in all occupied spaces and avoiding excessive depressurization of spaces on the ground floor. This action should be implemented within 72 hours of receiving the indoor air sample results.
 - Following implementation of the interim response action, an additional round of indoor air sampling will be conducted to assess the effectiveness of the interim response action.
 - The area will then be further evaluated to assess potential secondary sources contributing to indoor air concentrations, and pathway identification and mitigation, as warranted (Attachment B).

Following building evaluation and mitigation, as warranted, a confirmation sampling event will be conducted with the HVAC system off at the initial breathing zone and pathway sample locations. If feasible, the HVAC system will be turned off at least 36 hours before the sampling event is conducted to provide representative HVAC off data, and will remain off for the duration of the sampling event. Adequate notice will be provided to building management and potential occupants about the testing and schedule for when the ventilation system will be shut off. Sample duration may be 8 hours, 10 hours, or 12 hours, depending on the HVAC on sample duration. Samples will be collected in accordance with the Quality Assurance Project Plan (QAPP) described in the 2010 Work Plan (ARCADIS 2010).

Results of the confirmation sampling event will be evaluated using the tiered approach, and additional response actions are as follows:

- If indoor air concentrations sampled during the post-mitigation confirmation sampling event are less than Tier 2 criteria, no further sampling or mitigation will be necessary.
- If indoor air concentrations measured during the post-mitigation confirmation sampling event are greater than Tier 2 criteria, ARCADIS will work with the Companies, property owners/tenants, RWQCB, and USEPA to determine and implement appropriate long-term measures.

Previous indoor air results in this scenario indicate concentrations were greater than Tier 2 screening criteria with the HVAC system on; therefore, in the case where mitigation activities were ineffective at reducing indoor air concentrations with the HVAC system off, an additional round of confirmation sampling with the HVAC system on will be necessary to confirm the effectiveness of alternative long-term mitigation measures at reducing indoor air concentrations.

If the confirmation sampling event indicates alternative long-term mitigation measures are effective at reducing indoor air concentrations below Tier 2 screening criteria, ARCADIS will work with the Companies, property owners/tenants, RWQCB, and USEPA to establish a periodic indoor air monitoring and verification procedure.

If the confirmation sampling event indicates indoor air concentrations remain above Tier 2 screening criteria, ARCADIS will work with the Companies, property owners/tenants, RWQCB, and USEPA to further evaluate alternative mitigation measures.

Indoor Air Sampling and Mitigation Plan in Areas of the Building with Indoor Air Concentrations Less than Screening Criteria with HVAC Operational

Areas of the building previously sampled with indoor air concentrations less than screening criteria with the HVAC system operational will be handled as described on Figure 3C. If indoor air concentrations are less than long-term screening criteria under normal HVAC operating conditions (or exposure scenarios are not present) in areas of the building previously sampled that have since been remodeled, reoccupied, and resampled, these areas of the building will also be handled as described on Figure 3C. Areas that are in this category will be sampled with the HVAC system turned off and indoor air concentrations will be evaluated against tiered criteria as previously described. Response actions will be determined based on the following screening level evaluation results:

- If indoor air concentrations with the HVAC system off do not exceed Tier 1 or Tier 2 criteria, no further action will be necessary.
- If indoor air concentrations with the HVAC system off exceed Tier 2 criteria but are less than Tier 3 criteria, the building will be further evaluated to determine if potential exposure scenarios assumed during development of the screening criteria are present (USEPA 2014a). ARCADIS will then work with the Companies, property owners/tenants, RWQCB, and USEPA to evaluate whether mitigation is

recommended (Attachment B). If mitigation is not recommended, no further action will be necessary.

- As described previously, if indoor air concentrations with the HVAC system off exceed Tier 3 criteria, the HVAC system should be set to run continuously within 72 hours as an interim response action. The building will be further evaluated to confirm the results and assess exposure scenarios, potential secondary sources contributing to indoor air concentrations, and pathway identification and mitigation, as warranted. This process is described in Attachment B.

Following building evaluation and mitigation, as warranted, a confirmation sampling event will be conducted with the HVAC system off at the initial breathing zone and pathway sample locations in accordance with the QAPP and the sampling plans described previously in this Work Plan Addendum. Results of the confirmation sampling event will be evaluated using the tiered approach and additional response actions as follows:

- If indoor air concentrations sampled during the post-mitigation confirmation sampling event are less than Tier 2 criteria, no further sampling or mitigation will be necessary.
- If indoor air concentrations measured during the post-mitigation confirmation sampling event are greater than Tier 2 criteria, ARCADIS will work with the Companies, property owners/tenants, RWQCB, and USEPA to evaluate alternative mitigation measures.

Previous indoor air results in this scenario in these areas of the building indicate concentrations are less than screening criteria with the HVAC system on under normal operating standards; therefore, immediate sampling will not be necessary to confirm the effectiveness of alternate long-term mitigation measures at reducing indoor air concentrations. ARCADIS will work with the Companies, property owners/tenants, RWQCB, and USEPA to establish a periodic indoor air monitoring and verification procedure.

Additional Indoor Air Sampling Events

Additional indoor air performance monitoring events will be conducted under the following scenarios (ARCADIS 2013):

- If a substantive increase in VOC concentrations is observed in interior soil vapor monitoring points (SVP-1, SVP-2, SVP-10, SVP-17, SVP-18, and SVP-19).
- Following completion of remedial activities on the Semiconductor Site, and shutdown of the methane mitigation system, sampling will be conducted with the methane mitigation system turned off.

Sincerely,

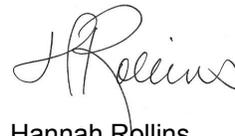
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Mr. Robert Fetter, Thermo Fisher Scientific
Mr. Don Bradshaw, P.G., ARCADIS
Ms. Amy Goldberg Day, ARCADIS

Attachments:

Table 1	Commercial Indoor Air Screening Levels
Figure 1	Site Vicinity Map and Property Locations
Figure 2	Site Plan
Figure 3A	Decision Flow Chart – Areas that Have Not Been Sampled with HVAC On or Have Been Remodeled
Figure 3B	Decision Flow Chart – Areas that Have Been Sampled with HVAC On and are Greater Than Tier 2 Criteria
Figure 3C	Decision Flow Chart – Areas with Indoor Air Concentrations Less Than Screening Criteria with HVAC On (Remodeled or Remodeled and Resampled)
Attachment A	June 2011 Indoor Air and Soil Gas Sampling Plan
Attachment B	Secondary Source Identification and Mitigation

References:

ARCADIS. 2010. Work Plan to Evaluate Potential Vapor Intrusion in the Off-Property Study Area and at 1250 West Middlefield Road, Teledyne Semiconductor and Spectra-Physics Laser, Inc., Sites, Mountain View, CA. September 24.

ARCADIS. 2011. Indoor Air and Soil Gas Sampling Plan for the Building Located at 1300 Terra Bella Avenue, Former Teledyne/Spectra Physics Site, Mountain View, Santa Clara County. June 24.

ARCADIS. 2013. Methane Mitigation System Expansion Startup Report and Performance Sampling Plan, Former Teledyne Semiconductor and Former Spectra-Physics Lasers, Inc., Facilities, Mountain View, California. July 25.

ATSDR. 2013. Minimum Risk Levels List. Available at:
<http://www.atsdr.cdc.gov/mrls/mrlolist.asp>. Revised July 2013.

RWQCB. 2013. Requirement for Workplan Addendum for Vapor Intrusion Evaluation for the Former Teledyne Property at the Former Teledyne/Spectra-Physics Site, 1300 Terra Bella Avenue and 1250 Middlefield Road, Mountain View, Santa Clara County. April 30.

USEPA. 2014a. Regional Screening Levels for Chemical Contaminants. Available at:
<http://www.epa.gov/region9/superfund/prg/>. Revised May 2014.

USEPA. 2014b. USEPA Region 9 Response Action Levels and Recommendations to Address Near-Term Inhalation Exposures to TCE in Air from Subsurface Vapor Intrusion. July 9.

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Tables

Table 1
Commercial Indoor Air Screening Levels
Former Spectra-Physics Lasers and Former Teledyne Semiconductor Sites
Former Teledyne Semiconductor Property, 1300 Terra Bella Avenue
Mountain View, California

(concentrations reported in micrograms per cubic meter)

Sample ID	Sample Date	Sample Type	TCE	cis-1,2-DCE	VC	PCE	trans-1,2-DCE	1,1-DCA	1,2-DCB	1,1,1-TCA	Chloroform	Freon 113
Tier 1 - Comparison to Background/Outdoor Ambient Air												
Tier 2 - Comparison to Long-Term Health Risk-Based Screening Criteria												
Industrial/Commercial Screening Level (May 2014) ^{1,4}			3.0	NA	2.8	2	NA	7.7	880	22,000	0.53	130,000
Tier 3 - Comparison to Short-Term Health Risk-Based Screening Criteria												
Acute Screening Level (July 2013) ²			NA	793*	1,278	1,357	793	NA	NA	10,914	488	NA
Short-Term Screening Levels (July 2013) ²			NA	793*	77	NA	793	NA	NA	3,820	244	NA
Interim Indoor Short-Term Response Action Levels ³			7**	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

1. USEPA Regional Screening Levels (RSLs), revised May 2014. Available at: <http://www.epa.gov/region9/superfund/prg/>.

Industrial Air RSLs are derived for exposure durations of 8 hours per day, 250 days per year for 25 years.

2. Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs), revised July 2013. Available at: <http://www.atsdr.cdc.gov/mrls/mrlist.asp>.

Acute MRLs are derived for exposure durations of 1 to 14 days. Short-term (intermediate) MRLs are derived for exposure durations of >14 to 364 days.

3. USEPA Interim Indoor Air Short-Term Response Action Levels for TCE (7 µg/m³) from memo from USEPA to Region 9 Superfund Division Staff and Management (USEPA 2014). "EPA Region 9 Response Action Levels and Recommendations to Address Near-Term Inhalation Exposures to TCE in Air from Subsurface Vapor Intrusion". July 9.

4. California-modified indoor air screening level for PCE (2 µg/m³) from memo from USEPA to Stephen Hill (RWQCB 2013). "EPA Region 9 Guidelines and Supplemental Information Needed for Vapor Intrusion Evaluations at the South Bay National Priorities List (NPL) Sites." December 3.

Units in micrograms per cubic meter (µg/m³) at 25° Celsius and 1 atmosphere.

* = Trans-1,2-DCE MRLs and RSLs are used for cis-1,2-DCE.

** = 10-hour workday as recommended by USEPA for South Bay Sites; 8-hour workday scenario screening level is 8 µg/m³.

1,1-DCA = 1,1-dichloroethane

1,2-DCB = 1,2-dichlorobenzene

1,1,1-TCA = 1,1,1-trichloroethane

BZ = breathing zone sample location

cis-1,2-DCE = cis-1,2-dichloroethene

NA = not available

OA = outdoor air sample location

PCE = tetrachloroethene

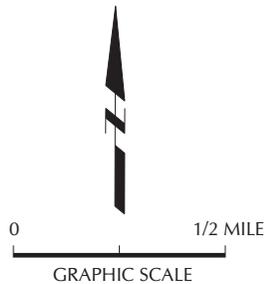
TCE = trichloroethene

trans-1,2-DCE = trans-1,2-dichloroethene

VC = vinyl chloride

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Figures

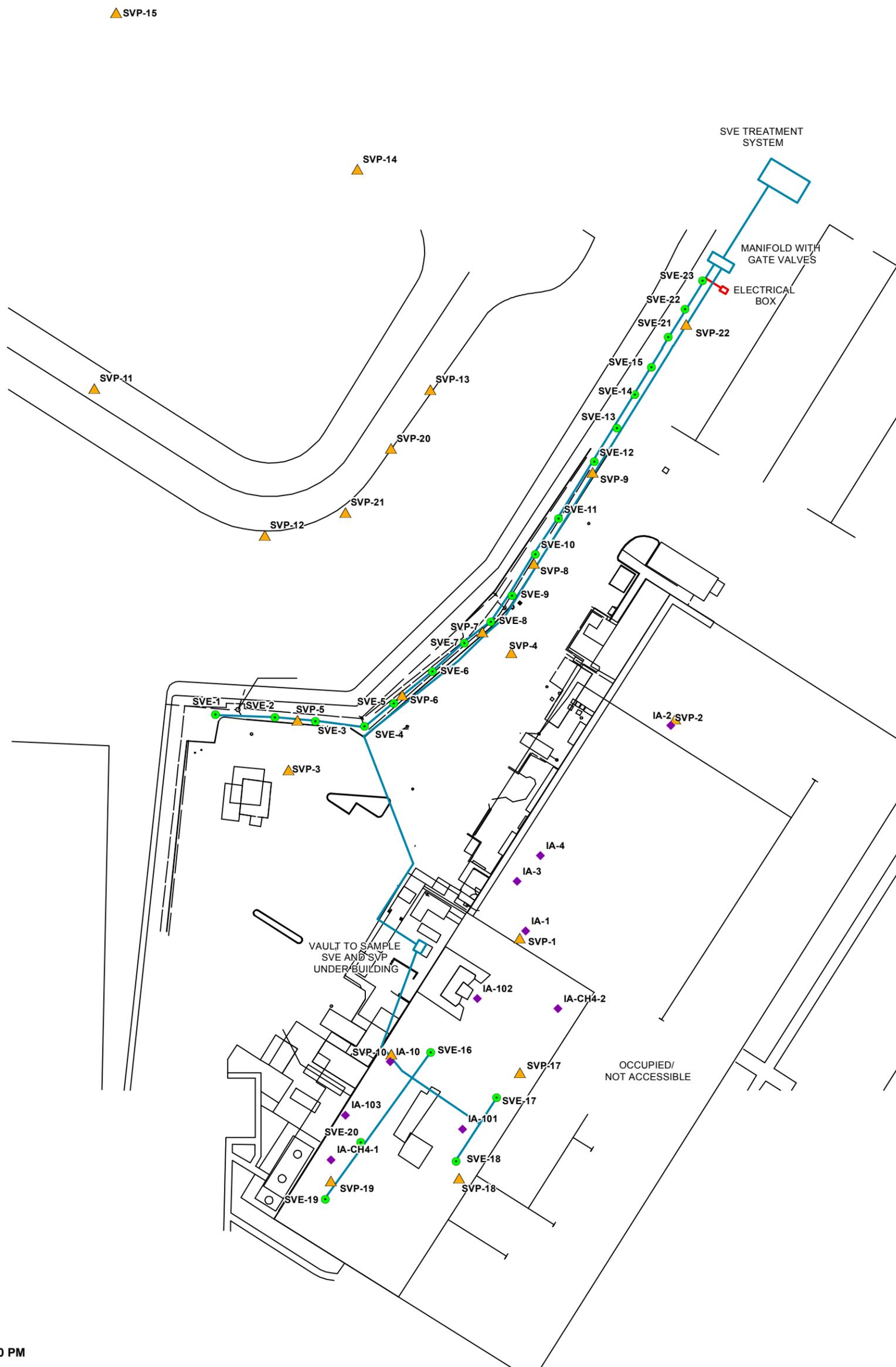


FORMER SPECTRA-PHYSICS LASERS AND
FORMER TELEDYNE SEMICONDUCTOR SITES
MOUNTAIN VIEW, CALIFORNIA

**SITE VICINITY MAP AND
PROPERTY LOCATIONS**



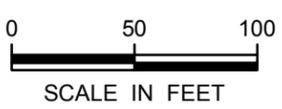
FIGURE
1



Revised on: 8/5/2014 4:55:20 PM

LEGEND

- ▲ SOIL VAPOR PROBE
- ◆ INDOOR AIR SAMPLE LOCATIONS
- SOIL VAPOR EXTRACTION WELLS
- SVE LINE



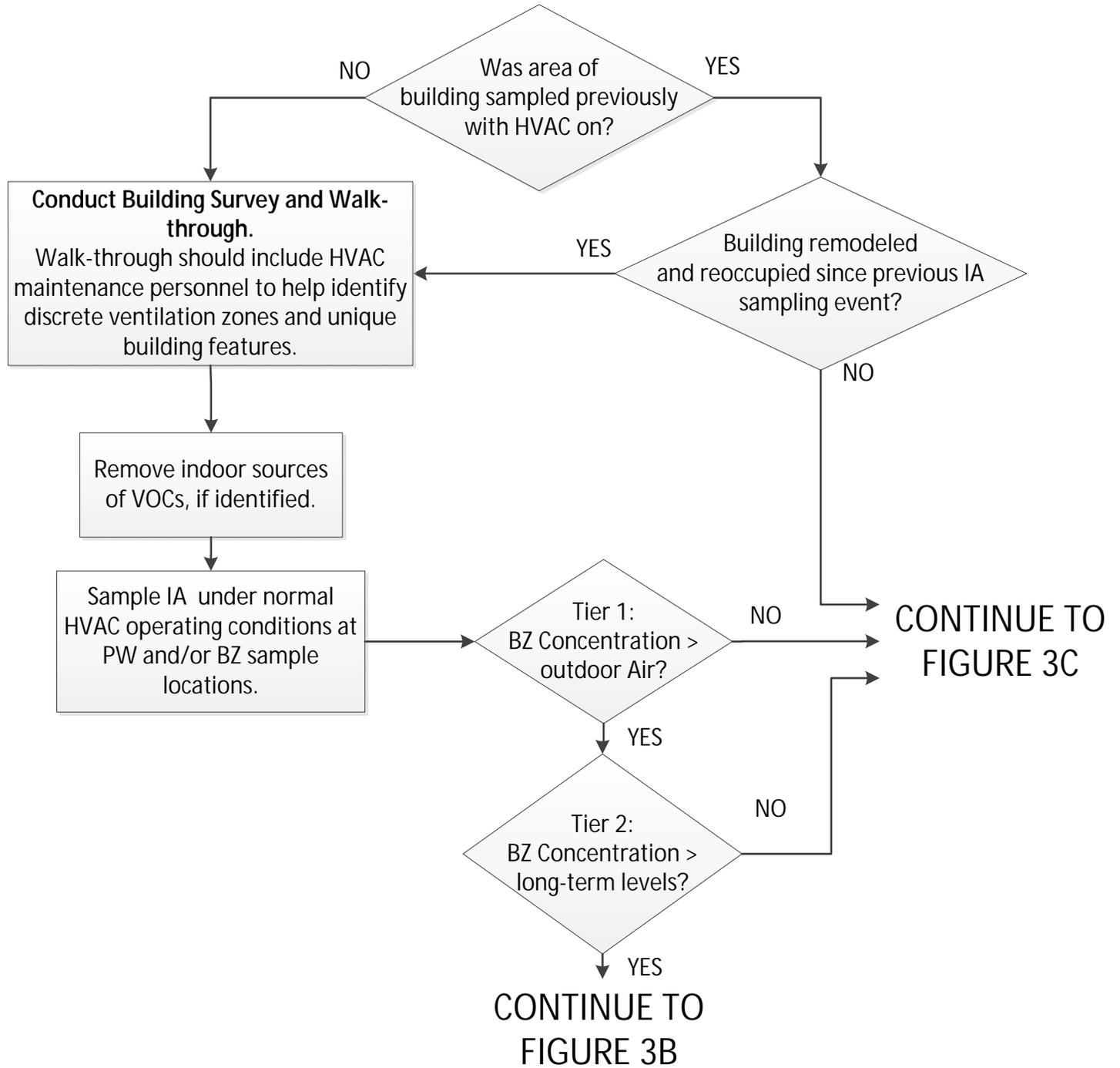
FORMER SPECTRA-PHYSICS LASERS AND FORMER
TYLEDYNE SEMICONDUCTOR SITES, FORMER
TELEDYNE SEMICONDUCTOR PROPERTY,
1300 TERRA BELLA AVENUE,
MOUNTAIN VIEW, CALIFORNIA

SITE PLAN



FIGURE
2

START



NOTES:

- > = GREATER THAN
- BZ = BREATHING ZONE
- HVAC = HEATING, VENTILATION, AND AIR CONDITIONING
- IA = INDOOR AIR
- PW = PATHWAY
- VI = VAPOR INTRUSION
- VOCs = VOLATILE ORGANIC COMPOUNDS

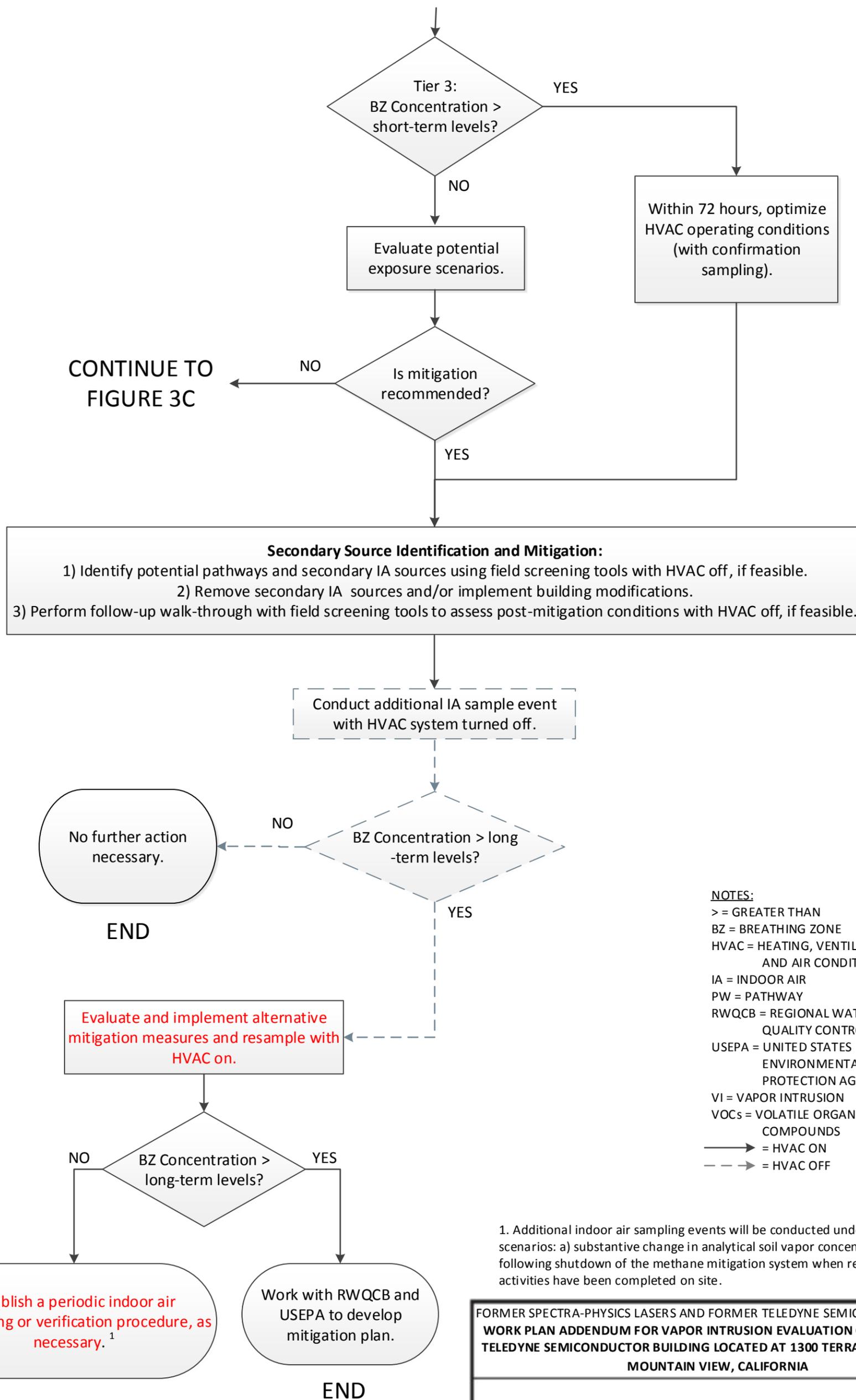
FORMER SPECTRA-PHYSICS LASERS AND FORMER TELEDYNE SEMICONDUCTOR SITES
WORK PLAN ADDENDUM FOR VAPOR INTRUSION EVALUATION OF THE FORMER
TELEDYNE SEMICONDUCTOR BUILDING LOCATED AT 1300 TERRA BELLA AVENUE,
MOUNTAIN VIEW, CALIFORNIA

DECISION FLOW CHART - AREAS THAT HAVE NOT BEEN SAMPLED
WITH HVAC ON OR HAVE BEEN REMODELLED



FIGURE
3A

CONTINUED FROM FIGURE 3A
(IA CONCENTRATIONS > TIER 2 CRITERIA WITH HVAC
OPERATIONAL)



NOTES:
 > = GREATER THAN
 BZ = BREATHING ZONE
 HVAC = HEATING, VENTILATION,
 AND AIR CONDITIONING
 IA = INDOOR AIR
 PW = PATHWAY
 RWQCB = REGIONAL WATER
 QUALITY CONTROL BOARD
 USEPA = UNITED STATES
 ENVIRONMENTAL
 PROTECTION AGENCY
 VI = VAPOR INTRUSION
 VOCs = VOLATILE ORGANIC
 COMPOUNDS
 ———→ = HVAC ON
 - - - -> = HVAC OFF

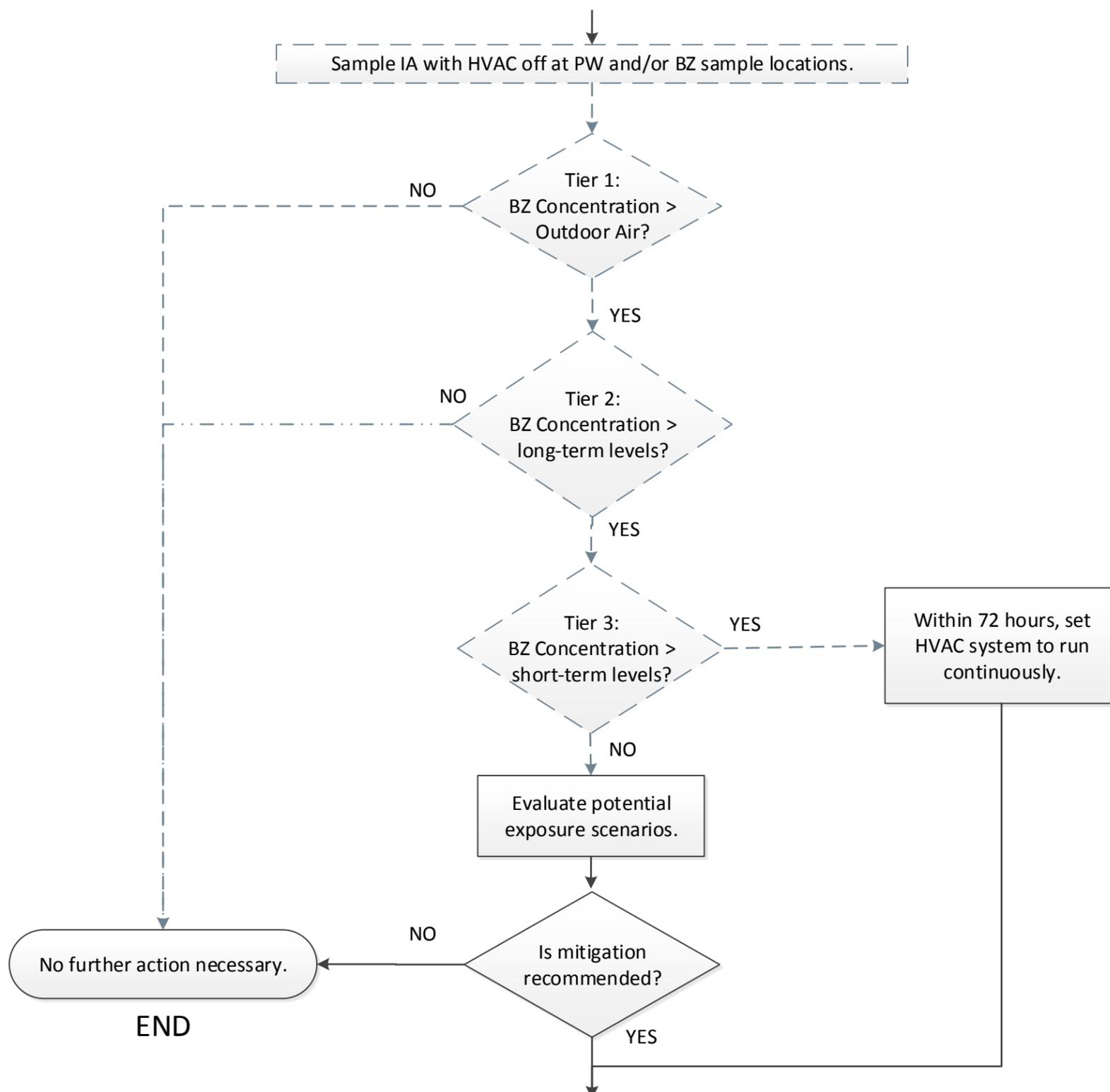
1. Additional indoor air sampling events will be conducted under the following scenarios: a) substantive change in analytical soil vapor concentrations, and b) following shutdown of the methane mitigation system when remedial activities have been completed on site.

FORMER SPECTRA-PHYSICS LASERS AND FORMER TELEDYNE SEMICONDUCTOR SITES
**WORK PLAN ADDENDUM FOR VAPOR INTRUSION EVALUATION OF THE FORMER
 TELEDYNE SEMICONDUCTOR BUILDING LOCATED AT 1300 TERRA BELLA AVENUE,
 MOUNTAIN VIEW, CALIFORNIA**

**DECISION FLOW CHART – AREAS THAT HAVE BEEN SAMPLED
 WITH HVAC ON AND ARE GREATER THAN TIER 2 CRITERIA**



CONTINUED FROM FIGURES 3A AND 3B
(IA CONCENTRATIONS < SCREENING CRITERIA WITH
HVAC OPERATIONAL)

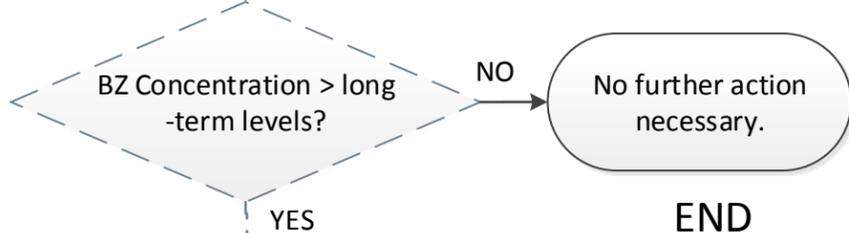


Secondary Source Identification and Mitigation:
 1) Identify potential pathways and secondary IA sources using field screening tools with HVAC off, if feasible.
 2) Remove secondary IA sources and/or implement building modifications.
 3) Perform follow-up walk-through with field screening tools to assess post-mitigation conditions with HVAC Off, if feasible.

NOTES:
 < = LESS THAN
 > = GREATER THAN
 BZ = BREATHING ZONE
 GC/MS = GAS CHROMATOGRAPH/
 MASS SPECTROMETER
 HVAC = HEATING, VENTILATION,
 AND AIR CONDITIONING
 IA = INDOOR AIR
 PW = PATHWAY
 VI = VAPOR INTRUSION
 ———→ = HVAC ON
 - - - -> = HVAC OFF

1. Additional indoor air sampling events will be conducted under the following scenarios: a) substantive change in analytical soil vapor concentrations and b) following shutdown of the methane mitigation system when remedial activities have been completed on site.

Conduct additional IA sample event
with HVAC system turned off.



1) Evaluate and implement alternative mitigation measures.
 2) Establish a periodic indoor air monitoring and verification
 procedure, as necessary. ¹

END

FORMER SPECTRA-PHYSICS LASERS AND FORMER TELEDYNE SEMICONDUCTOR SITES
**WORK PLAN ADDENDUM FOR VAPOR INTRUSION EVALUATION OF THE FORMER
 TELEDYNE SEMICONDUCTOR BUILDING LOCATED AT 1300 TERRA BELLA AVENUE,
 MOUNTAIN VIEW, CALIFORNIA**

**DECISION FLOW CHART – AREAS WITH INDOOR AIR
 CONCENTRATIONS LESS THAN SCREENING CRITERIA WITH HVAC ON
 (REMODELED OR REMODELED AND RESAMPLED)**



FIGURE
3C



Attachment A

June 2011 Indoor Air and Soil Gas
Sampling Plan



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MEMO

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Mr. Edgard Bertaut, TDY
Mr. Mark L. Rollins, TFS
Mr. Michael Colvin, FTC&H
Mr. Don Bradshaw, ARCADIS

From:
Ms. Erica Kalve, Senior Geologist, PG
Ms. Amy Goldberg Day, Principal Toxicologist

Date:
June 24, 2011

ARCADIS Project No.:
EM001727.0064

Subject:
Indoor Air and Soil Gas Sampling Plan for the Building Located at 1300 Terra Bella Avenue, Former Teledyne/Spectra-Physics Site, Mountain View, Santa Clara County

This memorandum provides a summary of the indoor air and soil gas sampling plan for the Former Teledyne Semiconductor Site located at 1300 Terra Bella Avenue in Mountain View, California (the Site; Figure 1). The indoor air and soil gas sampling plan has been developed in response to a request from the current building owner and the building occupant. These activities will be conducted in association with the soil gas monitoring program that has been implemented in accordance with the "Work Plan to Implement Full-Scale ERD Treatability Study, Spectra-Physics Lasers, Inc., and Former Teledyne Semiconductor, 1250 Middlefield Road and 1300 Terra Bella Avenue, Mountain View, California" (the Work Plan) submitted by Fishbeck, Thompson, Carr & Huber, Inc. (FTC&H) and S.S. Papadopoulos & Associates, Inc. (FTC&H 2010a) on August 16, 2010 (including the Addendum to the Work Plan dated November 17, 2010 [FTC&H 2010b] and the Second Addendum to the Work Plan dated December 22, 2010 [FTC&H 2010c]). The Work Plan, Addendum, and Second Addendum were approved by the San Francisco Regional Water Quality Control Board (RWQCB) in a letter dated January 24, 2011.

A summary of baseline soil gas monitoring results and site-specific soil gas screening criteria was presented in a memo dated June 8, 2011 (ARCADIS 2011). Activities conducted as part of the baseline soil gas sample event included an optimal purge volume test, field screening of the soil gas monitoring probes (locations shown on Figure 2), collection of soil gas samples, and development of soil gas action levels to be used to assess soil gas results of samples collected during future soil gas monitoring events. The soil gas action levels were developed using the Johnson and Ettinger (J&E) Model and the results were validated using multiple lines of evidence.

Building Survey

A building survey was conducted on June 20, 2011. The commercial building is a one-story with slab-on-grade foundation construction. The southern half of the building is currently unoccupied. The northern half of the building is currently occupied with multiple work areas including offices, work space areas, and laboratories that support research and development of gene discovery products. The occupied portion of the building has an operable heating, ventilation, and air conditioning (HVAC) system that is located on the roof (Figure 3) and consists of several units. Limited information regarding the operation of the HVAC system was available at the time the building survey was conducted. The following is a brief overview of the HVAC system operation provided at the time the building survey was conducted.

- Two HVAC units operate continuously for 24-hours a day, seven days a week, to cool the information technology server room (see Figure 2); however, one of the two HVAC units is likely connected to the neighboring office area located in the northeast corner of the building.
- One HVAC unit operates 24-hours a day, seven days a week, with periodic shutdowns scheduled for 15 minutes every hour to conserve energy. It is unclear which portion of the building is served by this HVAC unit.
- The remaining units associated with the HVAC system operate continuously from 5:00 am to 7:00 pm, Monday through Friday.

Other building features that affect air circulation include laboratory fume hoods located throughout the building that operate continuously for 24-hours a day, seven days a week, and roll-up doors in the warehouse area that typically remain open during normal business hours.

The building survey included a detailed building walk-through with the building occupant's program manager and details regarding employee work hours and facility use were provided. Based on the information provided, four primary groups of receptor populations occupy the building, including:

1. Scientist and supporting staff that work normal business hours when the entire HVAC system is operating;
2. Scientist and supporting staff that work normal business hours when the entire HVAC system is operating and also work overtime hours (i.e., nights and weekends) when only part of the HVAC system is operating;
3. Building security that work part time hours when the entire HVAC system is operating and part time hours when only part of the HVAC system is operating (note that building security typically occupy the northeastern corner of the building); and

4. Cleaning service employees that typically work in the evenings Monday through Friday, at times when the HVAC system may be fully or only partially operational.

Note that the ERD treatability study area is primarily located in the southwestern to northwestern side of the building.

Indoor Air and Soil Gas Sample Locations

Four indoor air sample locations will be sampled during the indoor air and soil gas sampling event as illustrated on Figure 2. Two sample locations (IA-1 and IA-2) were selected to generate data for calculating a site-specific soil gas to indoor air attenuation factor. These indoor air sample locations are near soil vapor points SVP-1 and SVP-2, which will be sampled contemporaneously with the indoor air samples. Two sample locations (IA-3 and IA-4) were selected to generate data representative of potential vapor intrusion exposure based on building occupancy patterns and vicinity to the ERD Treatability Study. Specifically, samples will be collected from the employee break room, which is frequently in use by various employees throughout the work day, and the tissue culture lab. Employees that work in the tissue culture lab are likely to work extended hours (i.e., nights and weekends) when only part of the HVAC system is operating.

One outdoor air sample will be collected with collection starting within 1 hour of the start of collection of the corresponding indoor air samples and analyzed for volatile organic compounds (VOCs). The outdoor air sample will be collected near the ventilation system air intake of the building (if accessible). Sampling equipment will be located away from wind shields.

Indoor Air Sample Procedures

Air samples for VOC analysis will be collected in 6-liter stainless steel evacuated Summa canisters designed specifically for collecting indoor and outdoor ambient air samples. Each 6-liter Summa canister will be equipped with a flow controller and flow restrictor that use a critical orifice to regulate the flow of air into the canister. The flow controllers will be checked by the laboratory to verify air flow for each canister is set at the appropriate rate for the collection of 8-hour samples (specifically, IA-1, IA-2, and IA-3; see Figure 2) and an integrated 24-hour sample (IA-4). The orifice is designed to allow for regulated flow of air between an 8-hour to 24-hour sample period. The canister will be pre-evacuated by the laboratory to approximately -30 inches of mercury (Hg).

The integrated 24-hour sample will be collected over the course of three days using a Nutech 2701 programmable timer/solenoid canister air sampling timer programmed to sample indoor air on a schedule consistent with typical normal and overtime work hours. The assumed overtime work schedule is 10 hours a day between the hours of 7:00 am and 7:00 pm, Monday through Friday, and 10 hours over the

weekend. A representative sample schedule will simulate this schedule through the following integrated sample durations:

- One 8-hour sample duration scheduled from 8:00 am to 4:00 pm on Thursday;
- One 8-hour sample duration scheduled from 8:00 am to 4:00 pm on Friday; and
- One 4-hour sample duration scheduled from 6:00 pm to 10:00 pm on Sunday.

The integrated sample will be collected following the United States Environmental Protection Agency (U.S. EPA) Standard Operating Procedure for the Collection of Volatile Organic Compounds for the EPA School Air Toxics Program (U.S. EPA 2009). Flow checks of the integrated 24-hour sample will be performed.

To ensure that the collected samples will meet the planned end use for this study, the following sample guidelines will be followed:

- If the initial vacuum gauge reads less than 26 inches of Hg, the canister will be replaced prior to sample collection.
- If the final vacuum gauge indicates that the canister is not under vacuum, the sample will be considered a grab sample.
- If the final vacuum gauge reads greater than 20 inches of Hg, the sample will be rejected.

Each indoor air sample collection device will be positioned for sample collection within the breathing zone at approximately 3 to 5 feet above ground surface. Sample collection devices may be placed on a desk, table, cabinet, or possibly a tripod or similar device so that the sampling location will be at the correct height following the procedures discussed below. The outdoor air sampling collection device will be positioned at the height deemed representative. After collection the samples will be submitted to Air Toxics, Ltd, for analysis of VOCs using modified U.S. EPA Method TO-15 (SIM).

Sampling Procedure

To start the sampling event:

1. Place the canister in the proper location (as indicated on Figure 2).
2. Record the initial vacuum (approximately -30 inches of Hg) of the canister on an air sampling log.

3. Using a wrench, remove the closing bolt on the top of the canister and attach the flow controller device, tighten with a wrench (with filter in-line), open the canister bellows valve, and note the start time. Start any co-located canisters at the same time.

To complete the sampling event:

1. Close the canister bellows valve and note the stop time on the air sampling log.
2. Using a wrench, detach the flow controller.
3. Replace the closing bolt on top of the canister and tighten with a wrench. Record the final vacuum of the canister (approximately -2 to -4 inches of Hg) on the air sampling log.

The outdoor ambient air sample collection will follow the same sample protocol as the indoor ambient air sample described above; however, the exact location of the outdoor air location will be selected following a field assessment of the HVAC system. The outdoor ambient air sample collection will begin within one hour of the start of indoor air sampling.

Soil Gas Sample Procedures

Soil gas samples will be collected following the same field procedures implemented as part of the soil gas monitoring program. Specifically, soil gas sampling will be conducted in accordance with the Department of Toxic Substances Control (DTSC) and the RWQCB – Los Angeles Region’s “Advisory – Active Soil Gas Investigations,” dated January 28, 2003 (DTSC 2003), and consistent with the quantitative leak testing using shroud and helium methodologies proposed in the California EPA’s “Agency Review Draft, Advisory – Active Soil Gas Investigation,” dated March 2010 (Cal-EPA 2010). Soil gas samples for VOC analysis will be collected in 6-liter stainless steel evacuated Summa canisters designed specifically for collecting soil gas samples. Each 6-liter Summa canister will be equipped with a soil gas sampling manifold.

Sampling Procedure

1. Samples will be collected following evacuation of the optimal purge volume of 1.2 liters as determined by the optimal purge volume test conducted in May 2011 (ARCADIS 2011).
2. Prior to VOC sample collection, the quantitative leak test will be conducted using the shroud and helium methodologies (Cal-EPA 2010).
3. Samples will be collected at a constant flow rate of approximately 150 to 200 milliliters per minute.

Samples will be submitted to Air Toxics, Ltd, for analysis of VOCs using modified U.S. EPA Method TO-15 (SIM).

Data Evaluation

The indoor air sampling results will be compared to the U.S. EPA Regional Screening Levels for ambient air quality described in the “Work Plan to Evaluate Potential Vapor Intrusion in the Off-Property Study Area and at 1250 West Middlefield Road” (ARCADIS 2010). The indoor air sampling results will be used to assess indoor air quality for the presence of VOCs and the soil gas sample results will be used to develop a site-specific attenuation factor for VOCs in soil gas to indoor air.

Implementation Schedule

Field sampling will commence on Thursday, June 30, 2011 and will be submitted to Air Toxics, Ltd, under standard turn-around-time, which is 10 business days. Following receipt of the results, ARCADIS will draft a summary memorandum documenting the analytical results, the development of the site-specific soil gas to indoor air attenuation factor, and the reassessment of the site-specific screening criteria. The memorandum will be finalized within two weeks of receiving the analytical results.

References

- ARCADIS. 2010. Work Plan to Evaluate Potential Vapor Intrusion in the Off-Property Study Area and at 1250 West Middlefield Road, Teledyne Semiconductor and Spectra-Physics Laser, Inc. Sites, Mountain View, California. September 24.
- ARCADIS. 2011. Baseline Soil Gas Monitoring Results and Site-Specific Soil Gas Screening Criteria for the Former Teledyne/Spectra-Physics site, Mountain View, Santa Clara. June 8.
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- Department of Toxic Substances Control (DTSC). 2003. Advisory – Active Soil Gas Investigations. January 28.
- Fishbeck, Thompson, Carr & Huber, Inc. (FTC&H) and S.S. Papadopoulos & Associates, Inc. 2010a. Work Plan to Implement Full-Scale ERD Treatability Study, Spectra-Physics Lasers, Inc., and Former Teledyne Semiconductor, 1250 Middlefield Road and 1300 Terra Bella Avenue, Mountain View, California. August 16.

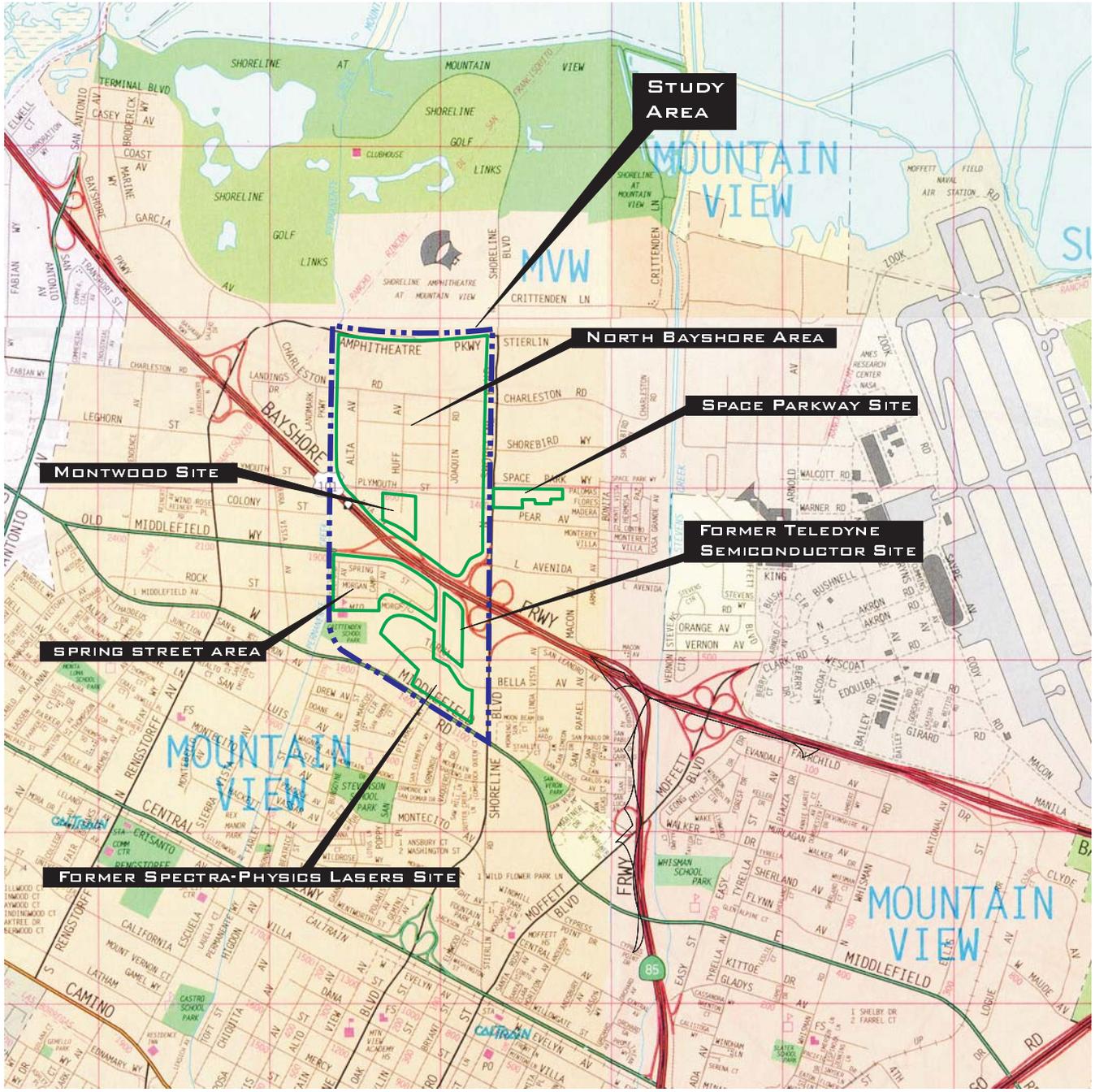
FTC&H. 2010b. Addendum to the Work Plan to Implement Full-Scale ERD Treatability Study, Spectra-Physics Lasers, Inc., and Former Teledyne Semiconductor, 1250 Middlefield Road and 1300 Terra Bella Avenue, Mountain View, California. November 17.

FTC&H. 2010c. Second Addendum to the Work Plan to Implement Full-Scale ERD Treatability Study, Spectra-Physics Lasers, Inc., and Former Teledyne Semiconductor, 1250 Middlefield Road and 1300 Terra Bella Avenue, Mountain View, California. December 22.

United States Environmental Protection Agency (U.S. EPA). 2009. Standard Operating Procedure for the Collection of Volatile Organic Compounds for the EPA School Air Toxics Program. August 5.

Figures

- 1 Site Vicinity Map and Property Locations
- 2 Site Map and Proposed Sample Locations
- 3 HVAC System Layout



FORMER SPECTRA-PHYSICS LASERS,
FORMER TELEDYNE SEMICONDUCTOR

**SITE VICINITY MAP AND
PROPERTY LOCATIONS**



FIGURE
1

Legend

Monitoring Wells

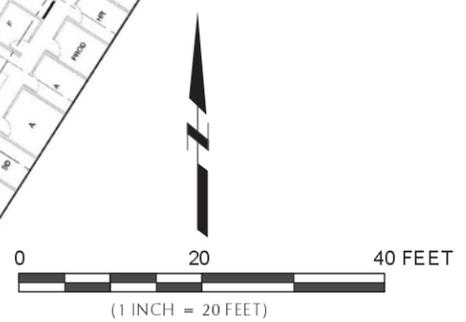
- Shallow Zone
- Upper Intermediate Zone
- Lower Intermediate Zone
- Membrane Interface Probe

Injection Well

- Shallow Zone
- Upper Intermediate Zone
- Lower Intermediate Zone

Proposed Wells - March 2011

- PMW-Shallow
- PMW-Upper Intermediate
- PMW-Lower Intermediate
- Soil Vapor Probe
- PID, Draeger Tube, and Soil Laboratory Analysis Location
- Proposed Indoor Air



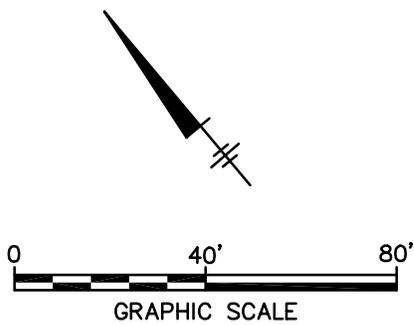
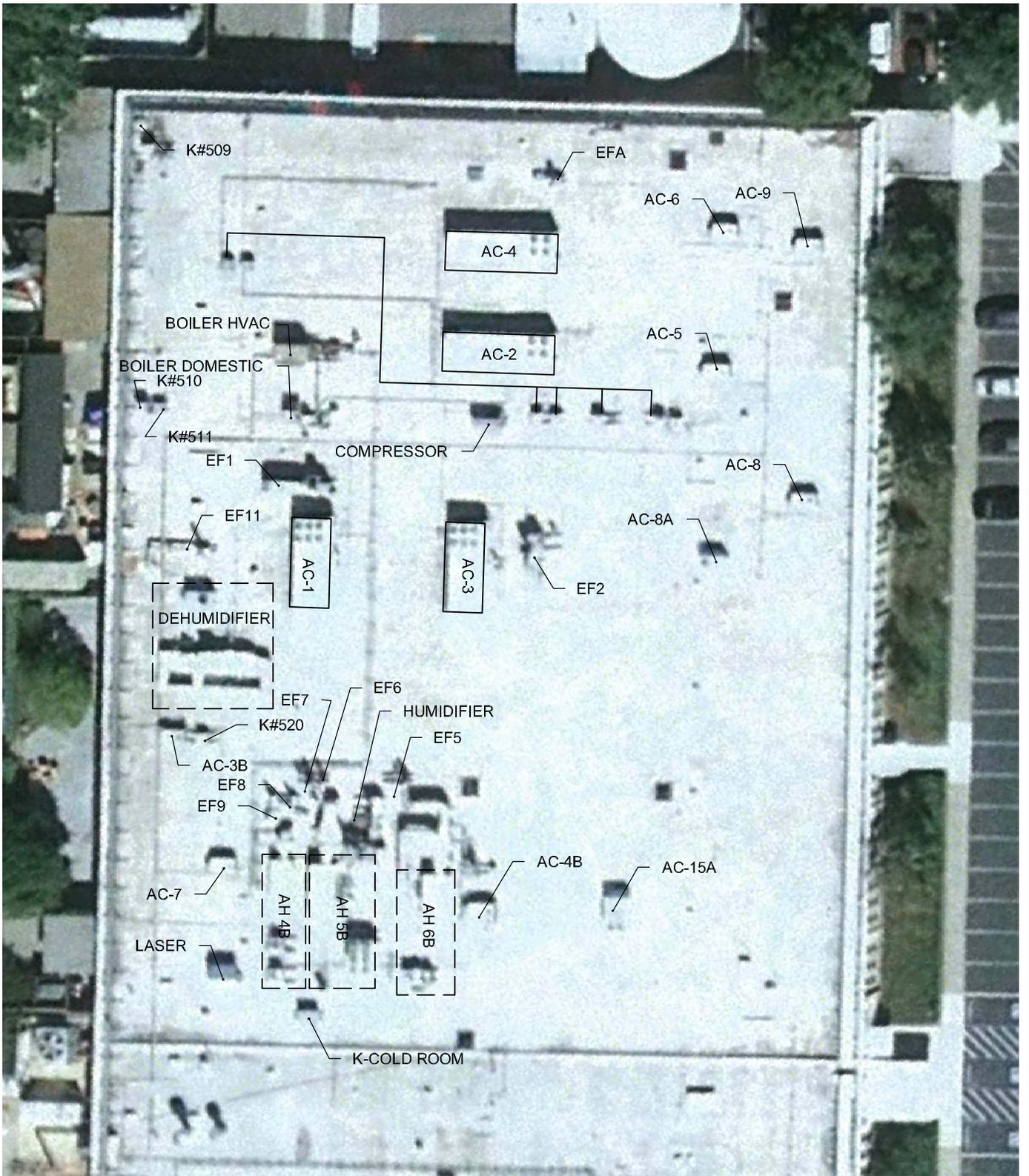
FORMER SPECTRA-PHYSICS LASERS,
FORMER TELEDYNE SEMICONDUCTOR

**SITE MAP AND PROPOSED SAMPLE
LOCATIONS**

FIGURE
2

DATE-DIV-ORIGINATOR
G:\ENVCAD\Emeryville\ACT\EM00172\0063\0006\Fig 2 Site Map 4-18-2011.cdr

CITY:(Ref) DIV:(Group) DB:(Ref) L:(Ref) PIC:(Ref) PM:(Ref) TM:(Ref) LVR:(Option) OFF=REF
 R:Design/001/0002/0002/ROOF PLANT.dwg LA:YOUT: 3 SAVED: 6/23/2011 1:23 PM ACADVER: 18.0US (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: ARCADIS-EMV.CTB PLOTTED: 6/23/2011 1:52 PM BY: BEARDSLEY, DANIEL
 XREFS: IMAGES: PROJECTNAME: --- SERVER-1\00688737849.jpg



FORMER SPECTRA-PHYSICS LASERS, FORMER TELEDYNE SEMICONDUCTOR	
HVAC SYSTEM LAYOUT	
	FIGURE 3



Attachment B

Secondary Source Identification
and Mitigation

Attachment B: Secondary Source Identification and Mitigation

Where additional evaluation and/or mitigation are deemed necessary based on the indoor air sampling plans described above, the following steps will be taken:

- Following confirmation of potential exposure scenarios, an additional detailed pathway and secondary source screening survey will be developed. A PID and/or a portable gas chromatograph/ mass spectrometer (GC/MS; “screening tools”) will be used to help distinguish between potential alternative sources of COCs and pathways contributing to indoor air concentrations. These screening tools are intended to be used for instantaneous estimates (grab samples) of indoor air concentrations and information collected during the screening assessment should not be directly compared to exposure screening criteria.
- If identified, potential alternative sources of indoor air concentrations will be removed, if feasible. The potential pathways identified either in the initial building walkthrough or the detailed pathway survey will be mitigated following one of the following building modifications (additional measures may be proposed in the future).
 - Improving seals for plumbing, fire riser, telecommunication, electrical, and/or data conduits.
 - Installing vapor-tight covers on interior sumps, if applicable.
 - Evaluating drains to ensure p-traps are functioning properly.
 - Sealing the perimeter of drains to limit potential migration of vapors from surrounding soils.
 - Installing one-way flow drain trap seals in all drains
 - Sealing cracks visually identified in concrete floor slabs and walls, and at joints between walls and floor slabs, if feasible.
 - Improving air circulation and/or balancing pressure differentials in spaces through implementation of minor building modifications
 - Painting vapor seal paint on walls or other surfaces.
- Following completion of mitigation procedures, an additional walkthrough may be conducted using screening tools to assess the effectiveness of the building modifications and detect remaining VOC sources contributing to indoor air concentrations, if present. If screening tool results indicate additional mitigation measures are warranted, additional work may be performed.