FOURTH FIVE-YEAR REVIEW REPORT FOR

TELEDYNE SEMICONDUCTOR/SPECTRA-PHYSICS, INC. SUPERFUND SITE

SANTA CLARA COUNTY, CALIFORNIA

PREPARED BY Army Corps of Engineers Seattle District

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Executive Summary

This is the fourth Five-Year Review of the Teledyne Semiconductor/ Spectra-Physics, Inc. Superfund Site (Site) located in Mountain View, Santa Clara County, California. The purpose of this Five-Year Review is to review information to determine if the remedy is protective of human health and the environment. The triggering action for this Five-Year Review (FYR) was the signing of the previous FYR on September 30, 2009.

The Teledyne Semiconductor (Teledyne) and Spectra-Physics Lasers, Inc. (Spectra-Physics) properties are located in Mountain View, Santa Clara County, California (collectively, the Properties). Although EPA listed them as part of two separate Superfund sites, the Properties are collectively referred to as the Teledyne/Spectra-Physics Site (or Site), which also includes a contaminated groundwater plume and down-gradient areas impacted by that plume. Contaminants of concern (COC) include trichloroethylene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), vinyl chloride and tetrachloroethene (PCE), which are at levels above cleanup standards. In 1991, EPA selected the following remedy for the Site to protect long-term human health and the environment:

- Soil vapor extraction and treatment (SVET) at Spectra-Physics.
- Groundwater extraction and treatment by air stripping with discharge to a nearby creek under an NPDES permit for the on-site groundwater extraction and treatment (GWET) system at the Teledyne site.
- Groundwater extraction and discharge to the sanitary sewer for the off-site Spring Street extraction system (SSES) and North Bayshore extraction system (NBES).

Currently operating are two groundwater extraction systems: the Spring Street extraction system and the North Bayshore extraction system. Both systems discharge to the local sanitary sewer treatment facility for treatment. There is also a full-scale enhanced reductive-dechlorination (ERD) study at the Teledyne site; associated with this is a soil vapor extraction system to mitigate the excess methane produced by the ERD operation. Also occurring on-site is a monitored natural attenuation (MNA) study. The results of the long-term MNA pilot study have successfully demonstrated that natural attenuation is a significant factor in reducing and maintaining plume size and volatile organic compound (VOC) concentrations in the North Bayshore Area. Trend analyses show that concentrations are generally decreasing. Cis-1,2-DCE is increasing at some locations due to anaerobic reductive dechlorination of TCE.

Study results have contributed significant new information that supports the decision to revise the current site remedy to improve remedial effectiveness and cleanup time frames. The monitoring results from the full-scale ERD treatability study have successfully demonstrated enhanced degradation of VOCs in shallow- and intermediate- groundwater zones. Significant decreases in VOC mass have already occurred since implementation of the full-scale ERD treatability study began. The results of

the long-term MNA study have successfully demonstrated that natural attenuation is a significant factor in reducing and maintaining plume size and VOC concentrations in the North Bayshore Area.

The groundwater cleanup levels and toxicity factors for some COCs have changed since the 1991 Record of Decision (ROD); however, the cleanup levels in the ROD for all COCs except chloroform are within the protective excess cancer risk range and are therefore considered protective. Groundwater results show concentrations of chloroform are also within the acceptable excess cancer risk range and are therefore protective. For non-cancer Regional Screening Levels (RSLs), EPA considers the respective MCL for each constituent as promulgated under the Safe Drinking Water Act to be protective for non-cancer effects. All the cleanup levels selected in the Site Cleanup Requirement (SCR) and the ROD are currently below their respective federal MCL, and therefore, are considered protective.

The land use has not changed since the last five year review. There are residential and light commercial buildings located in the vapor intrusion study area, which currently consists of the Spring Street Study Area and the North Bayshore Study Area (south and north of Highway 101, respectively). Vapor intrusion evaluations of residential and commercial buildings are ongoing, and results confirm that vapor intrusion of VOCs from shallow groundwater into structures is occurring within the study area.

Thus far, TCE was detected at two residential locations above the long-term health-risk-based screening criteria (0.43 $\mu g/m^3$), one of which was above the Interim Indoor Short-Term Response Action Level (2 $\mu g/m^3$). Mitigation systems have been installed in those buildings that exceed the screening levels. Commercial air sampling results for breathing zones had detected concentrations of TCE. TCE was detected at breathing zone height in one off-property commercial building at concentrations of 3.4 $\mu g/m^3$ and 6.4 $\mu g/m^3$ in samples collected from an office and conference room, respectively (during a Heating, Ventilation, and Air Conditioning [HVAC] "on" sampling event) and at concentrations of 6.5 $\mu g/m^3$ and 14 $\mu g/m^3$ in samples collected inside a restroom and the same office referenced above, respectively (during an HVAC "off" sampling event). These results indicate that vapor intrusion has the potential to occur in commercial and residential buildings overlying the shallow groundwater TCE plume.

A protectiveness determination of the remedy at the Teledyne Semiconductor and Spectra-Physics, Inc. Joint Superfund Sites cannot be made at this time until further information is obtained. Additional vapor intrusion assessments must be conducted to determine if indoor air pathways are complete. When unacceptable levels are encountered in a particular building, mitigation plans are developed and implemented to ensure that levels of volatile organic compounds (VOCs) in indoor air are protective. It is expected that these actions will take approximately two years to complete, at which time a protectiveness determination can be made. To be protective in the long-run, a new remedy should be selected due to the declining effectiveness of the existing remedy.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Teledyne Semiconductor and Spectra-Physics, Inc.		
EPA ID: Teledyne Semiconductor: CAD009111444 and Spectra-Physics, Inc.: CAD009138488		
Region: 9	**State:** CA	**City/County:** Mountain View/ Santa Clara

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: State of California **If "Other Federal Agency" was selected above, enter Agency name:** Click here to enter text.
Author name (Federal or State Project Manager): Melanie Morash, EPA and Roger Papler, RWQCB
Author affiliation: EPA Region 9 and California Regional Water Quality Control Board
Review period: September 2013 – May 2014
Date of site inspection: October 2013
Type of review: Policy
Review number: 4
Triggering action date: September 30, 2009 Previous Five-Year Review Report
Due date *(five years after triggering action date)*: September 30, 2014

Issues/Recommendations				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s): N/A	**Issue Category: Remedy Performance** **Issue:** The performance of the selected remedy in the ROD, groundwater extraction and treatment, has declined and new remedial actions are being investigated. **Recommendation:** Complete ROD Amendment or prepare Explanation of Significant Differences selecting new remedial actions and include updated institutional controls			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	09/2018

OU(s): N/A	**Issue Category:** Changed Site Conditions **Issue:** The FYR vapor intrusion evaluation indicated that the subsurface-to-indoor air pathway is be a concern at the site. **Recommendation:** Continue to monitor and provide mitigation for vapor intrusion, including step-outs to lower concentration areas of the shallow TCE groundwater plume.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Yes	Yes	EPA	EPA	09/2016

Sitewide Protectiveness Statement (if applicable)	
Protectiveness Determination: Protectiveness Deferred	*Addendum Due Date (if applicable):* Click here to enter date.
Protectiveness Statement: A protectiveness determination of the remedy at the Teledyne Semiconductor and Spectra-Physics, Inc. Joint Superfund Sites cannot be made at this time until further information is obtained. Additional vapor intrusion assessments must be conducted to determine if indoor air pathways are complete. When unacceptable levels are encountered in a particular building, mitigation plans are developed and implemented to ensure that levels of volatile organic compounds (VOCs) in indoor air are protective. It is expected that these actions will take approximately two years to complete, at which time a protectiveness determination can be made. To be protective in the long-run, a new remedy should be selected due to the declining effectiveness of the existing remedy.	

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List of Abbreviations

ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
DCA	dichloroethane
DCB	dichlorobenzene
DCE	dichloroethene
DHS	Department of Health Services
DNAPL	dense non-aqueous phase liquid
EPA	Environmental Protection Agency
ERD	enhanced reductive dechlorination
FFS	focused feasibility study
FYR	Five-Year Review
GWET	groundwater extraction and treatment
IRIS	Integrated Risk Information System
IUR	inhalation unit risk
LEL	lower explosive limit
MCL	maximum contaminant level
MNA	monitored natural attenuation
NCP	National Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NBES	North Bayshore Extraction System
PCE	tetrachloroethene
PID	photoionization detector
ppm	parts per million
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
RAOs	Remedial Action Objectives
RfDi	reference dose inhalation
RfDo	reference dose oral
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
RWQCB	Regional Water Quality Control Board
SCR	Site Cleanup Requirements
Sfo	slope factor oral
SSES	Spring Street Extraction System
SVE	soil vapor extraction
SVET	soil vapor extraction and treatment
TCA	trichloroethane
TCB	trichlorobenzene
TCE	trichloroethene
USACE	U.S. Army Corps of Engineers
VC	vinyl chloride
VOC	volatile organic compound

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Fourth Five-Year Review Report

for

Teledyne Semiconductor and Spectra-Physics Inc.

1. Introduction

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. The methods, findings, and conclusions of FYRs are documented in five-year review reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 and the National Contingency Plan (NCP). CERCLA 121 states:

> "*If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*"

EPA interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

> "*If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such actions no less often than every five years after the initiation of the selected remedial action*."

EPA Region 9, California Regional Water Quality Control Board and the U.S. Army Corps of Engineers (USACE) conducted the FYR and prepared this report regarding the remedy implemented at the Teledyne/Spectra-Physics Superfund Site in Mountain View, Santa Clara, California. The State of California, represented by the California Regional Water Quality Control Board (RWQCB) is the lead agency for developing and implementing the remedy for the Site; EPA provides final regulatory concurrence.

This is the fourth FYR for the Teledyne/Spectra-Physics Site. The triggering action for this policy review is the previous FYR signed September 30, 2009. The FYR is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

2. Site Chronology

Table 1 lists the dates of important events for the Teledyne/Spectra-Physics Superfund Site.

Table 1. Chronology of Site Events

Event	Date
Teledyne and Spectra-Physics installed on-site sumps for acid neutralization and waste collection.	1962 - 1977
Teledyne used sumps for acid neutralization and waste collection.	Before 1980
Spectra-Physics used sumps for collecting rinse waters.	Before 1987
Teledyne started remediation investigations.	1982
Spectra-Physics started remedial investigations.	1984
Teledyne started interim remedial actions.	1986
The Teledyne Semiconductor Site was added to NPL	July 1987
Spectra-Physics started soil-vapor extraction and treatment.	1989
The off-site North Bayshore Extraction System (NBES) was started.	1990
Order 91-025 (Order) adopted by the Regional Water Quality Control Board (RWQCB) for both sites approved remedies that include soil-vapor extraction; groundwater extraction, treatment, and discharge to surface water under an National Pollutant Discharge Elimination System (NPDES) permit; and groundwater extraction and discharge to a sanitary sewer. The Order defines Final Site Cleanup Requirements.	February 1991
The Spectra-Physics Site was added to the NPL	February 1991
The Record of Decision (ROD) for the Teledyne/Spectra-Physics Site was issued.	March 1991
The first Five Year Review (FYR) was completed.	September 1999
Allegheny-TDY and Thermo Electron submit Ten-Year Review Report to RWQCB.	March 2001
The monitored natural attenuation (MNA) proposal for the Study Area was submitted.	September 2003
RWQCB approved the plan to study natural attenuation.	November 2003
The majority of the NBES and the Spring Street Extraction System (SSES) were turned off for MNA study except for wells E-8 and E-13 in the NBES.	2003
Soil-gas analyses and vapor intrusion studies reports were submitted.	2004
Allegheny-TDY and Thermo Electron submit three-year supplemental report to the Ten-Year Review.	June 2004
The second FYR was completed.	September 2004
The Work Plan for Pilot Study for Enhanced Reductive Dechlorination (ERD) at Teledyne site was submitted.	September 2005

Event	Date
RWQCB approved the groundwater ERD pilot study	October 2005
The interim MNA Study report and Final ERD Pilot Study Report were submitted.	February 2007
The SSES was restarted to capture high VOC concentrations resulting from ERD-desorbed VOCs from ERD pilot study.	2007
Data gap investigation was performed.	2007-2008
The third FYR was completed.	September 2009
The 2009 Draft Focused Feasibility study (FFS) was completed.	2009
Vapor Intrusion Investigations	2010-present
A covenant and environment restriction on the property was recorded by ECI Two Terra Bella LLC for the Teledyne property.	August 2010
The Soil Vapor Extraction (SVE) methane mitigation system was installed and started to remove methane that was present in the soil as a result of the ERD treatability study.	December 2011
A covenant and environment restriction on the property was recorded by New Community Baptist Church for the Spectra-Physics property.	September 2012
The Final FFS was completed; the remedial action involving source area ERD treatment, followed by MNA and distal plume MNA and additional measures to treat potential vapor intrusion was selected.	2013

3. Background

3.1. Physical Characteristics

The former Teledyne facility was located at 1300 Terra Bella Avenue and the Spectra-Physics facility was located at 1250 Middlefield Road, in Mountain View, California. Mountain View has a population of 65,000 and is located in the northwest portion of Silicon Valley in Santa Clara County and is part of the San Francisco Bay Metropolitan Region. Teledyne is presently located at 1274 Terra Bella Avenue and Spectra-Physics is presently located at 1277 Terra Bella Avenue. The Teledyne Semiconductor and Spectra-Physics Laser Superfund properties are located immediately south of Highway 101 (see Figure 1). Several other RWQCB Site Cleanup Program sites are located nearby, as shown on Figure 1, and in some cases operation of remedies at those sites has affected conditions at the Teledyne/Spectra-Physics Site. Many of these effects are discussed in this report (e.g., groundwater flow direction has been affected by multiple extraction systems in addition to those at the Teledyne/Spectra-Physics Site. The single area containing several Superfund sites has been the subject of several studies and the study area is also identified on Figure 1.

The groundwater plume originating from the two sites is managed as one commingled plume by the successors to Teledyne Semiconductor and Spectra-Physics. The commingled groundwater contaminant plume extends down-gradient, in a northerly direction toward the bay, for almost one mile. The plume passes under Highway 101, past Amphitheatre Parkway, to the former dewatering trench for the Mountain View Landfill.

The buildings at the source area on Terra Bella Avenue are still in use for light industrial activities. Most of the buildings formerly used by Spectra-Physics are still in use although at least one is vacant and another, on West Middlefield Road, was vacated by industrial/commercial occupants and is being used as a church.

Northwest of and adjacent to the former Teledyne property, the western lateral portion of the plume underlies the residences in the Spring Street area (see Figure 1).

Buildings above the plume in the down-gradient area, to the north of Highway 101, are almost exclusively commercial offices. This area is considered the North Bayshore area (see Figure 1). Residences used to exist in this area but, with city-zoned development, these gave way to relatively new office buildings occupied primarily by companies engaged in computer hardware and software development.

3.2. Geology/ Hydrology

The Teledyne/Spectra-Physics Site is situated in the northwestern portion of the Santa Clara Valley, California, which lies along the western edge of San Francisco Bay. The Santa Clara Valley is an alluvial plain that slopes gently northward, flanked by the Diablo Range to the east-northeast and the Santa Cruz Mountains to the west-southwest. The alluvium comprises a complex sequence of clay, silt, sand, and gravel. Within the Santa Clara Valley, two significant water-bearing zones have been identified as the Upper and Deep Aquifers.

The Upper Aquifer consists of approximately 70 feet of silty clay and clayey silt interbedded with sand and gravel. The Deep Aquifer exists at depths greater than 100 feet below ground surface (bgs) and is reported to extend to a depth of approximately 700 feet bgs. The Deep Aquifer is the primary source of water in the Santa Clara Valley. The Upper and Deep Aquifers are separated by a regional aquitard of low-permeability, fine-grained sediments approximately 50 to 150 feet thick.

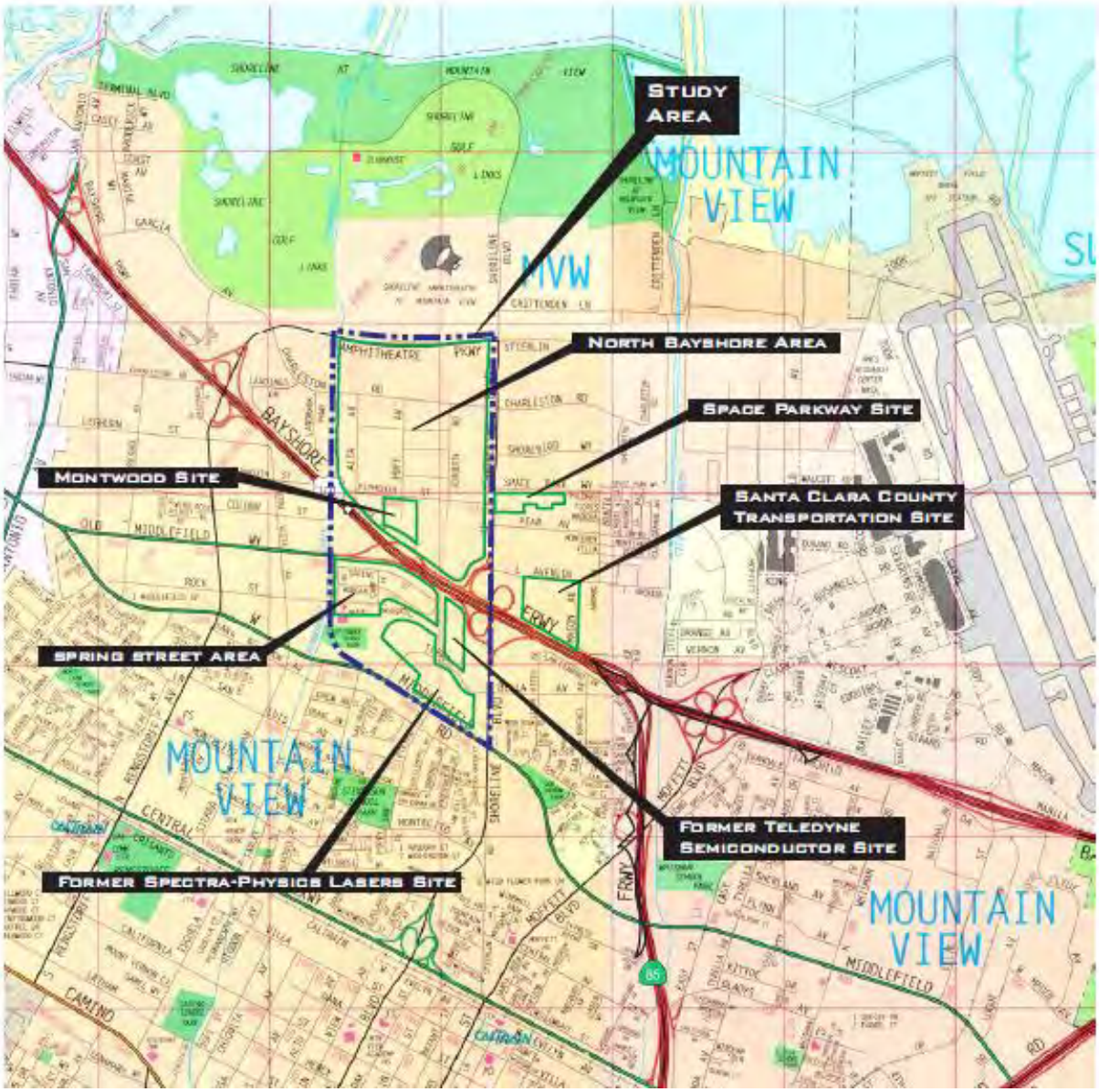

Figure 1. Location Map for the Teledyne/ Spectra-Physics Superfund Site and other nearby Superfund Sites

The Upper Aquifer is divided into three zones as follows:

- A shallow zone extending from approximately 20 to 35 feet bgs;
- An upper intermediate zone extending from approximately 35 to 50 feet bgs; and
- A lower intermediate zone extending from approximately 50 to 70 feet bgs.

The shallow, upper intermediate, and lower intermediate Zones consist of interconnected permeable lenses that are separated by mostly continuous aquitards of variable thickness. The estimated depth to shallowest groundwater beneath the Teledyne/Spectra-Physics Site, and the site vicinity, is approximately 5 to 10 feet bgs. Groundwater flow in the three zones is to the north. The groundwater

flow direction has been generally consistent since project inception and has been influenced by the operation of groundwater extraction systems at the Teledyne/Spectra-Physics Site and other nearby Superfund sites.

3.3. Land and Resource Use

Historical aerial photographs show that historical land use within the study area was agricultural, dating back to 1937 and possibly longer. The study area was developed as an industrial area during the period from 1961 to 1973. The industrial companies historically located in the vicinity of the study area were involved in a wide range of manufacturing activities. In addition to agricultural and commercial use, the study area included residential use.

The Spectra-Physics Site's most up-gradient building has been converted to a community church with other properties used by a variety of commercial tenants, and the Teledyne site is primarily used by commercial and laboratory businesses. The Spring Street area is mostly residential and the North Bayshore Area is mostly commercial land use with limited residential land use. The land use north of and down-gradient of the site includes a landfill for the City of Mountain View with an active golf course and an amphitheatre developed over the landfill.

The study area is located within jurisdiction of the Santa Clara Valley Water District where groundwater is a source of public water supply. Any domestic water supply wells previously present in the study area have been decommissioned. The entire study area has been developed and is supplied with City Water, and the installation of new domestic wells within the study area is restricted.

3.4. History of Contamination

Since 1962, Teledyne Semiconductor (Teledyne) owned and operated a semiconductor manufacturing facility and Spectra Physics, Inc. (Spectra-Physics) manufactured lasers and associated components starting in 1961.

Teledyne and Spectra-Physics installed on-site sumps for acid neutralization and waste collection during the years 1962-1977. Site investigations began at Teledyne in 1982 and at Spectra-Physics in 1984. Soil samples collected from both sites indicated that releases of volatile organic compounds (VOCs) had occurred and had impacted soil and groundwater at both sites. The Upper Aquifer in the Shallow and Intermediate zones at both sites had been impacted and only Spectra-Physics required soil remediation. The Deep Aquifer was not impacted by the contamination.

The plume is commingled with three other identified sources of VOCs within the down-gradient study area:

- Montwood site located at 1615 and 1625 Plymouth Street (see Figure 1)
- Perry/ Arrillaga site located at 1098 Alta Avenue (see Figure 2)
- Space Park Way site located at the Southeast corner of Space Park Way and N. Shoreline Boulevard (See Figure 1).

The Perry/Arrillaga and Montwood sites are regulated under separate RWQCB Orders and have localized groundwater extraction and treatment (GWET) systems. The Montwood site shut down its GWET system to conduct a temporary monitored natural attenuation (MNA) study and is currently implementing a full-scale enhanced reductive-dechlorination (ERD) pilot study.

Teledyne was added to the NPL in July 1987 and Spectra-Physics in February 1991.

3.5. Initial Response

Interim remedial actions included the removal of leaking underground sumps and tanks, excavation of contaminated soil, installation and operation of three groundwater extraction and treatment/discharge or discharge-only systems, operation of the City of Mountain View dewatering trench, and a soil vapor extraction system.

Teledyne removed a tank and excavated the surrounding contaminated soils in August 1982 and ceased using some of the sumps in 1987. Spectra-Physics removed four sumps suspected of leaking at its site. In 1987, the sumps were removed and 6 feet of soil surrounding the sumps was excavated to a depth of 2 feet below the bottom of the sumps.

Interim remedial actions began at Teledyne in October 1986 with the startup of an on-site GWET system to provide hydraulic control and remediation of the impacted groundwater. This system extracted groundwater from both the shallow zone (well RA-1) and intermediate zone (well T-32I) in the upper aquifer. The groundwater extracted from this system was treated by an air stripper and then discharged to Permanente Creek under a National Pollutant Discharge Elimination System (NPDES) permit.

Two GWETs were installed in separate off-property areas. Operation of the North Bayshore Extraction System (NBES) that consisted of 11 shallow-zone wells and six intermediate-zone wells was started in 1990. The water from this system was discharged into the sanitary sewer system under a City of Mountain View permit and treated in the publicly owned treatment plant. A second off-site system located on Spring Street (SSES), a residential area northwest of and adjacent to the Teledyne property, was started in 1991. This system consists of three shallow-zone and two intermediate-zone wells. Groundwater extracted from the SSES was discharged to the sanitary sewer, also under a City of Mountain View permit and treated in the publicly owned treatment plant.

To address the impacted soil on the Spectra-Physics property, soil vapor extraction and treatment (SVET) systems were installed in 1989 and in 1992. Both systems treated the extracted vapors with granular activated carbon.

Figure 2 shows the locations and timeline of the remedial actions from 1982 to present.

3.6. Basis for Taking Action

The primary contaminant(s) of concern (COCs) for the Site are chlorinated VOCs in soil and groundwater. Both the ROD and the Site Cleanup Requirements (SCR) identified the following nine indicator chemicals:

- 1,1-dichloroethane (1,1-DCA)
- 1,1-dichloroethene (1,1-DCE)
- 1,2-dichloroethene (1,2-DCE)
- tetrachloroethene (PCE)
- 1,2,4-trichlorobenzene (1,2,4-TCB)
- 1,1,1-trichloroethane (1,1,1-TCA)
- toluene
- trichloroethene (TCE)
- vinyl chloride (VC)

The ROD also includes these three additional chemicals:

- 1,2-dichlorobenzene (1,2- DCB)
- 1,1,2-trichloroethane (1,1,2-TCA)
- chloroform

The presence of these contaminants in soil and groundwater provided the basis for taking action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The release of hazardous substances into the environment at the Site posed, or potentially posed, a threat to human health and the environment via inhalation, ingestion, and direct contact. In particular, the threat of potential contamination to the deeper aquifer, which is a source of municipal drinking water, was a large concern.

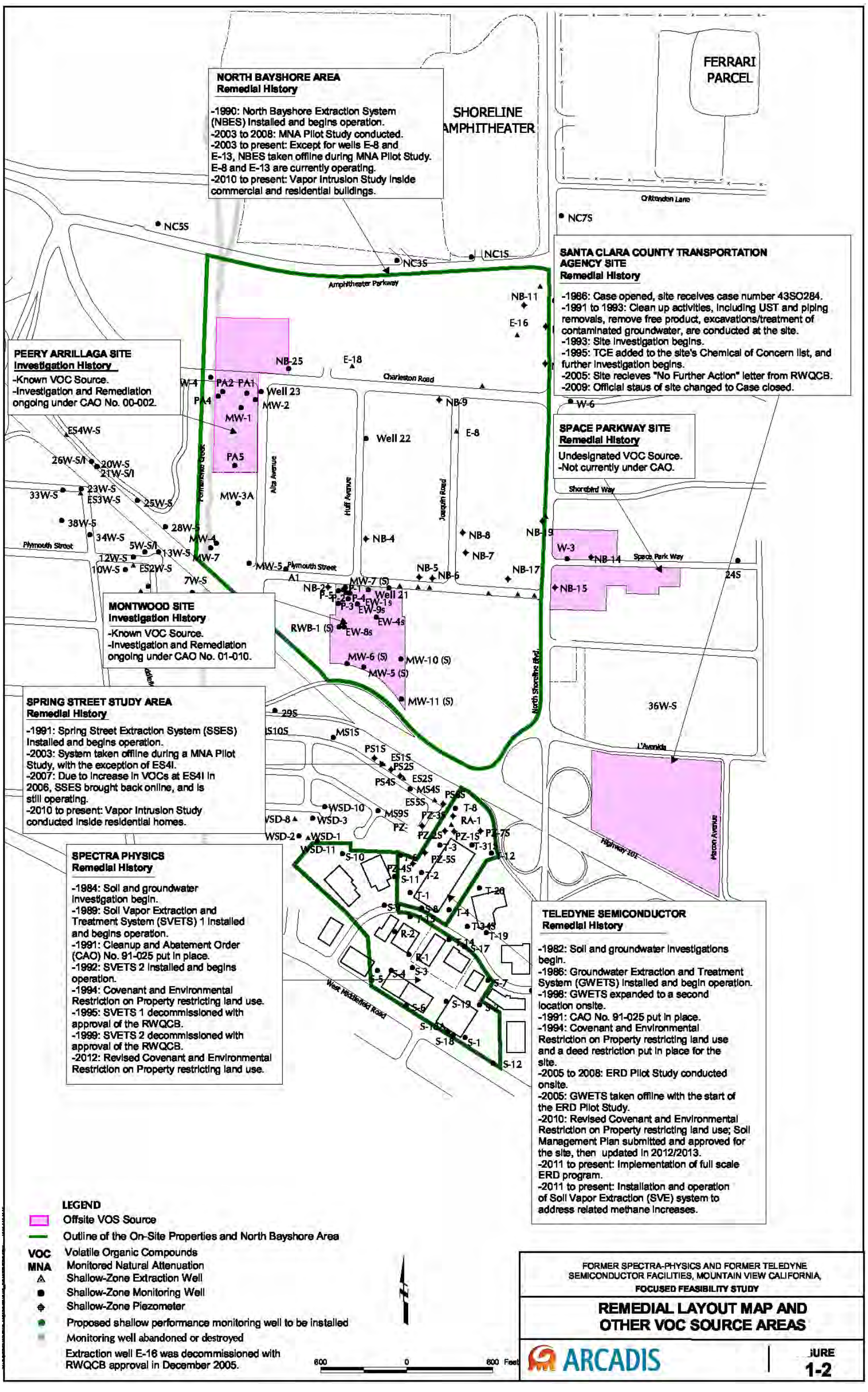

Figure 2. Remedial layout map and other VOC source areas.

4. Remedial Actions

4.1. Remedy Selection

A baseline public health evaluation was prepared along with a remedial investigation/feasibility study (RI/FS) for both sites. These documents form the basis of the remedial plan. The RWQCB adopted Final Site Cleanup Requirements (SCRs), Order No. 91-025 in February 1991 and the U.S. EPA adopted a Record of Decision (ROD) on March 22, 1991. The cleanup levels for groundwater in the ROD are different than those listed in the State Order.

The final site cleanup remedy selected in the ROD for the two sites combined consisted of the following elements:

- Soil vapor extraction and treatment at Spectra-Physics
- Groundwater extraction and treatment by air stripping with discharge under an NPDES permit for the on-site GWET system at Teledyne
- Groundwater extraction and discharge to the sanitary sewer for the off-site NBES and SSES

The objective of the selected remedy is to remove and permanently destroy the contaminants from both soils and groundwater or significantly reduce the toxicity, mobility, or volume of hazardous substances in both media. These response actions will greatly reduce the possibility of contamination of current and potential water supplies.

The ROD selected groundwater cleanup levels for twelve COCs. The Final SCRs Order No. 91-025 selected MCLs for groundwater cleanup levels for ten COCs. Table 2 compares the cleanup levels selected in the ROD with those selected in Order No. 91-025.

Table 2. Cleanup Levels Selected in the ROD and in Order No. 91-025

Chemical	ROD Cleanup Levels (ppb)	Source	Order No. 91-025 Cleanup Standard (ppb)	Source
1,1-DCA	5	State MCL	5	State MCL
1,2-DCB	600	Federal MCLG and MCL	Not listed	Not listed
1,1-DCE	6	State MCL	6	State MCL
Cis-1,2-DCE	6	State MCL	6	State MCL
Trans-1,2-DCE	Not listed	Not listed	10	State MCL
PCE	5	State and Federal MCL	5	State MCL
1,2,4-TCB	9	Federal MCLG and MCL	40	Calculated cleanup standard
1,1,1-TCA	200	Federal MCLG and MCL and State MCL	200	State MCL
1,1,2-TCA	3	Federal MCLG	Not listed	Not listed
TCE	5	State and Federal MCL	5	State MCL

Chemical	ROD Cleanup Levels (ppb)	Source	Order No. 91-025 Cleanup Standard (ppb)	Source
Toluene	100	State Drinking Water Action Level (DWAL)	100	State recommended Drinking Water Action level
VC	0.5	State MCL	0.5	State MCL
Chloroform	100	Federal MCL	Not listed	Not listed

4.2. Remedy Implementation

Prior to the SCR and ROD, interim remedial activities included an SVET system and removal of contaminated soil from the Spectra-Physics property, and installation and operation of two groundwater extraction and treatment (GWET) systems at the Teledyne property. There were and currently are groundwater extraction systems that discharged to the sanitary sewer system at the Spring Street and North Bayshore areas. By 1992, a second SVET system was installed at the Spectra-Physics site. In 1995 and 1998, the two SVET systems on the Spectra-Physics site were decommissioned with approval by RWQCB.

In November 2003, an MNA study was approved by RWQCB to be conducted near the North Bayshore area and all but two extraction wells (E-8 and E-13) from the NBES and all wells from the SSES were taken offline. Due to increased concentrations detected in one of the SSES wells, beginning in March 2006, the entire SSES was restarted in January 2007 and continues to operate. Although MNA continues in the off-property North Bayshore area, wells E-8 and E-13 and all SSES wells are continuing to operate. The MNA study concluded that MNA alone would not remediate the site to cleanup goals within a reasonable time frame at the Teledyne Site. Figure 2 shows the location of the extraction wells.

In October 2005, an ERD pilot study was approved by RWQCB and was implemented on the northern portion of the Teledyne Site. The GWET system at the on-property Teledyne site was taken offline for the pilot study and remains offline today. When the study was completed in January 2011, the RWQCB granted conditional approval to fully implement the ERD program. The Responsible Parties injected substances that enhance naturally occurring reduction of chlorinated compounds that have since destroyed VOC mass in place. In one location, the ERD program lowered groundwater-VOC levels from up to 80,000 micrograms per liter to below MCLs within one year. A vapor intrusion and soil vapor monitoring program were initiated just prior to the initial ERD injections to monitor conditions associated with the ERD injections.

4.3. Operation and Maintenance (O&M)

The on-property GWETS has been turned off since December 2005. The NBES wells, with the exception of wells E13 and E8, were turned off in December 2003 to conduct an MNA pilot study. Extraction wells E13 and E8 continued to operate through the period of this review. The totalizing

flow meter in well E8 was replaced in March 2011. The SSES wells have been operated through the period of this review. In June 2013, the pump was replaced in well ES5S. The extracted groundwater from both extraction systems is discharged to the sanitary sewer system under a City of Mountain View permit. Quarterly monitoring of the discharge to the sanitary sewer was completed and submitted to the City of Mountain View.

5. Progress Since Last Five-Year Review

5.1. Previous Five-Year Review Protectiveness Statement and Issues

The protectiveness statement from the 2009 FYR for the Teledyne Semiconductor/Spectra-Physics, Inc. Sites stated the following:

> *A protectiveness determination of the remedy at the Teledyne/Spectra-Physics Site cannot be made at this time until after a vapor intrusion assessment is completed at the Spring Street and North Bayshore Areas. There currently is limited information at these two locations to assess the potential for vapor intrusion. All other exposure pathways that could result in unacceptable risks are being controlled, and institutional controls are preventing exposure to, or the ingestion of, contaminated groundwater. In the Spring Street and North Bayshore areas, the vapor intrusion exposure pathway will be reevaluated in approximately one year following the planned vapor intrusion monitoring. In order to make a protectiveness determination, an addendum to the 2009 Five Year Review is required. The FYR addendum should be completed by September 30, 2011.*

The 2009 FYR included five issues and recommendations. Each recommendation and its current status are discussed in Table 3.

Table 2. Status of Recommendations from the 2009 FYR

Issues from previous FYR	Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Potential vapor intrusion concern in Spring Street Area	Perform vapor intrusion assessment in Spring Street Area	PRPs	2010	Residential and commercial indoor air sampling	2010
Potential vadose zone source under former Teledyne building	Perform additional data gap investigation to evaluate potential vadose zone source under former Teledyne building	PRPs	2010	This area was further characterized as part of the full-scale ERD study	2011
Declining effectiveness of GWET over time	Further evaluate remedial technology of ERD and MNA	PRPs	2010	A full-scale ERD study was implemented	2011
Remedy Change	A ROD Amendment will be needed to reflect a change in remedy and potential new RAO for vapor intrusion	RWQCB	2011	No ROD amendment has been issued	NA
Existing covenant was recorded prior to adoption of California Civil Code section 1471	Pursuant to a decision to adopt ICs, record new restrictive covenants consistent with current California law	PRPs	2010	New covenants were recorded for the Teledyne and Spectra-Physics properties	2010 & 2012

Note: PRP - Potentially Responsible Party

5.2. Work Completed at the Site During this Five Year Review Period

5.2.1. Full-Scale Enhanced Reductive Dechlorination Study

A full-scale enhanced reductive-dechlorination (ERD) study was implemented in January 2011 for the former Teledyne Semiconductor facility. The objective of the full-scale ERD treatability study was to develop strongly reducing conditions that persist for an extended period of time to facilitate dehalogenation of TCE and the associated breakdown products cis-1,2-DCE and vinyl chloride. The degradation process is carried out by anaerobic bacteria, and a by-product of the process is the generation of methane. The goal of the study was to demonstrate that ERD is successfully treating groundwater containing VOCs and to support a change in remedy specified in the ROD from groundwater extraction and treatment to ERD and MNA. Figure 3 is a conceptual model of anaerobic reductive dechlorination of TCE

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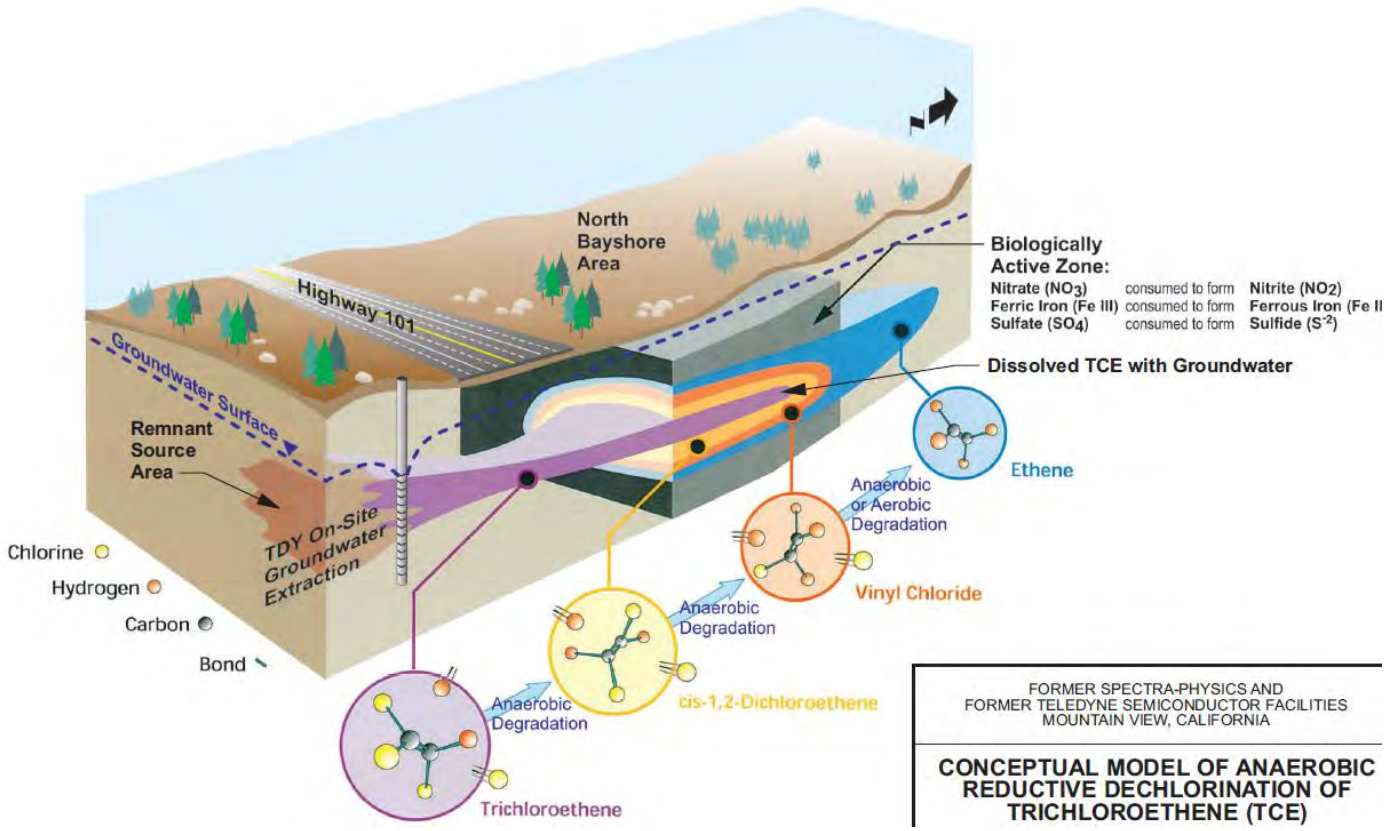

Figure 3. Conceptual Model of Anaerobic Reductive Dechlorination of TCE

One hundred fifty-five injection wells were installed in 2010 and 2011. Injections began in May 2011. Groundwater performance monitoring has been conducted on a quarterly or semiannual basis since implementation of the treatability study. The results indicate that significant reductions in VOC levels have been achieved within the study area. Significant reductions in TCE with accompanying increases in daughter product concentrations (cis-1,2-DCE and vinyl chloride) have been observed in monitoring wells in the treatment area.

The full-scale ERD study implementation has successfully achieved strongly reducing conditions for chlorinated compounds and has resulted in elevated methane concentrations detected in groundwater and soil. Thirteen soil-vapor probes were installed across the ERD treatment area to monitor VOC and methane concentrations in the soil gas. Seven additional soil-vapor probes were installed in the Spring Street Area to monitor potential effects of the ERD treatability study on soil gas down-gradient from the Teledyne site. Additional soil-gas sampling began in May 2011 concurrent with the beginning of the full-scale ERD study. The program includes monthly soil-gas monitoring and on-site building surveys. In addition, several indoor air sampling events have been conducted to evaluate air quality in areas with elevated concentrations of VOCs and/or methane in soil gas. Elevated

concentrations of methane in soil gas have resulted in supplemental remedial actions, including installation of a property-boundary SVE system in December 2011, and development and implementation of a vapor intrusion mitigation plan. Operation of the SVE system has effectively reduced concentrations of VOCs and methane in soil gas along the property boundary. The system was expanded in April 2013 to reduce concentrations of VOCs and methane in soil gas under a portion of the on-site building.

5.2.2. Focused Feasibility Study

The prior Focused Feasibility Study (FFS) report was submitted in June 2009 and the RWQCB approved the Data Gap Investigation portion of the FFS. The final FFS report presented the results of the full-scale ERD work plan in April 2013. The FFS also summarized and evaluated results of site investigations and remedial actions completed to date, summarized significant new information affecting the remedy, proposed new remedial action objectives (RAOs), and presented and evaluated remedial action alternatives to support a change to the existing remedial action.

The focused feasibility study concluded:

- The monitoring results from the ERD pilot study and full-scale ERD treatability study have successfully demonstrated enhanced degradation of VOCs in shallow and intermediate groundwater zones.
- Significant decreases in VOC mass have already occurred since implementation of the full-scale ERD treatability study began.
- The results of the long-term MNA pilot study have successfully demonstrated that natural attenuation appears to be a significant factor in reducing and maintaining plume size and VOC concentrations in the North Bayshore Area.
- The on-site and off-site vapor intrusion study indicates that vapor intrusion of VOCs from shallow groundwater into structures is occurring within the study area. Though potential building mitigation approaches could help improve indoor air quality, expedited groundwater cleanup is ultimately the most effective remedy for preventing vapor intrusion from occurring.

5.2.3. Vapor Intrusion Study

An on-site and off-site vapor intrusion study began in 2010 to evaluate whether VOCs in shallow groundwater are potentially impacting quality of indoor air, outdoor air, or crawl-space air outside or within residences and business overlying the shallow-zone TCE groundwater plume within the study area. The study is currently in progress, but confirms a complete pathway from subsurface VOC contamination to indoor air. Mitigation activities are required for certain commercial and residential buildings.

6. Five-Year Review Process

6.1. Administrative Components

EPA Region 9 initiated the FYR in August 2013 and scheduled its completion for September 2014. The review team was led by Melanie Morash of EPA, Remedial Project Manager (RPM), and Roger Papler of RWQCB, State Project Manager, for the Teledyne Semiconductor and Spectra-Physics, Inc. Joint Superfund Sites, and Karah Haskins (physical scientist), Amy Ebnet (geologist), and Marlowe Laubach (chemical engineer), all with the Seattle District USACE. In August 2013, EPA held a scoping call with the review team to discuss the Site and items of interest as they related to the protectiveness of the remedy currently in place.

6.2. Community Involvement

On April 10, 2014, a public notice was published in the *Mountain View Voice* announcing the commencement of the Five-Year Review process for the Teledyne Semiconductor and Spectra-Physics, Inc. Joint Superfund Sites, providing EPA's and the State's contact information, and inviting community participation. The press notice is available in Appendix B. No one contacted EPA as a result of this advertisement.

6.3. Document Review

This FYR included a review of relevant, site-related documents including the ROD, remedial action reports, and recent monitoring data. A complete list of the documents reviewed can be found in Appendix A.

<u>ARARs Review</u>

Chemical-specific ARARs identified in the selected remedy are listed in Table 4. For 4 of the 12 COCs, the cleanup level was set at the state Maximum Contaminant Level (MCL). The cleanup standards for 1,2-DCB, 1,2,4-TCB, and chloroform did not have State MCLs at the time of the ROD; therefore, the federal MCL was selected. Also, the federal cleanup standard for 1,1,2-TCA was more stringent than the state MCL; therefore, the federal MCL was selected.

Since the ROD was issued in 1991 the following MCLs have changed:

- the state has adopted a cleanup level for 1,2-DCB equal to the federal MCL
- the state MCL decreased for 1,1,2-TCA and is now equal to the federal MCL
- the federal MCL is now less stringent for 1,2,4-TCB and there is now a state MCL more stringent than both the old and revised federal MCL
- the state MCL for 1,1,2-TCA is now less stringent than in the ROD and equal to the federal MCL

- the state MCL for toluene is now less stringent than it was in the ROD, but still more stringent than the federal MCL
- the federal MCLG for chloroform is now more stringent

Table 3. Summary of Groundwater ARAR Changes

			MCLs at Time of ROD, 1991			MCL Under Current Regulations		
Chemical	**1991 ROD Cleanup Level (µg/L)**	**Source**	**Calif. MCL (µg/L)**	**US EPA MCLG (µg/L)**	**US EPA MCL (µg/L)**	**State (µg/L)**	**Federal (µg/L)**	**Notes**
1,1-DCA	5	State MCL	5	NA	NA	5	NA	No Changes
1,2-DCB	600	Federal MCLG and MCL	NA	600	600	600	600	State has adopted federal MCL
1,1-DCE	6	State MCL	6	7	7	6	7	No Changes
1,2-DCE	6	State MCL	6	70	70	6	70	No Changes
PCE	5	State and Federal MCL	5	0	5	5	5	No Changes
1,2,4-TCB	9	Federal MCLG and MCL	NA	9	9	5	70	Federal MCL is less stringent than ROD
1,1,1-TCA	200	Federal MCLG and MCL and State MCL	200	200	200	200	200	No Changes
1,1,2-TCA	3	Federal MCLG	32	3	5	5	5	State is now equal to federal
TCE	5	State and Federal MCL	5	0	5	5	5	No Changes
Toluene	100	State Drinking Water Action Level (DWAL)	100	1000	1000	150	1000	Changed in 1994; State MCL is less stringent than ROD.
VC	0.5	State MCL	0.5	0	2	0.5	2	No Changes
Chloroform	100	Federal MCL	NA	NA	100	NA	70	EPA MCL is more stringent than it was in 1991 ROD

Federal and State laws and regulations other than the chemical-specific ARARs that have been promulgated or changed over the past five years are described in Table 4. ARARs identified in 1991 ROD that are no longer pertinent due to the phase the remedy is in are not included in the table. There have been no significant changes to any of the ARARs since the ROD was issued in 1991.

Table 4. Applicable or Relevant and Appropriate Requirements Evaluation

Requirement	Citation	Description	Effect on Protectiveness	Amendment Date
Federal Drinking Water Standard	Section 1412 of the Safe Drinking Water Act, 42 U.S.C. Section 300a-l	Maximum Contaminant Levels Goals (MCLG) that are set at levels above zero shall be attained by remedial actions for ground or surface water that are current or potential sources of drinking water when the MCLGs are relevant and appropriate under the circumstances of the release based on the factors in 300.400(g)(2)	No changes have occurred that affect protectiveness	N/A
California Drinking Water Standard	Calif. Dept. of Health Services (DHS) Drinking Water Action Levels (DWALS)	Health based concentration limits set by the DHS to limit public exposure to substances not yet regulated by promulgated standards. The DWAL for toluene is 100 ppb	No changes have occurred that affect protectiveness	N/A
	Resolution 68-1, California	Affects remedial standards. The policy requires maintenance of existing water quality unless it is demonstrated that a change will benefit the people of the State, will unreasonably affect present or potential uses, and will not result in water quality less than prescribed by other State policies	No changes have occurred that affect protectiveness	N/A
City Clean Water Standard	City of Mtn. View Industrial Waste Ordinance and the Federal Clean Water Act Pretreatment Standards (40 CFR 403.5)	For discharges of groundwater to the local sanitary sewer system. The Clean Water Act allows municipalities to determine the pretreatment standards for discharges to Publicly Owned Treatment Works within its jurisdiction	No changes have occurred that affect protectiveness	Updated in 70FR60192 on October 14, 2005

Requirement	Citation	Description	Effect on Protectiveness	Amendment Date
Directive 9355.0-28	EPA Office of Solid Waste and Emergency Response (OSWER) Directive 9355.0-28	"Control of Air Emissions from Superfund Groundwater Air Strippers at Superfund Groundwater Sites" applies to remedial decisions at Superfund sites in ozone non-attainment areas. This directive requires such sites to control volatile organic compound emissions from air strippers and soil vapor extractors to 15 pounds per day per facility.	No changes have occurred that affect protectiveness	N/A
State Air Quality Standard	Bay Area Air Quality Management District (BAAQMD) Regulation 8. Rule 47	"Air Stripping and Soil Vapor Extraction Operations" which applies to new and modified operations. Individual air stripping and soil vapor extraction operations emitting benzene, vinyl chloride, perchloroethylene, methylene chloride, and/or trichloroethylene are required to control emissions by at least 90 percent by weight. Operations emitting less than 1 pound per day of these compounds are exempt from this requirement if they pass a District risk screening evaluation. Individual air stripping and soil vapor extraction operations emitting greater than 15 pounds per day of organic compounds other than those listed above are required to control emissions by at least 90 percent by weight. Regulation 8, Rule 47 is an ARAR for the implementation of the remedy in the Study Area.	No changes have occurred that affect protectiveness	N/A
RCRA Land Disposal Restrictions	Resource Conservation Recovery Act (RCRA) Land Disposal Restrictions	Adsorbents and other materials used for remediation of VOCs, such as activated carbon, chemical-adsorbing resins, or other materials used in the treatment of groundwater or air will contain the chemicals after use. RCRA land disposal restrictions are not applicable but are relevant and appropriate to disposal of treatment media due to the presence of constituents which are sufficiently similar to RCRA wastes.	No changes have occurred that affect protectiveness	N/A

Human Health Risk Assessment Review

A human health risk assessment was completed for the Site as part of the 1991 ROD. The risk assessment identified the exposure pathways at Teledyne Semiconductor/Spectra-Physics, Inc. Sites as domestic use of groundwater including ingestion, inhalation, and dermal exposure, inhalation of ambient air near manholes along the sanitary sewer, and possible inhalation of indoor residential air. In addition, a human health risk assessment screening evaluation was performed for the FFS.

The risk assessment identified the exposure pathways and associated risks shown in Table 5.

Table 5. Summary of Site Risks Identified in 1991 ROD

Exposure Scenario & Pathway	Risk Driver(s)	Current/Future	Maximum Excess Cancer Risk Estimate	Maximum Excess Non Cancer Risk Estimate
Inhalation of ambient air near sanitary sewer (TCE)	Utility workers	Current	1.1E-6	-
	Residents	Current	6.9E-7	-
Groundwater ingestion, dermal contact, and inhalation (showering) (all VOCs)	Residents	Current	2.0E-5	0.18
		Future (shallow groundwater zone)	1.1E-2	16.97
		Future (intermediate groundwater zone)	4.3E-4	7.72
Inhalation of indoor residential air (TCE and 1,1,1-TCA)	Residents	Current	1.9E-5	0.18

Additionally, the 2011 TCE Toxicological Review assessment concluded that TCE exposure poses potential human health hazards for non-cancer toxicity to multiple organs and to the developing fetus, including fetal cardiac malformations. This and other findings of the TCE assessment indicate that women in the first trimester of pregnancy are one of the most sensitive populations to TCE inhalation exposure. On July 9, 2014, EPA Region 9's toxicologists recommended developing a site-specific operational framework to take into account this near-term risk.

The ROD did not identify any soil exposure pathways. This assumption remains valid. The human health risk assessment screen in the final FFS concluded that direct soil contact does not exist because the Sites are completely covered with buildings, landscaping, and a parking lot. Additionally, the restrictive covenants on the properties restrict excavation work on the properties, unless expressly permitted in writing by the RWQCB.

Vapor Intrusion: EPA's understanding of contaminant migration from soil gas and/or groundwater into buildings has evolved over the past few years leading to the conclusion that vapor intrusion may have a greater potential for posing risk to human health than assumed when the ROD was prepared. In April 2013, EPA released an external review draft version of its vapor intrusion guidance titled "*OSWER Final GUIDANCE for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface sources to Indoor Air*" (EPA 2013).

The potential for vapor intrusion is evaluated following a "multiple lines of evidence" approach. The primary COCs at the Site as identified in the ROD are 1,1-dichloroethane (1,1-DCA), 1,2-dichlorobenzene (1,2-DCB), 1,1-dichloroethene (1,1-DCE), tetrachloroethene (PCE), 1,2,4-trichlorobenzene (1,2,4-TCB), 1,1,1-trichloroethane (1,1,1-TCA), 1,1,2-trichloroethane (1,1,2-TCA), trichloroethene (TCE), toluene, and vinyl chloride. VOC concentrations are limited to the shallow and intermediate zones. A vapor intrusion evaluation began in September 2010 and is being conducted in the Off-Property Study Area (currently consisting of the Spring Street Area and North Bayshore Area) and at 1250 West Middlefield Road (the former Spectra-Physics Lasers facility). A total of 32 residential buildings and 17 commercial buildings were initially identified as candidates for sampling, as these buildings overlie areas of highest VOC concentration in groundwater[1] or are otherwise source properties for the original releases. A vapor intrusion evaluation at one of the 17 commercial buildings – the building located at 1300 Terra Bella Avenue (the former Teledyne Semiconductor facility) – has been postponed, however, until the ERD treatments currently underway at that location have been completed. Meanwhile, an SVE & methane mitigation system is in operation at the former Teledyne Semiconductor facility

In 2010, sampling was conducted at 14 of the residential properties with a 15th residence sampled in 2013. In 2014, another round of sampling was conducted at 14 residential properties, prompted by the following developments: 1) a decrease in the long-term screening level for TCE from 1.2 $\mu g/m^3$ to 0.43 $\mu g/m^3$ based on the 2011 TCE Risk Assessment; (2) the identification of a short-term non-cancer effects screening level for TCE of 2 μ/m^3, also based on the 2011 TCE Risk Assessment; and (3) an evolved understanding of the higher potential for vapor intrusion during colder weather in residential-type, passively ventilated buildings.

Regarding commercial buildings, eleven were sampled between 2011 and 2013. Samples were collected from indoor air, potential preferential pathway locations and outdoor air, and analyzed using a low level TO-15 Selective Ion Method (SIM) for COCs.

For each residential and commercial property where access was granted a building walkthrough and pre-sampling inspection was completed to identify conditions that might affect the air quality sampling. In commercial buildings, potential preferential pathways, including utility conduits and other penetrations in the building slabs were evaluated via visual inspection and low-concentration photoionization detector (PID) readings. The results from the residential and commercial indoor air sampling are discussed in section 6.4 Data Review.

Toxicity values: EPA's Integrated Risk Information System (IRIS) has a program to update toxicity values used by EPA in risk assessment when newer scientific information becomes available. In the past five years there have been a number of changes to the toxicity values for certain COCs at the Site as well as changes in risk assessment procedures that account for changes in the screening levels presented. Toxicity values were not listed in the ROD and the Baseline Public Health Evaluation for these sites was not available at the time of this five-year review.

[1] A screening-level cut-off of 100 µg/L TCE in shallow-zone groundwater was used to identify commercial building candidates for the initial study, and a screening level of 50 µg/L TCE was used to identify residential buildings.

However, the cumulative impact of toxicity value revisions can be inferred by comparing the May 2014 EPA tap water multi-pathway RSLs with ROD cleanup levels for all COCs

Table 6. Comparison of ROD Cleanup Levels with RSLs

Contaminant of Concern	Cleanup Level (µg/L)	Tap water multipathway Cancer RSL (µg/L)	Tap water multipathway non-cancer RSL (µg/L)	RSL < ROD Cleanup Level?
1,1-DCA	5	**2.7**	3800	Yes
1,2-DCB	600	NA	**300**	Yes
1,1-DCE	6	NA	280	No
Cis-1,2-DCE[1]	6	NA	36	No
Trans-1,2-DCE	10	NA	360	No
PCE	5	**0.07***	41	Yes
1,2,4-TCB	9	**1.1**	**4.0**	Yes
1,1,1-TCA	200	NA	8000	No
1,1,2-TCA	3	**0.28**	**0.41**	Yes
TCE	5	**0.49**	**2.8**	Yes
Toluene	100	NA	1100	No
Vinyl chloride	0.5	**0.019**	44	Yes
Chloroform	100	**0.22**	**97**	Yes

Notes: Bolded values are less than the ROD cleanup level.
*Using California OEHHA toxicity values http://www.oehha.ca.gov/tcdb/index.asp

As shown in Table 6, cancer and/or non-cancer RSLs are now below the ROD cleanup levels for several COCs: 1,1-DCA, PCE 1,2-DCB, TCE, 1,2,4-TCB, 1,1,2-TCA, vinyl chloride, and chloroform.

EPA uses an excess cancer risk range between 10^{-4} and 10^{-6} for managing risk; if the excess cancer risk is below or within this range the standard may still be considered protective. The RSLs presented in Table 6 represent the concentration at which cancer risk is 10^{-6}. Seven of the COCs cleanup levels are above their respective cancer RSLs; however, six of those COCs cleanup levels are still within EPA's protective excess cancer risk range of 10^{-4} to 10^{-6}. The cleanup level of 100 µg/L for chloroform is still above the upper bound of EPA's protective excess cancer risk range of 0.19 – 19 µg/L, indicating that the cleanup level for chloroform may not be protective. The largest detected concentration of chloroform since 2009 was 1.4 µg/L in extraction well E8 on May 17, 2011. This concentration is within EPA's protective excess cancer risk range.

Five COCs (1,2-DCB, 1,2,4-TCB, 1,1,2-TCA, TCE, and chloroform) have cleanup levels that now exceed the non-cancer RSL. Any concentration below the non-cancer RSL indicates that no adverse health effect from exposure is expected. Concentrations significantly above the non-cancer RSL may indicate an increased potential of non-cancer effects. Although the clean-up level set for these five COCs are above the non-cancer RSL, EPA considers the respective MCL for each constituent as promulgated under the Safe Drinking Water Act to be protective for non-cancer effects. All the cleanup levels selected in the SCR and ROD are currently below their respective federal MCL, and therefore, are considered protective.

In addition, for three of the five COCs with new non-cancer RSL changes are detected at levels well below their respective non-cancer RSL. The largest detected concentration found for 1,2-DCB was 150 µg/L, which is significantly below the cleanup level and RSL. Since 2009, the largest detected concentration of chloroform in the offsite wells was 1.4 µg/L, which is also significantly below the cleanup level and RSL.

Ecological Review

An ecological risk assessment was not conducted at the time of the ROD. The ROD does list two endangered species that are reported to use South San Francisco Bay. The California clapper rail and the salt marsh harvest mouse exist in the tidal marshes of the bay and its shore. The endangered California brown pelican is occasionally seen in the Bay area, but is not known to nest in the South Bay. According to the ROD, the site did not constitute critical habitat for endangered species nor did it include or impact any wetlands. The statement above is still valid for the Site.

Much of the Site consists of industrial buildings and some residences. Wildlife usage would be those species typically found in an urban environment (primarily birds since most of the Site is covered by buildings or asphalt.) It is believed that no exposure pathways exist for sensitive ecological receptors under current conditions. There have been no changes to Site usage since the ROD or last FYR that may change the ecological assessment. In summary, the Site is of low wildlife value, the Site does not pose risks to ecological resources, and the remedy is protective of the environmental constituents present.

6.4. Data Review

6.4.1. Soil

Soil samples were collected from the ERD treatment area between March and December 2011. The ERD treatment area is defined as the Teledyne site within the geographic area defined by the contour indicating isoconcentration of 500 µg/L total VOC. Figure 4 shows the target treatment areas. PID readings collected at each injection-well borehole were overlaid on a map to demonstrate their spatial distribution. Two areas of significantly elevated PID readings were identified suggesting the presence of significant TCE mass in saturated soil. The first area was located beneath the northern portion of the ERD treatment area. This area was previously identified during the 2007-2008 data gap investigation. The second area of significantly elevated PID readings was located beneath the southern portion of the ERD treatment area. Based on the readings the greatest amount of impact was associated with the upper-intermediate groundwater zone.

The soil data collected in March-December 2011 verified that TCE is the primary COC within the ERD treatment area (Table 6-6, Arcadis 2013a). For the other constituents analyzed, over 60 percent of the results were non-detects. These data points were to be used as a baseline for the ERD treatment.

The SCR orders adopted by RWQCB in 1991 have soil cleanup standards listed at 2.5 ppm total VOCs for soil at depths of 0 to 10 feet bgs and 0.5 ppm total VOCs at depths of 10 to 14 feet bgs. Soil data was collected between March 2011 and December 2011. Soil data was collected at depths ranging from 0 to

70 feet bgs. Total VOC concentrations were generally highest in the upper-intermediate zone in the southern area portion of the ERD treatment area and the lower-intermediate zone in the northern portion of the treatment area.

6.4.2. Groundwater

Groundwater monitoring is performed semiannually. All available groundwater monitoring data associated with the Site, with an emphasis on data collected since June 2009, were reviewed and evaluated as part of this review.

The site is broken into five on- and off-property areas as follows:

On-Property: Teledyne and Spectra-Physics

Off-Property: Spring Street, off-property and North Bayshore

The site encompasses hundreds of wells in the shallow and intermediate zones, including monitoring and extraction wells and piezometers (Figure 2-1a, 2-1b, and 2-1c, Arcadis 2013a). Table 7 shows the wells that have monitoring data collected during the last five years and the wells that have exceedances of one or more COCs. The off-property area of the Off-Property portion of the site is outside both Spring Street and North Bayshore areas.

Table 7 Wells sampled since last five year review

Spectra-Physics On-Property	Off-Property Monitoring Wells	Spring Street Monitoring and Extraction Wells	North Bayshore Extraction Wells	Teledyne On-Property Wells
S-3	**W-1**	MS-2I	**E1**	**T-4**
S-9	**W-2**	**MS-9S**	**E2**	**T-6**
S-12	W-2A	**MS-10S**	**E3**	**T-11**
S-15	**W-3**	**PS4S**	**E4**	T-13
S-16	W-4	**PS6S**	**E5**	T-20
S-18	W-4A	**ES1**	**E6**	**PZ-2**
	W-6	**ES2**	**E7**	**PZ-5**
	W-6A	**ES3I**	**E8**	**PZI-1**
	W-21	**ES4I**	**E9**	
	Well 23	**ES5S**	**E10**	
	W-24S		**E11**	
	W-24I		**E12**	
	W-27I		**E13**	
	W-28S		**E14**	
	W-28I		**E15**	
	W-30S		**E18**	
	W-30I		**E19**	
			NB-25	
			NB-26I	
	NC1S			
	NC2I			
	NC7S			

Notes: Bolded values are wells that had an exceedance of one or more COCs.

The primary constituents remaining in the study area at levels above MCLs are TCE, cis-1,2-DCE, PCE and VC. Data collected from 2009 through 2013 was evaluated to determine the cleanup progress near the study area. Cis-1,2-DCE and VC are degradation products of TCE. This degradation process is enhanced with injections in the ERD treatment process.

TCE concentration plume maps from November 2009 (Figure 5 and Figure 6, LFR 2010) and the fourth quarter of 2012 (Figure 2-5a and Figure 2-5b, Arcadis 2013a) show that the outer boundary of the contaminated plume has generally not changed in size or location over the four year period. However, certain wells show significant decreases in levels, which may be attributed to the ERD treatment activities and the on-property 0.1 and 0.01 ug/L isoconcentration lines have shrunk substantially within the source Teledyne property . The 2012 plume defines the areas with concentrations of TCE within the 0.1mg/L to 0.01 mg/L range better than the 2009 plume because there are more data points available for analysis.

TCE concentrations above the MCL are still present under most of the off-property North Bayshore and Spring Street areas, extending east to North Shoreline Boulevard and north into the North Bayshore area. Only a small portion of the plume in the upper intermediate zone underlying the Spectra-Physics site has TCE concentrations above the MCL. The intermediate-zone plume does not underlie as much of the Spring Street area as the shallow-zone plume. The TCE plume in the intermediate zone also extends east to the Space Parkway area and north to the North Bayshore area.The C Zone is the designated drinking water source. At the source properties, groundwater-VOC levels in the two C-Zone wells C-1 and C-2 have not been detected. In 2005, the two on-property C-Zone wells were destroyed to address potential slip-trip fall hazards associated with the surface leakage due to unusually strong artesian conditions.

6.4.2.1 On-Property Monitoring Wells

Teledyne

There are eight wells being monitored at the Teledyne site. The Teledyne property is the ERD study area, so the concentrations of COCs in this area reflect the pattern of a highly reducing environment, where TCE is decreasing and cis-1,2-DCE and VC are temporarily increasing. In the last five years of sampling, wells T-13 and T-20 had concentrations of COCs that were not detected or below the cleanup levels and well T-11 only had three sampling events where TCE exceeded the MCL. The other five wells monitored at the Teledyne site had concentrations of TCE, cis-1,2-DCE and VC above the MCLs. TCE concentrations decreased rapidly as cis-1,2-DCE and VC peaked after ERD injections in November 2011.

Spectra-Physics

Over the last five years, six wells have been sampled in the Spectra-Physics area with four in the Shallow zone [S-3, S-9, S-12, S-18] and two in the Intermediate zone [S-15I, S-16I]). In 2012, groundwater-TCE levels were not above the MCL in the Shallow-zone groundwater beneath the Spectra-Physics area (Figure 7, Arcadis 2013b). Concentrations of other COCs were mostly not detected (Table 5, Arcadis 2013b). Of those, TCE, cis-1,2-DCE, and vinyl chloride were not detected in S-9, S-12, and S-16I.

Shallow-Zone Monitoring Well S-3

Monitoring well S-3 is located near the center of the former Spectra-Physics area. Concentrations of TCE were below the MCL between 2009 and 2013. The maximum detected concentration was 0.9 µg/L (December 2010). Cis-1,2-DCEwas detected above the MCL (70 µg/L) at concentrations ranging from 400 µg/L in 2009 to 330 µg/L in 2013. These values are within the range of historical concentrations detected for cis-1,2-DCE, though there is an overall decreasing trend in concentrations since the maximum detection of 610 µg/L observed in 2004. Vinyl chloride concentrations ranged from non-detect to 6.8 µg/L during 2009-2013 with the detections all above the MCL (2 µg/L).

Results from a Mann-Kendall trend test are shown in Appendix F and represent the time period from 2009 to 2013. The results show cis-1,2-DCE concentrations are stable. The trends indicate that vinyl chloride is increasing. These results are expected from natural TCE reductive dechlorination processes.

Shallow-Zone Monitoring Well S-18

Monitoring well S-18 is located in the upgradient portion of the former Spectra-Physics area. Concentrations of TCE were below the MCL between 2009 and 2013. The maximum detected concentration was 1.0 µg/L (November 2013). Cis-1,2-DCE and vinyl chloride were not detected above the laboratory reporting limit of 0.5 µg/L between 2009 and 2013.

Intermediate-Zone Monitoring Well S-15I

The intermediate-zone well S-15I is also located near the center of the former Spectra-Physics area. TCE was detected above the MCL during 2009-2013 with a maximum detected concentration of 10 µg/L in December 2010. In well S-15I, cis-1,2-DCE was also mostly below the MCL as observed at well S-3 with a maximum concentration of 0.052 µg/L observed in 2007 and decreasing trends in the 2009-2013 timeframe. Vinyl chloride was not detected above the laboratory reporting limit of 0.5 µg/L at this well between 2009 and 2013. The Mann-Kendall trend analysis for TCE indicates that TCE is decreasing.

As described above and shown by the plume represented by data from 2012, there are limited areas with TCE concentrations above the MCL in the shallow-zone and intermediate-zone groundwater beneath the former Spectra-Physics area.

6.4.2.2 Off-Property Monitoring Wells

Groundwater monitoring occurs at approximately 22 off-property wells. Table 7 shows which of these wells still have concentrations of COCs that exceed MCLs. Down-gradient off-property shallow-zone monitoring wells were evaluated to determine if the plume is stable or if concentrations are decreasing. Wells NC7S and Well W-4 had non-detect values for all COCs (Figure 2-1a, Arcadis 2013a). This confirms that the plume is not migrating further down-gradient or to the west of Permanente Creek. Concentrations of TCE and cis-1,2-DCE at wells NC1S, NB-25, 28S and Well 23 were above the MCLs. Vinyl chloride and cis-1,2-DCE were found above the MCL at well W-3. Only vinyl chloride was found above the MCL at well W-6. Mann-Kendall trend analysis results show that TCE and cis-1,2-DCE are increasing at Well 23, stable at Well NB-25, and stable and decreasing, respectively, at well NC1S (Appendix F).

Down-gradient off-site intermediate-zone monitoring wells were also evaluated. Well 28I had non-detect values for all constituents sampled in the last five years. Well NC2I exceeded the MCL for TCE at all sampling events during the last five years and has not exceeded the MCL for cis-1,2-DCE since December 2010. The trend analysis for TCE and cis-1,2-DCE concentrations at well NC2I showed that TCE did not have a trend and cis-1,2-DCE is decreasing. Well NB26 is also down-gradient and had concentrations that exceeded the MCL for TCE and cis-1,2-DCE during the last two sampling events. The trend analysis for TCE and cis-1,2-DCE at well NB26 were increasing (Appendix F).

Spring Street

Ten wells were monitored in the Spring Street area over the last five years. Concentrations of TCE near the Spring Street area are generally above the MCL and appear to be stable or slightly decreasing. However, groundwater-TCE levels in wells MS-2I, MS-9S, and MS-10S are not above the MCL for TCE concentrations. TCE is generally decreasing in the Spring Street area. The maximum TCE concentrations for the Spring Street area were found in the intermediate-zone well ES3I, but appear to be decreasing over the last five years of monitoring. Concentrations of cis-1,2-DCE and VC do not have an apparent trend in the Spring Street area. Concentrations of VC are highest in wells ES5S and ES4I with a maximum of 210 µg/L.

North Bayshore Extraction Wells

The North Bayshore Extraction system consists only of extraction wells. Almost every well sampled in the shallow-zone and intermediate-zone of the North Bayshore area had concentrations of TCE, cis-1,2-DCE, PCE and VC above the MCL. On average, concentrations of these constituents were higher in the shallow-zone wells than the intermediate-zone wells. It appears that concentrations of TCE and PCE are decreasing throughout the North Bayshore area and concentrations of cis-1,2-DCE and VC are being affected by ERD treatments.

6.4.3. ERD-Related Monitoring and Remediation

The ERD groundwater monitoring network consists of eight shallow-zone wells, four upper-intermediate zone wells and five lower-intermediate zone wells (Figure 7-9, Arcadis 2013a). Figure 4 shows the ERD target treatment areas for each aquifer zone.

The analytical results from the baseline event (April 2011) through November 2012 event are summarized in Table 6-7 of the Focused Feasibility Study (Arcadis 2013a). The results indicate that ERD activity has been detected in the monitoring wells and is evident by the decrease in TCE concentrations and the temporarily increased cis-1,2-DCE and VC concentrations.

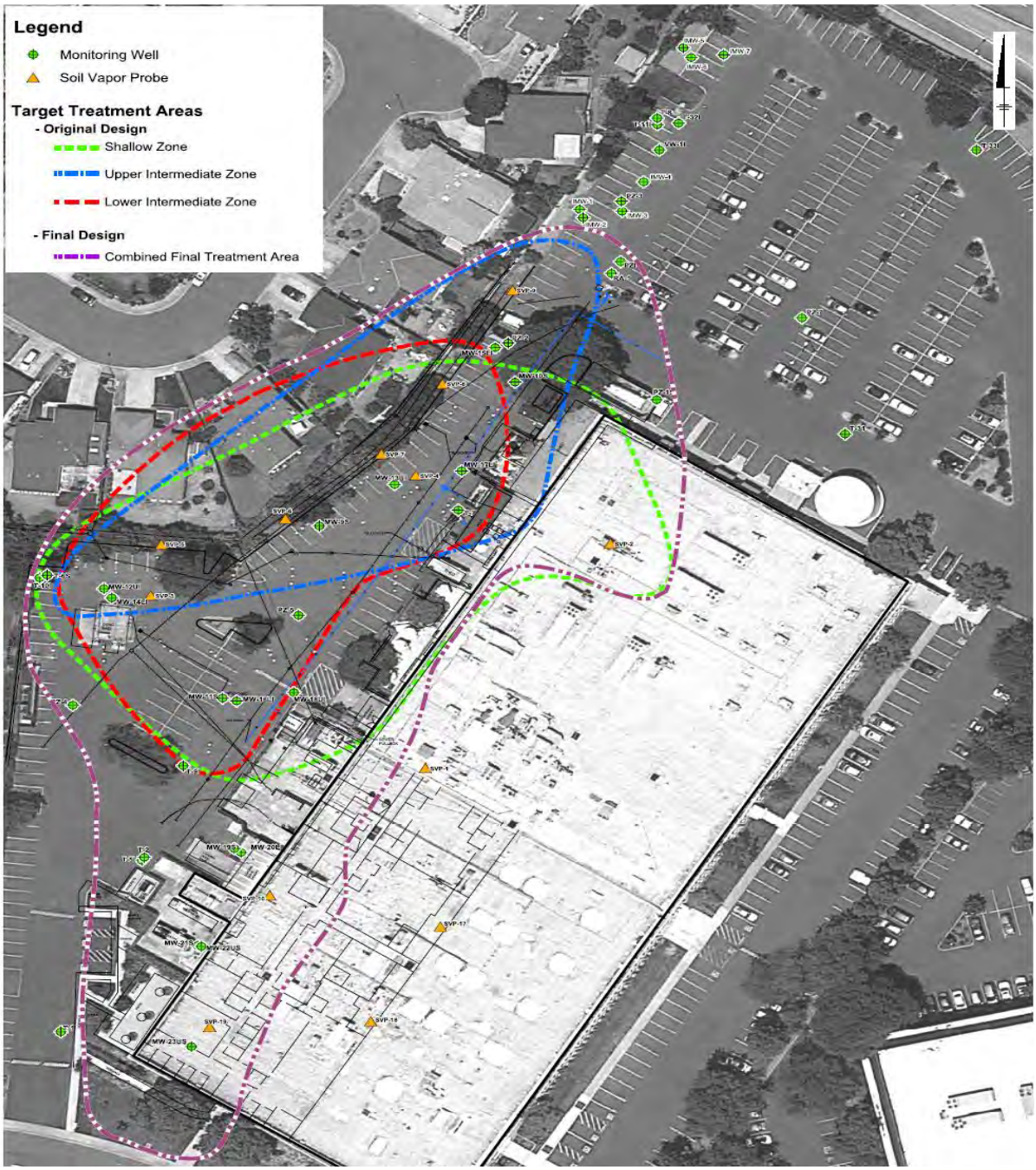

Figure 4. ERD Treatability Study Location Map

Soil Gas

The soil gas monitoring program was developed to monitor changes in volatile organic compounds and methane in soil gas associated with the full-scale ERD study. Thirteen soil-vapor probes were installed across the ERD treatment area to monitor VOC and methane concentrations in the soil gas. In addition, seven soil-vapor probes were installed in the Spring Street Area to monitor potential effects of the ERD

treatability study on soil gas downgradient from the Semiconductor Site. Soil-gas monitoring began prior to initiation of shallow-zone ERD treatment. Currently, soil-gas monitoring occurs monthly at on-site and off-site soil vapor points.

In general, VOC concentrations in soil gas have decreased over the course of the ERD treatability study. Additionally, VOC concentrations have decreased at the property boundary wells since the SVE system began operation in November 2011.

Methane was detected above the action level of 5% methane at the exterior property boundary monitoring points in August 2011. The SVE system was installed in response to the elevated methane levels. Since installation, methane levels have declined to below 1.0% methane in all soil gas monitoring points along the property boundary. In April 2012 soil gas monitoring results indicated that methane concentrations at the interior soil vapor monitoring points had increased above the action level. In response, a methane mitigation plan was implemented, which included applying a paint-on vapor barrier, replacing the well caps, and replacing the top layer of cement to well vaults and inside electrical panels.

The methane screening results for the Spring Street Area monitoring wells were all 0% methane with the exception of one well which exceeded the action level. After the SVE system was installed, the methane readings steadily decreased in the well to 0% in August 2012.

6.4.4. Indoor Air

Off-Property Residential and Commercial Indoor Air Sampling

As described previously in section 5.2.3, a vapor intrusion study is underway in the off-property residential and commercial buildings in the Spring Street Study Area, North Bayshore Study Area and at 1250 West Middlefield Road (the former Spectra-Physics Lasers facility). The following is a summary of the *Status Report for Vapor Intrusion Evaluation* and the 2014 indoor air sampling results, as compared with the USEPA 2013 RSLs for residential and commercial/industrial air quality.

Residential

In 2010, sampling was conducted at 14 of the residential properties with a 15th residence sampled in 2013. In 2014, another round of sampling was conducted at 14 residential properties. In 2014, TCE was detected at two locations above the long-term health-risk-based screening criteria (0.43 µg/m^3), one of which was also above the Interim Indoor Air Short-Term Response Action Level (2 µg/m^3). No outdoor air sampling locations during the 2014 sampling events yielded concentrations of TCE above laboratory detection limits. Both locations were above areas with groundwater with TCE concentrations ranging from 5.0-50.0 µg/L. Mitigation systems were installed in each building with detected levels of VOCs above the RSLs. Based on the results of these investigations, EPA has concluded that the vapor intrusion pathway is complete in certain buildings overlying groundwater TCE concentrations greater than 5 µg/L. A subset of residences over the plume have been tested for potential indoor air and additional outreach for sampling access is planned; therefore, the vapor intrusion study is ongoing.

Commercial

Commercial air sample results for breathing zones had detected concentrations of TCE. TCE was detected at breathing zone height in one off-property commercial building at concentrations of 3.4 $\mu g/m^3$ and 6.4 $\mu g/m^3$ in samples collected from an office and conference room, respectively (during a Heating, Ventilation, and Air Conditioning [HVAC] "on" sampling event) and at concentrations of 6.5 $\mu g/m^3$ and 14 $\mu g/m^3$ in samples collected inside a restroom and the same office referenced above, respectively (during an HVAC "off" sampling event). Potential pathways identified in the restroom and in certain other affected areas of the building were mitigated, and ventilation was enhanced in the one affected office and restrooms (by installation of ventilation grates to minimize depressurization and improve air circulation) as well as throughout the building (the building-wide HVAC system was modified to run 24 hours per day, 7 days per week, with a minimum of 15% outdoor air supplied to the building at all times). Subsequent breathing zone sampling confirmed the effectiveness of the mitigation activities in reducing VOC levels in indoor air due to vapor intrusion to below RSLs at those locations sampled.

Indoor samples for potential preferential pathways were also collected from commercial buildings, certain of which (mainly fire suppression system riser pipes and floor drains) showed detections of TCE above screening levels and which were subsequently mitigated. Mitigation activities included conduit sealing at slab penetration locations, installing vapor-tight covers on interior sumps, evaluating and sealing perimeters of drains, placing one-way flow drain trap seals in drains, resealing plumbing fixtures, and applying vapor seals to surfaces.

Background/outdoor ambient air samples were also collected for comparison to commercial indoor air results. PCE and chloroform were detected in the outdoor air samples at multiple locations, but not at levels above screening levels. Results from commercial air sampling for breathing zones and potential preferential pathways may be found in Table 3 and Table 4 of the *Vapor Intrusion Evaluation Report* (Arcadis 2013), respectively.

6.5. Site Inspection

A site inspection was conducted on October 22, 2013. Participants included Melanie Morash (EPA), Roger Papler (RWQCB), Erica Kalve with Arcadis, Scott Morrison with PES Environmental, Inc., and Ellen Enberg and Aaron King with USACE. The site inspection checklist is presented in Appendix D. Photos from the site inspection are presented in Appendix E.

The GWET system was observed to be in good condition, considering it was not in operation. The air stripper is not currently in use but remains available, if needed. Monitoring wells were inspected and appeared to be in good condition. Also observed was the operation of the pilot bioremediation program that includes ERD. ERD-generated methane was treated using SVE. In general, the Site appears to be in good condition.

6.6. Interviews

During the FYR process, interviews were conducted with parties impacted by the Site, including the current landowners and regulatory agencies involved in Site activities. The purpose of the interviews was

to document the perceived status of the Site and any perceived problems or successes with the phases of the remedy that have been implemented to date. Two interviews were conducted during the Site visit on October 22, 2013. In addition, two residential neighbors answered interview questions via e-mail. Interviews are summarized below and completed interview forms are included in Appendix C.

Interviews were conducted with Erica Kalve, geologist for Arcadis, and Scott Morrison, Senior Engineer for PES Environmental, Inc. They thought that the remedy was performing well. The current bioremediation pilot is successfully remediating the groundwater with monitoring results showing decreases in contaminant levels. The only unexpected O&M difficulty they encountered in the last five years was the formation of methane resulting from the ERD treatment. However, this is being successfully mitigated using SVE. The residential neighbors interviewed were Keith Desilva and Linda Thomas. They expressed concerns about the noise level at night but were satisfied by the state/federal responsiveness to this issue. They also expressed concern about being informed about the site's activities and progress. They requested periodic updates of the progress of the project and the possible end date of the cleanup operation.

6.7. Institutional Controls

The ROD did not explicitly include institutional controls (ICs) in the selected remedy; however, RWQCB Order 91-025 required the parties to record restrictive covenants (or "deed restrictions"). Accordingly, Teledyne Inc. and Spectra-Physics Inc. recorded restrictive covenants prohibiting the use of groundwater on the properties with the Santa Clara County Recorder on February 24, 1992 (No. 11260055) and August 11, 1994 (No. 12640287), respectively. The covenants restricted the installation of any groundwater wells on the properties except in connection with the remedial program or other remedial activities approved by the RWQCB. The covenants also prohibit destroying, damaging, or otherwise interfering with the operation of remedial program equipment except to allow the removal of remedial program equipment following termination of the applicable portion of the remedial program.

The 2009 FYR determined that the original restrictive covenants did not comply with California Civil code section 1471. On July 14, 2010, a new covenant and environmental restriction on property was signed by ECI Two Terra Bella LLC for the Teledyne property and on August 21, 2012; a new covenant and environmental restriction on property was signed by New Community Baptist Church, for the Spectra-Physics property. These covenants provide the following restrictions:

- Development of the burdened property shall be restricted to industrial, commercial, and office space.
- No residence for human habitation shall be permitted on the burdened property.
- No hospitals shall be permitted on the burdened property.
- No schools or persons under 21 years of age shall be permitted on the burdened property.
- No day care centers for children or day care centers for Senior Citizens shall be permitted on the burdened property.
- No excavation work on the property, unless expressly permitted in writing by the board.

- All uses and development of the burdened property shall be consistent with any applicable board order or risk management plan, each of which is hereby incorporated by reference including future amendments thereto. All uses and development shall preserve the integrity of any cap, any remedial measures taken or remedial equipment installed, and any groundwater monitoring system installed on the burdened property pursuant to the requirements of the board, unless otherwise expressly permitted in writing by the board.
- No owners or occupants of the property or any portion thereof shall drill, bore, otherwise construct, or use a well for the purpose of extracting water for any use including but not limited to, domestic, potable, or industrial uses, unless expressly permitted in writing by the board.

7. Technical Assessment

7.1. Question A: Is the remedy functioning as intended by the decision documents?

Yes, the remedy is functioning as intended by the ROD, however new remedial actions are being implemented on-site for more optimized clean-up.

Remedial Action Performance

There were three components to the remedial actions listed in the ROD in 1991: SVE at Spectra-Physics, GWET at Teledyne, and groundwater extraction and discharge for off-site North Bayshore Extraction System (NBES) and Spring Street Extraction System (SSES). The soil vapor extraction systems that were installed on the Spectra-Physics site are no longer in operation. The GWET system that was operating on the Teledyne site and discharging to Permanente Stream is no longer in operation. There are still groundwater extraction systems operating in the Spring Street and North Bayshore areas that discharge to the local sanitary sewer.

Concentrations above clean-up goals remain in many of the wells at the site and down-gradient for TCE, cis-1,2-DCE, PCE and vinyl chloride. The plume appears to be stable and concentrations of VOCs in most wells are either stable or declining.

System Operations/O&M

The groundwater remedy in the ROD is still functioning as intended. All extraction wells from the SSES are still operating and two extraction wells from the NBES are still operating. The on-property Teledyne GWET system was shut down during implementation of the bioaugmented ERD pilot study. As stated previously, newer technology is being implemented at the Teledyne property to reduce VOCs more efficiently. Currently, ERD injections are enhancing the degradation of TCE to cis-1,2-DCE and VC. For example, results from the Spectra-Physics Site show that TCE concentrations are decreasing while cis-1,2-DCE concentrations are increasing in some areas. This trend is common in reducing conditions.

Implementation of Institutional Controls and Other Measures

The ROD did not explicitly include institutional controls in the selected remedy; however, RWQCB Order 91-025 required the parties to record restrictive covenants. The institutional controls in place include prohibitions on the use of groundwater until cleanup levels are achieved. No activities were observed that would have violated the institutional controls.

7.2. Question B: Are the exposure assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of Remedy Selection Still Valid?

No, the exposure assumptions, toxicity data, cleanup levels and remedial actions used at the time of the remedy selection are not valid. The rationale behind this conclusion is discussed below.

Changes in Standards and TBCs

The groundwater cleanup levels have changed since the ROD. However, the ROD provides that the final appropriate remedial goal for each indicator chemical in groundwater is either the MCLG (if not equal to zero), the federal MCL, or the State MCL, whichever is most stringent, meaning that if the current state or federal MCL is equal to or less than the corresponding standard defined in the ROD, then current MCLs are the cleanup goals. The following is a summary of the cleanup levels that have changed since the ROD was issued in 1991:

- the state has adopted a cleanup level for 1,2-DCB equal to the federal MCL
- the state MCL decreased for 1,1,2-TCA and is now equal to the federal MCL
- the federal MCL is now less stringent for 1,2,4-TCB and there is now a state MCL more stringent than both the old and revised federal MCL
- the state MCL for 1,1,2-TCA is now less stringent than the 1991 ROD and equal to the federal MCL
- the state MCL for toluene is now less stringent than it was in the 1991 ROD, but still more stringent than the federal MCL
- the federal MCLG for chloroform is now more stringent.

Other ARARs have also changed since the ROD was issued. These changes do not affect the protectiveness of the remedy.

Vapor Intrusion Evaluation

A vapor intrusion study is ongoing at the Spring Street study area and North Bayshore Study area. There are exceedances of the short-term and long-term health-risk-based screening levels in samples from certain residential buildings of TCE. Certain commercial building breathing zone samples had exceedances of both the short-term and long-term health risk-based screening levels for TCE

concentrations. Mitigation is being provided for buildings that exceed RSLs; however, there remain some residences and commercial buildings that have yet to be sampled. In addition, some building owners have declined sampling and are located over TCE-contaminated groundwater at concentrations that might result in vapor intrusion. Planning for additional rounds of outreach and sampling is in progress, and access negotiations at certain other buildings in the study area are underway. Ultimately, the protectiveness of the remedy cannot be determined until the remaining rounds of outreach and sampling have been completed.

Changes in Exposure Pathways

There have been no changes in exposure pathways since the ROD was issued in 1991.

The land use has not changed on-site or off-site since the last FYR. The vapor intrusion study has been ongoing since 2010 and results confirm residential and commercial indoor air exposures from groundwater contamination on-site. These issues are being addressed with mitigation. There will also be additional indoor air studies in the future to more fully assess the extent of vapor intrusion in the study area.

Changes in Toxicity and Other Contaminant Characteristics

Toxicity factors for several COCs have changed since the ROD was issued. For cancer RSLs, EPA uses an excess cancer risk range between 10^{-4} and 10^{-6} for managing risk; if the excess cancer risk is below or within this range, the standard may still be considered protective. Five of the six COCs that have cancer RSLs below the ROD cleanup levels are within EPA's protective excess cancer risk range. The remaining COC, chloroform, currently has detected concentrations within EPA's protective excess cancer risk range. For non-cancer RSLs, EPA considers the respective MCL for each constituent as promulgated under the Safe Drinking Water Act to be protective for non-cancer effects. All the cleanup levels selected in the SCR and ROD are currently below their respective federal MCL, and therefore, are considered protective.

Changes in Risk Assessment Methods

There have been no changes in risk assessment methods.

Expected Progress Toward Meeting RAOs

The objective of the selected remedy stated in the ROD is to remove and permanently destroy the contaminants from both soils and groundwater or significantly reduce the toxicity, mobility, or volume of hazardous substances in both media. Since implementation of the full-scale ERD study, on-property groundwater monitoring results indicate that significant reductions in VOC levels have been achieved. Groundwater monitoring results in most wells outside of the off-property area affected by ERD injections have indicated that concentrations of COCs in the plume are either stable or decreasing.

The Site is progressing toward achieving RAOs.

7.3. Question C: Has Any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No other information is known at this time that could call into question the protectiveness of the remedy.

7.4. Technical Assessment Summary

Currently the only remedial actions selected in the 1991 ROD still in operation are the Spring Street extraction system and two extraction wells in the North Bayshore extraction system. These systems discharge water to the local sanitary sewer which is treated in a publicly owned treatment plant.

On-property COCs at the former Teledyne property include TCE, cis-1,2-DCE, vinyl chloride and PCE below the cleanup standards in most locations and are at levels above cleanup standards in some locations. Trend analyses show that concentrations are decreasing substantially in the ERD remediation area, with cis-1,2-DCE and other TCE degradation byproducts temporarily increasing at some locations due to anaerobic reductive dechlorination of TCE.

The groundwater cleanup levels and toxicity factors for some COCs have changed since the 1991 ROD. The cleanup levels in the ROD for all COCs are within the acceptable excess cancer risk range and are therefore considered protective. Groundwater results show concentrations of chloroform are also within the cancer risk range and are therefore protective. For non-cancer RSLs, EPA considers the respective MCL for each constituent as promulgated under the Safe Drinking Water Act to be protective for non-cancer effects. All the cleanup levels selected in the SCR and ROD are currently below their respective federal MCL, and therefore, are considered protective.

The land use has not changed since the last five year review. There are residential and light commercial buildings located in the off-property area. Vapor intrusion evaluations are ongoing on-property and off-property. Results suggest that vapor intrusion of VOCs from shallow groundwater into structures is occurring within the study area. Mitigation is being provided for buildings that exceed RSLs, however there remain some buildings overlying TCE contaminated groundwater at concentrations that might result in vapor intrusion that have yet to be sampled. Planning for additional rounds of outreach and sampling is in progress, and access negotiations at certain other buildings in the study area are underway. Further investigations are being performed to learn the extent of the vapor intrusion.

Study results have contributed significant new information that supports the decision to revise the current site remedy to improve remedial effectiveness and cleanup time frames. The monitoring results from the ERD pilot study and full-scale ERD treatability study have successfully demonstrated enhanced degradation of VOCs in shallow- and intermediate- groundwater zones. Significant decreases in VOC mass have already occurred since implementation of the full-scale ERD treatability study began. The results of the long-term MNA pilot study have successfully demonstrated that natural attenuation appears to be a significant factor in reducing and maintaining plume size and VOC concentrations in the North Bayshore area.

8. Issues

Table 8 summarizes the current issues for the Teledyne/ Spectra-Physics Site.

Table 8. Current Issues for the Teledyne/ Spectra-Physics Site

Issue	Affects Current Protectiveness (Yes or No)	Affects Future Protectiveness (Yes or No)
The performance of the selected remedy in the ROD, groundwater extraction and treatment, has declined and new remedial actions are being investigated.	No	Yes
The FYR vapor intrusion evaluations conducted so far indicate that the subsurface-to-indoor air pathway is a concern at the site.	Yes	Yes

9. Recommendations and Follow-up Actions

Table 9 provides recommendations to address the current issues at the Teledyne/ Spectra-Physics Site.

Table 9. Recommendations to Address Current Issues at the Teledyne/Spectra Physics Site

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Yes or No)	
					Current	Future
The performance of the selected remedy in the ROD, groundwater extraction and treatment, has declined and new remedial actions are being investigated.	Complete ROD Amendment or prepare Explanation of Significant Differences selecting new remedial actions to include updated institutional controls	EPA	EPA	09/2018	No	Yes
The FYR vapor intrusion evaluations conducted so far indicate that the subsurface-to-indoor air pathway is a concern at the site.	Continue to monitor and provide mitigation for vapor intrusion, including step-outs to lower concentration areas of the shallow TCE groundwater plume.	EPA	EPA	06/2016	Yes	Yes

In addition, the following are recommendations that do not affect current protectiveness and were identified during the Five-Year Review:

- Well 23 and well NB-26 have increasing concentrations of TCE and cis-1,2-DCE. These are down-gradient wells that should continue to be monitored.

10. Protectiveness Statement

A protectiveness determination of the remedy at the Teledyne Semiconductor and Spectra-Physics, Inc. Joint Superfund Sites cannot be made at this time until further information is obtained. Additional vapor intrusion assessments must be conducted to determine if indoor air pathways are complete. When unacceptable levels are encountered in a particular building, mitigation plans are developed and implemented to ensure that levels of volatile organic compounds (VOCs) in indoor air are protective. It is expected that these actions will take approximately two years to complete, at which time a protectiveness determination can be made. To be protective in the long-run, a new remedy should be selected due to the declining effectiveness of the existing remedy.

11. Next Review

This is a Site that requires ongoing FYRs as long as waste is left on site that does not allow for unlimited use and unrestricted exposure. The next FYR will be due within five years of the signature date of this FYR.

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Appendix A: List of Documents Reviewed

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Arcadis, 2010. *Groundwater Monitoring Report for the Semiannual Reporting Period January 1 through June 30, 2010, Former Spectra-Physics Lasers, Inc., and Former Teledyne Semiconductor Facilities, Mountain View, California,* s.l.: s.n.

Arcadis, 2011. *Groundwater Monitoring Report for the Semiannual Reporting Period January 1 through June 30, 2011, Former Spectra-Physics Lasers, Inc., and Former Teledyne Semiconductor Facilities, Mountain View, California,* s.l.: s.n.

Arcadis, 2011. *Revised Groundwater Monitoring Report for the Semiannual Reporting Period July 1 through December 31, 2010 Former Spectra-Physics Lasers, Inc., and Former Teledyne Semiconductor Facilities Mountain View, California,* s.l.: s.n.

Arcadis, 2012. *Groundwater Monitoring Report for the Semiannual Reporting Period January 1 through June 30, 2012, Former Spectra-Physics Lasers, Inc., and Former Teledyne Semiconductor Facilities, Mountain View, California,* s.l.: s.n.

Arcadis, 2012. *Groundwater Monitoring Report for the Semiannual Reporting Period July 1 through December 31, 2011, Former spectra-Physics Lasers, Inc., and Former Teledyne Semiconductor Facilities, Mountain View, California,* s.l.: s.n.

Arcadis, 2013. *Focused Feasibility Study, Former Spectra-Physics Lasers, Inc., and Former Teledyne Semiconductor Facilities, Mountain View, California,* s.l.: s.n.

Arcadis, 2013. *Groundwater Monitoring Report for the Semiannual Reporting Period January 1 through June 30, 2013, Former Spectra-Physics Lasers, Inc., and Former Teledyne Semiconductor Facilities, Mountain View, California,* s.l.: s.n.

Arcadis, 2013. *Groundwater Monitoring Report for the Semiannual Reporting Period July 1 through December 31, 2012, Former Spectra-Physics Lasers, Inc., and Former Teledyne Semiconductor Facilities, Mountain View, California,* s.l.: s.n.

Arcadis, 2013. *Revised Work Plan Adendum for Vapor Intrusion Evaluation in the Off-Property Study Area and at 1250 Middlefield Road, Former Teledyne/Spectra-Physics Sites, 1300 Terra Bella Avenue and 1250 Middlefield Road, Mountain View, California,* s.l.: s.n.

California Regional Water Quality Control Board San Francisco Bay Region, 1991. *Order No. 91-025 Site Cleanup Requirements for: Teledyne Semiconductor, Inc. and Spectra-Physics Lasers, Inc.,* s.l.: s.n.

LFR Inc., 2009. *Focused Feasibility Study Spectra-Physics Lasers, Inc., and Former Teledyne Semiconductor 1250 West Middlefield Road and 1300 Terra Bella Avenue, Mountain View, California,* s.l.: s.n.

LFR, 2010. *Groundwater Monitoring Report for the Semiannual Reporting Period July 1 through December 31, 2009 Spectra-Physics Lasers, Inc., and Teledyne Semiconductor Mountain View, California,* s.l.: s.n.

US Environmental Protection Agency, 1999. *Five-Year Review (Type I), Teledyne/Spectra-Physics, Mountain View, California,* s.l.: s.n.

US Environmental Protection Agency, 2004. *Five-Year Review Teledyne Semiconductor, 1300 Terra Bella Avenue, & Spectra-Physics Lasers, 1335 Terra Bella Avenue, Mountain View, Santa Clara County, California,* s.l.: s.n.

US Environmental Protection Agency, 2009. *Third Five-Year Review Teledyne Semiconductor/Spectra-Physics, Inc. Sites 1300 Terra Bella Avenue and 1250 West Middlefield Road, Mountain View, Santa Clara County, California,* s.l.: s.n.

Appendix B: Press Notices

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PUBLIC NOTICE

REGIONAL WATER BOARD AND EPA BEGIN FOURTH FIVE-YEAR REVIEW OF CLEANUP AT TWO SUPERFUND SITES:

TELEDYNE SEMICONDUCTOR
1300 Terra Bella Avenue; Mountain View, California

and

SPECTRA-PHYSICS, INC.
1250 Middlefield Road; Mountain View, California

The California Regional Water Quality Control Board San Francisco Bay Region (Regional Water Board) and the U.S. Environmental Protection Agency (EPA) are conducting a review of cleanup actions at the Teledyne Semiconductor and the Spectra-Physics Superfund Site, both located in Mountain View California. The review will evaluate whether the cleanup actions for the Site remain protective of human health and the environment.

This is the fourth Five-Year Review for the Teledyne Semiconductor and the Spectra-Physics Superfund Site. During this upcoming review process, the Regional Water Board and EPA will study site-specific information for the period between 2009 and 2014, and will evaluate the Site's remedial protectiveness. The Regional Water Board and EPA's project managers conducted facility inspections and will talk with company representatives, other regulatory authorities, and interested members of the public. The methods, findings and conclusions from the review will be documented in the Five-Year Review to be issued by Fall 2014 and will be placed in the information repositories listed below.

The major chemicals of concern are trichloroethene (TCE) and its breakdown chemicals. To remediate the soil-TCE contamination at the Spectra-Physics properties, the responsible party excavated the source area and operated a soil vapor extraction system until TCE removal rates were too low justify continued operation. To clean up groundwater-TCE contamination at the Teledyne property, the responsible party operated on- and off-property groundwater pump and treat systems. The on-property was shut down to accommodate an innovative remedial technology. To address potential vapor intrusion impacts on indoor air, indoor air evaluations are currently ongoing at certain residential and commercial properties near the Site.

The Regional Water Board and EPA invite the community to learn more about this review process and provide input about progress of the clean-up. One way to get involved is to contact Regional Water Board Project Manager Roger Papler at (510) 622-2435, or Roger.Papler@waterboards.ca.gov or Alejandro Diaz, Community Involvement Coordinator, at (415) 972-3242 or diaz.alejandro@epa.gov.

You can obtain further site information at the following Regional Water Board's website at: http://geotracker.waterboards.ca.gov/search.asp. Enter the unique Case/Global ID numbers for this Site, which is SL721281224 and 721201221. Then click on "Report", then on "Geo Report/Site Documents" link under the Electronic Submittals heading.

You may also review the report and other Site documents at the Regional Water Board offices at: 1515 Clay Street, Suite 1400, Oakland, CA 94612 – phone (510) 622-2300.

2 X 3 - 6 UNITS (1/8 PG) - 3.875" x 4.75"
MOUNTAIN VIEW VOICE

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Appendix C: Interview Forms

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Five-Year Review Interview Record

Site:	Teledyne Semiconductor and Spectra-Physics, Inc.	**EPA ID No:**	Teledyne Semiconductor: CAD009111444 Spectra Physics, Inc.: CAD009138488

Interview Type: Visit

Location of Visit: Mountain View, CA

Date: 10/22/2013 **Time:** 3:00 PM

Interviewer:	Aaron King Ellen Engberg	**Title:**	Environmental Engineer Geologist	**Organization:**	USACE USACE

Individual Contacted

Name:	Erica Kalve	**Title:**	Geologist	**Organization:**	Arcadis
Telephone:	(510) 596-9620	**Address:**			
Name:	Scott Morrison	**Title:**	Senior Engineer	**Organization:**	PES Environmental, Inc.
Telephone:	(415) 899-1600	**Address:**	1682 Novato Boulevard, Suite 100 Novato, CA 94947		

Summary of Converstation

1) What is your overall impression of the project?

The project has been an overall positive and continues to move forward with meaningful improvements. The soil vapor extraction (Spectra-Physics) is successful, the former source area is being successfully remediated via enhanced reductive dechlorination (ERD), the methane extraction system has been serving its purpose, and the MNA study indicated that MNA is occuring (the plume isn't expanding).

2) Is the remedy functioning as expected? How well is the remedy performing?

Yes. The remedy is performing as well as one could hope.

3) What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

The MNA study has shown stable to decreasing trends.

4) Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

There is not a continuous O&M presence. One person checks the methane SVE system daily to confirm that it is on and operational. The methane SVE system is monitored monthly. The extraction system is checked weekly to monthly, and is monitored quarterly. The whole site is monitored semi-annually.

5) Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect protectiveness of the remedy? Please describe changes and impacts.

The full-scale ERD treatability study, the installation of the SVE system for methane, and the continuation of pumping from the SSES to manage mobilization resulting from the ERD have all occurred in the last five years. However, these things have only increased the effectiveness of the remedy.

6) What are the annual operating costs for your organization's involvement with the site?

Annual costs will be provided later.

7) Have there been unexpected O&M difficulties or costs at the site in the last five years? If so, please give details.

The methane issue with the ERD effort was somewhat unexpected, as it was not part of the original project planning.

8) Have there been opportunities to opimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

The methane SVE is optimized monthly (pull more from areas with higher concentrations). The ERD effort has its own optimization program to identify the best areas for reinjection.

9) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy?

The change in the understanding of TCE toxicity may impact the protectiveness of the remedy.

10) Do you have any comments, suggestions, or recommendations regarding the project?

No. The group of people working on this project is a good team, a good working group, and willing to have open dialogue regarding the project.

Five-Year Review Interview Record							
Site:	Teledyne Semiconductor and Spectra-Physics, Inc.					**EPA ID No:**	Teledyne Semiconductor: CAD009111444 Spectra Physics, Inc. : CAD009138488
Interview Type:		e-mail					
Location of Visit:	Mountain View, CA						
Date:	12/3/2013	**Time:**	10:01 AM				
Interviewer:	Roger Papler			**Title:**	Engineering Geologist	**Organization:**	San Francisco Bay RWQCB
Individual Contacted							
Name:	Keith Desilva			**Title:**	Residential Neighbor	**Organization:**	
Telephone:				**Address:**			
Name:				**Title:**		**Organization:**	
Telephone:				**Address:**			

Summary of Converstation

1) What is your overall impression of the project?

I think it is important to have this project completed to make sure the toxic matter is removed from the surrounding soil so it will not affect our health and the water table.

2) What effects have site operations had on the surrounding community?

The noise level at night. I think it has been mitigated by having the compressor off during sleeping hours. I think that's what has been done. I am not positive. I suggested to the gentleman by the name of Dale when he stopped by to check on the noise level.

3) Are you aware of any community concerns regarding the site operation and administration?

No.

4) Are you aware of any events, incidents, activities at the site such as: a) Vandalism, b) Trespassing, c) Emergency responses from local authorities?

No

5) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy?

No

6) Do you feel well informed about the site's activities and progress?

No. But I would like to get periodic updates of the progress of the project and the possible end date of the cleanup operation.

7) Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

Yes. I am very satisfied by the response from you and your agents when the noise level was a significant issue. I would like to recommend to install a better noise insulator or having the compressor underground if this project is going to go on for much longer.

Five-Year Review Interview Record							
Site:	Teledyne Semiconductor and Spectra-Physics, Inc.					**EPA ID No:**	Teledyne Semiconductor: CAD009111444 Spectra Physics, Inc. : CAD009138488
Interview Type:		e-mail					
Location of Visit:	Mountain View, CA						
Date:	12/3/2013	**Time:**	12:25 PM				
Interviewer:	Roger Papler			**Title:**	Engineering Geologist	**Organization:**	San Francisco Bay RWQCB
Individual Contacted							
Name:	Linda Thomas			**Title:**	Residential Neighbor	**Organization:**	
Telephone:				**Address:**			
Name:				**Title:**		**Organization:**	
Telephone:				**Address:**			

Summary of Converstation

1) What is your overall impression of the project?

Through conversations and emails with you, I have a better understanding of what the project involves and the need for it. I believe the completion of it is very important for the safety and well being of the surrounding community.

2) What effects have site operations had on the surrounding community?

The noise emitted from the equipment has been very invasive at times and was something that initially took months to get resolved. The City of Mountain View ignored repeated requests for help and there was no way for any of us in the affected area to identify the responsible party. The noise problem seems to have been mitigated, at least for now.

3) Are you aware of any community concerns regarding the site operation and administration?

Not at this time.

4) Are you aware of any events, incidents, activities at the site such as: a) Vandalism, b) Trespassing, c) Emergency responses from local authorities?

No

5) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy?

No

6) Do you feel well informed about the site's activities and progress?

No. I would be interested in periodic updates if possible.

7) Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

I would have suggested informing the surrounding community of this site when it was first installed and providing contact information. I am very satisfied with your interest in our well being and help in resolving the noise issue. You have been very informative and helpful in providing a better understanding of the project. It just should not have been so frustrating and difficult to find the proper person to contact.

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Appendix D: Site Inspection Checklist

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Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Teledyne Semiconductor and Spectra-Physics, Inc.	**Date of inspection:** 10/22/2013
Location: Mountain View, CA	**EPA ID:** Teledyne Semiconductor: CAD009111444; Spectra-Physics, Inc.: CAD009138488
Agency, office, or company leading the five-year review: State of California	**Weather/temperature:** Clear, 67° F

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☐ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other: *Groundwater monitoring, soil vapor extraction (for methane resulting from ERD), enhanced reductive dechlorination*
- ☒ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone no. _____
   Problems, suggestions; ☒ Report attached _____
   _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed ☐ at site ☐at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____
   _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency:
Contact: _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	**O&M Documents**			
	☒ O&M manual	☒ Readily available	☒ Up to date	☐ N/A
	☒ As-built drawings	☒Readily available	☒ Up to date	☐ N/A
	☒ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: Documents are not kept on site, but remediation contractors and Regional Water Quality Control Board have access to up to date copies of all required documents, not just those in this section.			
2.	☒Site-Specific Health and Safety Plan	☒ Readily available	☒ Up to date	☐ N/A
	☒ Contingency plan/emergency response plan	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: Contingency plan is part of the Health and Safety Plan			
3.	**O&M and OSHA Training Records**	☒ Readily available	☒ Up to date	☐N/A
	Remarks: OSHA training records available at contractor facilities			
4.	**Permits and Service Agreements**			
	☒ Air discharge permit	☒ Readily available	☒ Up to date	☐ N/A
	☒ Effluent discharge	☒ Readily available	☒Up to date	☐ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
	☐ Other permits_____	☐ Readily available	☐ Up to date	☐ N/A
	Remarks: The air discharge permit is held in case the air stripper needs to be used. Extracted water is discharged to the sanitary sewer under permit.			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks:			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks:			
7.	**Groundwater Monitoring Records**	☒ Readily available	☒ Up to date	☐N/A
	Remarks:			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks:			

9.	**Discharge Compliance Records**			
	☒ Air	☒ Readily available	☒ Up to date	☐ N/A
	☒ Water (effluent)	☒ Readily available	☒ Up to date	☐ N/A
	Remarks:			
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: No continuous on-site presence			

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State

☐ PRP in-house ☒ Contractor for PRP

☐ Federal Facility in-house ☐ Contractor for Federal Facility

☐ Other

Remarks: Arcadis: groundwater monitoring, SVE system operation for methane, soil gas (ERD study); PES Environmental: air permitting, water permitting, groundwater extraction system monitoring and maintenance; Fishbeck, Thompson, Carr, and Huber: designed and implemented ERD study

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☐ Funding mechanism/agreement in place

Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached

Date Date Total cost

From_____ To_____ _____ ☐ Breakdown attached

Date Date Total cost

From_____ To_____ _____ ☐ Breakdown attached

Date Date Total cost

From_____ To_____ _____ ☐ Breakdown attached

Date Date Total cost

From_____ To_____ _____ ☐ Breakdown attached

Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Methane issue was not expected, and was not part of the original planning documents.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks:

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A

Remarks:

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____

Frequency _____

Responsible party/agency _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☐ No ☐ N/A

Other problems or suggestions: ☐ Report attached

_____

_____

_____

_____

2.	**Adequacy**	☐ ICs are adequate	☐ ICs are inadequate	☐ N/A
	Remarks_____			
	_____			
	_____			
D. General				
1.	**Vandalism/trespassing**	☐ Location shown on site map	☒ No vandalism evident	
	Remarks:			
2.	**Land use changes on site**	☒ N/A		
	Remarks:			
3.	**Land use changes off site**	☒ N/A		
	Remarks:			
VI. GENERAL SITE CONDITIONS				
A. Roads	☒ Applicable	☐ N/A		
1.	**Roads damaged**	☐ Location shown on site map	☒ Roads adequate	☐ N/A
	Remarks:			
B. Other Site Conditions				
	Remarks: Many neighborhood or stray cats were noted during the site inspection.			
VII. LANDFILL COVERS	☐ Applicable	☒ N/A		
VIII. VERTICAL BARRIER WALLS	☐ Applicable	☒ N/A		
IX. GROUNDWATER/SURFACE WATER REMEDIES	☒ Applicable	☐ N/A		
A. Groundwater Extraction Wells, Pumps, and Pipelines		☒ Applicable	☐ N/A	
1.	**Pumps, Wellhead Plumbing, and Electrical**			
	☒ Good condition	☒ All required wells properly operating	☐ Needs Maintenance	☐N/A
	Remarks: Only ES-4I was inspected, and that was only long enough to lift the manhole and take a quick photograph. From the photograph, the well appears to be in good condition.			
2.	**Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**			
	☒ Good condition	☐ Needs Maintenance		
	Remarks:			

3. **Spare Parts and Equipment**

☒ Readily available ☒ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks:

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

C. Treatment System ☒ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)

☐ Metals removal ☐ Oil/water separation ☒ Bioremediation (ERD)

☒ Air stripping ☒ Carbon adsorbers (VPGAC)

☐ Filters_____

☐ Additive (*e.g.*, chelation agent, flocculent)_____

☐ Others_____

☒ Good condition ☐ Needs Maintenance

☒ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☒ Equipment properly identified

Remarks: The air stripper has not been used for some time, but remains available for use if needed. VPGAC is used to polish before gases from the methane SVE are released to the atmosphere. In situ bioremediation via enhanced reductive dechlorination (ERD) was performed by injecting emulsified vegetable oil and bioaugmenting with KB1. The last injection took place over the May 2011-January 2013 timeframe. The residence time is approximately 2-2.5 years. Another injection is being planned.

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☒ Good condition ☐ Needs Maintenance

Remarks:

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ☒ Good condition ☐ Proper secondary containment ☐ Needs Maintenance

Remarks:

4. **Discharge Structure and Appurtenances**

☐ N/A ☒ Good condition ☐ Needs Maintenance

Remarks:

5.	**Treatment Building(s)** ☒ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Remarks: There are no treatment buildings, and no chemicals are stored on site.
6.	**Monitoring Wells** (pump and treatment remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks: Not all wells were located during the site visit because of the large number of wells associated with the site.
D. Monitoring Data	
1.	Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: ☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining
D. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☐All required wells located ☐Needs Maintenance ☐N/A Remarks: Not all wells were located during the site visit because of the large number of wells associated with the site.
X. OTHER REMEDIES	
XI. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). The remedy as described in the ROD is no longer operating. The SSES system is still operating, two wells in the NBES are operating, and groundwater is being monitored. Otherwise, the original SVE system is no longer operating and the other extraction wells are not in use. There is now a full-scale "pilot" bioremediation program, and an SVE system associated with methane generation as a result of the bioremediation injections. That said, the remedial actions currently taking place at the site appear to be effective and functioning as designed.

B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. O&M procedures appear to be sufficient for the current site operations.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. The only issue that was somewhat unexpected was the production of appreciable methane resulting from the ERD injections. An SVE system was installed down-gradient of the ERD program to mitigate the issue.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. The methane SVE system is optimized monthly by pulling a greater flow rate from locations with higher concentrations. The ERD program is optimized by identifying locations requiring additional injections.

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Appendix E: Site Visit Photos

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Photo 1. Air stripper (not in use)

Photo 2. Enhanced bioremediation injection points

Photo 3. Extraction well E-8S

Photo 4. North Bayshore Extraction System sampling port

Photo 5. North Bayshore Extraction System control panel for E-8S

Photo 6. Location of E-9S (not operation, but sampled as part of MNA monitoring)

Photo 7. Extraction well E-13I.

Photo 8. Control Panel for Spring Street Extraction System

Photo 9. Extraction well ES-5S and sampling port for Spring Street extraction system

Photo 10. Extraction well ES-4I

Photo 11. Typical monitoring well

Photo 12. Methane SVE system with sound barriers

Photo 13. Methane extraction well and header

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Appendix F: Data Analysis Tables

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Table F1 Soil Analytcal Summary for TCE and Total VOC

Former Teledyne Semiconductor Spectra Physics Site

Boring ID	Depth Interval (ft)	Field Duplicate	Collection Date	Trichloroethene	Total VOCs
SB-A-10s	(33-34)		07/14/11	0.005 U	0.073
SB-A-10s	(33-34)	X	07/14/11	0.005 U	0.070
SB-A-10s	(43-44)		07/14/11	0.005 U	0.071
SB-A-11s	(21-22)		07/12/11	0.005 U	0.077
SB-A-11s	(43-44)		07/12/11	0.005 U	0.075
SB-A-14s	(21-22)		07/11/11	0.58	0.721
SB-A-14s	(39-40)		07/11/11	0.005 U	0.077
SB-B-12s	(40-41)		07/12/11	410	565.463
SB-B-12s	(51-52)		07/12/11	0.0077	0.087
SB-B-13s	(42-43)		07/11/11	0.016	0.096
SB-B-13s	(42-43)	X	07/11/11	0.019	0.092
SB-B-13s	(51-52)		07/11/11	0.005 U	0.074
SB-B-14s	(36-37)		07/11/11	0.62	0.694
SB-B-14s	(51-52)		07/11/11	0.005 U	0.083
SB-B-15s	(41-42)		07/12/11	330	520.783
SB-B-15s	(51-52)		07/12/11	0.26	0.488
SB-B-15s	(70-71)		07/14/11	1.2	1.804
SB-B-15s	(77-78)		07/14/11	0.0062	0.080
S-F-3LI	(63-64)		03/21/11	540	579.028
SB/TW-A-22	(15-16)		11/07/11	4.4	4.569
SB/TW-A-22	(23-24)		11/07/11	0.005 U	0.172
SB/TW-A-23	(12-13)		11/07/11	0.037	0.215
SB/TW-A-23	(23-24)		11/07/11	0.005 U	0.175
S-B-10S	(34-35)		05/26/11	2.6	2.854
S-B-10S	(44-45)		05/26/11	1.6	1.813
S-B-11S	(24-25)		05/26/11	0.014	0.183
S-B-11S	(38-39)		05/26/11	0.005 U	0.097
S-B-11S	(44-45)		05/26/11	0.005 U	0.092
SB-4	(14-15)		12/06/11	0.11	0.275
SB-4	(23-24)		12/06/11	0.005 U	0.171
SB-5	(14-15)		12/06/11	0.074	0.250
SB-5	(23-24)		12/06/11	0.005 U	0.186
SB-6	(16.5-17.5)		12/06/11	0.012	0.185
SB-6	(23-24)		12/06/11	0.005 U	0.183
SB-7	(16.5-17.5)		12/07/11	0.005 U	0.187
SB-7	(23-24)		12/07/11	0.005 U	0.165
S-B-7S	(35-36)		05/25/11	3.5	3.811
S-B-7S	(44-45)		05/25/11	0.02	0.108
SB-8	(5-6)		12/07/11	0.005 U	0.176
S-B-8S	(37-38)		05/25/11	3.9	4.185
S-B-8S	(44-45)		05/25/11	0.81	0.910

SB-9	(5-6)		12/07/11	0.005 U	0.178
SB-9	(14-15)		12/07/11	0.57	0.748
S-B-9S	(38-39)		05/25/11	1.6	1.798
S-B-9S	(44-45)		05/25/11	0.052	0.153
SB-A-13s	(41-42)		07/15/11	0.005 U	0.080
SB-A-13s	(61-62)		07/15/11	0.005 U	0.078
SB-A-15S	(11-12)		09/07/11	0.0077	0.193
SB-A-15S	(19-20)		09/07/11	0.64	37.275
SB-A-16S	(10-11)		09/08/11	0.005 U	0.179
SB-A-16S	(19-20)		09/08/11	3.5	12.585
SB-A-18LI	(53-54)		10/26/11	0.005 U	0.172
SB-A-18LI	(57-58)		10/26/11	0.005 U	0.180
SB-A-19s	(17-18)		10/25/11	11	11.164
SB-A-19s	(45-46)		10/25/11	0.005 U	0.170
SB-A-20s	(13-14)		10/24/11	8.6	13.033
SB-A-20s	(45-46)		10/24/11	0.005 U	0.168
SB-A-7s	(33-34)		07/07/11	0.19	0.285
SB-A-7s	(43-44)		07/07/11	0.041	0.133
SB-A-8s	(46-47)		07/06/11	45	61.254
SB-A-8s	(50-51)		07/06/11	52	55.967
SB-A-9s	(18-19)		07/06/11	3.4	6.076
SB-A-9s	(18-19)	X	07/06/11	2.3	4.575
SB-A-9s	(31-32)		07/06/11	0.35	0.516
SB-A-9s	(43-44)		07/06/11	0.005 U	0.073
SB-B-12LI	(46-47)		09/09/11	3.9	4.414
SB-B-12LI	(59-60)		09/09/11	0.0082	0.177
SB-B-13LI	(49-50)		09/09/11	3.6	3.810
SB-B-13LI	(62-63)		09/09/11	0.005 U	0.175
SB-B-14LI	(41-42)		09/09/11	13	13.211
SB-B-14LI	(41-42)	X	09/09/11	23	23.221
SB-B-14LI	(69-70)		09/09/11	0.005 U	0.167
SB-B-16LI	(1-2)		09/12/11	0.033	0.316
SB-B-16LI	(7-8)		09/12/11	0.01	0.206
SB-B-16LI	(29-30)		09/12/11	3.6	4.033
SB-B-16LI	(48-49)		09/12/11	0.43	0.859
SB-B-16LI	(67-68)		09/12/11	0.067	0.228
SB-B-17LI	(18-19)		09/13/11	0.12	0.609
SB-B-17LI	(42-43)		09/13/11	0.055	0.232
SB-B-17LI	(68-69)		09/13/11	0.005 U	0.169
SB-B-18LI	(21-22)		09/12/11	0.029	0.274
SB-B-18LI	(34-35)		09/12/11	11	12.300
SB-B-18LI	(67-68)		09/12/11	0.0056	0.173
SB-B-18LI	(67-68)	X	09/12/11	0.005 U	0.172
SB-B-19S	(23-24)		09/12/11	0.05	0.264
SB-B-19S	(43-44)		09/12/11	0.018	0.190
SB-B-20LI	(46-47)		09/14/11	0.005 U	0.162

SB-B-20LI	(66-67)		09/14/11	0.005 U	0.177
SB-B-21LI	(25-26)		09/10/11	0.026	0.209
SB-B-21LI	(42-43)		09/10/11	140	140.509
SB-B-21LI	(70-71)		09/10/11	0.013	0.179
SB-B-22LI	(36-37)		09/10/11	39	39.252
SB-B-22LI	(42-43)		09/10/11	640	640.316
SB-B-22LI	(42-43)	X	09/10/11	860	860.639
SB-B-22LI	(60-61)		09/10/11	4.4	4.570
SB-B-23S	(21-22)		09/16/11	0.036	0.203
SB-B-23S	(45-46)		09/16/11	0.005 U	0.168
SB-B-24S	(9-10)		09/16/11	0.18	0.355
SB-B-24S	(42-43)		09/16/11	0.0082	0.180
SB-B-24S	(42-43)	X	09/16/11	0.013	0.174
SB-B-8LI	(51-52)		09/08/11	3.9	4.148
SB-B-8LI	(65-66)		09/08/11	3.5	4.170
SB-B-8LI	(78-79)		09/08/11	2	2.265
SB-D-10LI	(25-26)		09/15/11	52	58.425
SB-D-10LI	(57-58)		09/15/11	0.005 U	0.158
SB-D-11S	(26-27)		10/29/11	52	52.156
SB-D-11S	(53-54)		10/29/11	0.005 U	0.170
SB-D-11S	(90-91)		10/29/11	0.005 U	0.170
SB-E-5LI	(61-62)		04/07/11	67	71.453
SB-E-5LI	(64-65)		04/07/11	56	58.551
SB-E-5LI	(77-78)		04/07/11	0.0078	0.187
SB-E-7LI	(23-24)		09/15/11	3.3	6.817
SB-E-7LI	(57-58)		09/15/11	4.3	4.484
SB-E-7LI	(67-68)		09/15/11	180	190.280
SB-MW-195S	(35-36)		09/13/11	5.7	6.351
SB-MW-20LI	(64-65)		09/13/11	7.1	9.057
S-C-6LI	(20-21)		03/14/11	0.0086	0.482
S-C-6LI	(47-48)		03/14/11	0.18	0.274
S-C-6LI	(60-61)		03/14/11	0.053	0.145
S-D-6LI	(18-19)		03/15/11	0.012	2.404
S-D-6LI	(26-27)		03/15/11	0.034	0.141
S-D-6LI	(52-53)		03/15/11	0.019	0.115
S-D-7LI	(16-17)		03/15/11	1.9	4.391
S-D-7LI	(22-23)		03/15/11	0.0078	0.197
S-D-7LI	(44-45)		03/15/11	2.1	2.191
S-D-7LI	(44-45)	X	03/15/11	2.1	2.190
S-E-4LI	(42-43)		03/14/11	8.5	8.855
S-E-4LI	(48-49)		03/14/11	1.5	1.749
S-E-4LI	(55-56)		03/14/11	0.06	0.168
S-E-6LI	(26-27)		05/23/11	24	26.014
S-E-6LI	(76-77)		05/23/11	0.023	0.115
S-F-2LI	(43-44)		03/10/11	1.1	1.198
S-F-2LI	(57-58)		03/10/11	4.3	4.413

S-F-2LI	(57-58)	X	03/10/11	3	3.110
S-F-2LI	(61-62)		03/10/11	5	5.141
S-MW-17LI	(59-60)		03/23/11	100	100.216
S-MW-17LI	(64-65)		03/23/11	210	216.210
S-MW-17LI	(67-68)		03/23/11	5.1	5.190

Results expressed in mg/Kg dry weight.

Total VOCs - Sum of detected compound concentrations.

Data Qualifiers:

U - Not detected above the given limit.

Soil Gas Sample Analytical Results for VOCs
Former Spectra-Physics Lasers Inc. and Former Teledyne Semiconductor Site
Mountain View, California
(concentrations reported in micrograms per cubic meter)

Sample ID	Sample Date	TCE	cis-1,2-DCE	VC	PCE	trans-1,2-DCE	1,1-DCA	1,2-DCB	1,1,1-TCA	Chloroform	Freon 113
SVP-1	05/14/2011	21,000	2,000	<20 J	1,600	35	<31	<46	<42	<38	<59
SVP-1	6/20/2011	18,000	2,200	<20	930	<31	<32	<47	<43	<38	<60
SVP-1	7/7/2011	19,000	1,800	<21	1,200	<32	<33	<49	<44	<40	<62
SVP-1	07/20/2011	15,000	1,600	<27	880	<43	<44	<65	<59	<52	<82
SVP-1	08/18/2011	14,000	1,100	<40	910	<61	<63	<93	<84	<76	<120
SVP-1	09/21/2011	15,000	1,100	<27	720	<42	<43	<63	<58	<52	<81
SVP-1	10/26/2011	9,600	1,000	<20	1,700	<31	<31	<46	<42	9,600	110
SVP-1	11/29/2011	13,000	1,100	<39	510	<60	<62	<91	<83	<74	<120
SVP-1	12/21/2011	11,000	1,300	<20	560	<32	<32	<48	<44	<39	<62
SVP-1	1/18/2012	11,000	1,500	<19	570	<30	<30	<45	<41	<37	<58
SVP-1	2/15/2012	11,000	1,300	<20	470	<31	<32	<47	<42	<38	<60
SVP-1	3/14/2012	11,000	1,300	<21	580	<32	<33	<49	<45	<40	90
SVP-1	4/25/2012	8,600	1,100	<13	440	<20	<21	<31	<28	<25	<39
SVP-1	5/15/2012	10,000	1,400	<19	520	<30	<30	<45	<41	<36	220
SVP-1	6/14/2012	13,000	1,400	<20	510	<31	<31	<46	<42	<38	440
SVP-1	7/18/2012	11,000	1,400	<16	520	<24	<25	<37	<34	<30	1,000
SVP-1	8/22/2012	14,000	950	<20	620	<31	<32	<47	<43	<38	1,000
SVP-1	9/20/2012	6,800	180	<7.9	450	<12	<12	<19	<17	<15	110
SVP-1	10/25/2012	7,400	160	<16	620	<25	<26	<38	<34	<31	140
SVP-1	11/28/2012	5,900	110	<10	510	<16	<16	<24	<22	20	590
SVP-1	1/17/2013	4,900	470	<13	380	<21	<21	<32	<29	<26	250
SVP-1	2/20/2013	300	310	<8.4	200	<13	<13	<20	<18	<16	250
SVP-2	05/14/2011	5,600	<31	<20 J	1,700	<31	<32	<47	<43	<38	<60

Soil Gas Sample Analytical Results for VOCs
Former Spectra-Physics Lasers Inc. and Former Teledyne Semiconductor Site
Mountain View, California
(concentrations reported in micrograms per cubic meter)

Sample ID	Sample Date	TCE	cis-1,2-DCE	VC	PCE	trans-1,2-DCE	1,1-DCA	1,2-DCB	1,1,1-TCA	Chloroform	Freon 113
SVP-2	6/20/2011	7,400	<31	<20	1,700	<31	<32	<47	<43	<38	<60
SVP-2	7/7/2011	11,000	<32	<20	2,600	<32	<32	<48	<44	<39	73
SVP-2	07/20/2011	7,600	<16	<10	1,400	<16	<16	<24	<22	<20	33
SVP-2	08/18/2011	8,900	<31	<20	1,900	<31	<31	<46	<42	<38	79
SVP-2	09/21/2011	7,800	<24	<16	1,700	<24	<25	<37	<34	<30	63
SVP-2	10/26/2011	4,700	<12	<8.1	1,400	<12	<13	<19	<17	<15	73
SVP-2	11/29/2011	6,000	<24	<16	1,400	<24	<25	<37	<33	<30	100
SVP-2	12/21/2011	3,900	<13	<8.2	940	<13	<13	<19	<18	<16	130
SVP-2	1/18/2012	6,100	<16	<10	1,400	<16	<17	<25	<22	<20	160
SVP-2	2/15/2012	6,100	<15	<9.4	1,500	<15	<15	<22	<20	<18	190
SVP-2	3/14/2012	5,200	<12	<7.8	1,600	<12	<12	<18	<16	<15	260
SVP-2	4/25/2012	4,400	<11	<6.9	1,800	<11	<11	<16	<15	<13	220
SVP-2	5/15/2012	5,300	<15	<9.9	1,700	<15	<16	<23	<21	<19	250
SVP-2	6/14/2012	5,800	<15	<9.9	1,700	<15	<16	<23	<21	<19	240
SVP-2	7/18/2012	2,600	<2.0	3.8	1,500	<10	<2.1	<3.1	7.2	4.8	220
SVP-2	8/22/2012	2,100	<5.4	<3.5	1,600	<5.4	<5.5	<8.2	8.4	<6.7	190
SVP-2	9/20/2012	1,800	<4.0	<2.6	1,500	<4.0	<4.1	<6.1	7.2	<5.0	200
SVP-2	10/25/2012	980	<1.2	<0.39	1,200	<6.0	<1.2	<1.8	6.9	4.8	160
SVP-2	11/28/2012	970	<1.3	<0.41	1,100	<6.4	<1.3	<1.9	7.6	4.8	150
SVP-2	1/17/2013	1,600	<1.2	<0.40	1,600	<6.3	<1.3	<1.9	9.0	6.8	150
SVP-2	2/20/2013	110	<0.12	<0.039	76	<0.60	<0.12	<0.18	0.70	0.70	14
SVP-4	05/14/2011	12,000	39,000	81 J	<210	2,100	<130	<190	<170	<150	<240
SVP-5	07/21/2011	230	8.2	<0.082	5.6	<1.3	<0.26	<0.39	0.59	3.9	80

Soil Gas Sample Analytical Results for VOCs
Former Spectra-Physics Lasers Inc. and Former Teledyne Semiconductor Site
Mountain View, California
(concentrations reported in micrograms per cubic meter)

Sample ID	Sample Date	TCE	cis-1,2-DCE	VC	PCE	trans-1,2-DCE	1,1-DCA	1,2-DCB	1,1,1-TCA	Chloroform	Freon 113
SVP-5	08/18/2011	250	4.5	<0.099	6.9	<1.5	<0.31	<0.47	0.63	3.0	27
SVP-5	09/21/2011	170	8.8	<0.079	7.6	<1.2	<0.25	<0.37	0.58	1.6	16
SVP-5	10/26/2011	110	9.6	0.11	6.8	<0.64	0.14	<0.19	0.43	2.9	83
SVP-5	11/29/2011	6.1	<0.12	<0.039	0.85	<0.60	<0.12	<0.46	<0.16	1.7	0.68
SVP-5	12/22/2011	3.1	<0.12	<0.040	0.65	<0.61	<0.12	<0.19	<0.17	1.8	0.96
SVP-5	1/18/2012	5.1	0.24	<0.040	0.76	<0.62	<0.13	<0.19	<0.17	3.1	1.7
SVP-5	2/15/2012	5.3	<0.13	<0.042	0.68	<0.65	<0.13	<0.20	<0.18	5.7	1.9
SVP-5	3/14/2012	3.4	<0.12	<0.040	0.72	<0.61	<0.12	0.32	<0.17	5.5	0.66
SVP-5	4/27/2012	5.6	3.2	<0.10	0.84	<1.6	<0.33	0.49	<0.45	5.4	1.9
SVP-5	5/16/2012	1.7	<0.12	<0.040	0.94	<0.63	<0.13	<0.19	<0.17	3.1	0.52
SVP-5	6/15/2012	1.6	<0.13	<0.042	0.66	<0.65	<0.13	<0.20	<0.18	2.2	0.54
SVP-5	7/20/2012	0.78	<0.13	<0.041	0.36	<0.64	<0.13	<0.19	<0.18	1.8	0.61
SVP-5	8/23/2012	<1.2	<0.89	<0.29	<1.5	<4.4	<0.91	<1.3	<1.2	2.8	<1.7
SVP-5	9/21/2012	0.63	<0.12	<0.040	0.30	<0.63	<0.13	<0.19	<0.17	1.6	0.51
SVP-5	10/25/2012	0.50	<0.12	<0.040	0.23	<0.63	<0.13	<0.19	<0.17	1.4	0.57
SVP-5	11/28/2012	0.40	<0.13	<0.041	0.45	<0.64	<0.13	<0.19	<0.18	3.0	0.55
SVP-6	07/21/2011	200	1.3	<0.057	2.2	<0.89	<0.18	<0.27	0.71	1.3	13
SVP-6	08/17/2011	330	8	3.20	2.4	<2.2	<0.44	<0.66	1.1	2.5	310
SVP-6	12/22/2011	190	240	6.70	1.1	5.5	<0.37	<0.55	<0.50	2.8	<0.70
SVP-6	1/18/2012	200	120	18	1.8	3.2	<0.25	<0.37	<0.34	5.6	0.84
SVP-6	2/15/2012	65	34	0.41	0.78	0.77	<0.13	<0.20	<0.18	6.2	0.77
SVP-6	3/14/2012	18	6.4	0.15	0.29	<0.63	<0.13	<0.19	<0.17	2.2	0.58
SVP-6	4/27/2012	27	14	0.099	0.35	0.71	0.24	<0.18	<0.16	8.1	0.88

Soil Gas Sample Analytical Results for VOCs
Former Spectra-Physics Lasers Inc. and Former Teledyne Semiconductor Site
Mountain View, California
(concentrations reported in micrograms per cubic meter)

Sample ID	Sample Date	TCE	cis-1,2-DCE	VC	PCE	trans-1,2-DCE	1,1-DCA	1,2-DCB	1,1,1-TCA	Chloroform	Freon 113
SVP-6	5/16/2012	4.5	1.9	0.039	<0.21	<0.60	<0.12	<0.18	<0.16	1.0	0.53
SVP-6	6/15/2012	2.8	1.0	<0.041	<0.22	<0.64	<0.13	<0.19	<0.18	0.74	0.51
SVP-6	7/20/2012	3.4	2.0	<0.043	<0.23	<0.67	<0.14	<0.20	<0.18	1.0	1.3
SVP-6	8/23/2012	4.5	4.0	0.21J	<1.2	<3.4	<0.69	<1.0	<0.93	1.1	1.9
SVP-6	9/21/2012	2.2	1.2	0.040	<0.21	<0.61	<0.12	<0.19	<0.17	0.8	0.74
SVP-6	10/25/2012	2.0	0.86	<0.040	1.3	<0.61	<0.12	<0.19	<0.17	1.9	0.70
SVP-6	11/28/2012	0.68	0.24	<0.043	0.37	<0.67	<0.14	<0.20	<0.18	0.65	0.60
SVP-7	07/21/2011	270	0.47	<0.070	29	<1.1	<0.22	<0.33	<0.30	1.4	8.9
SVP-7	08/17/2011	300	0.66	<0.13	31	<2.0	<0.42	<0.62	<0.56	1.8	5.8
SVP-7	11/29/2011	960	58	<0.34	62	<5.2	1.4	<4.0	<1.4	1.3	18.0
SVP-7	12/27/2011	200	5.2	<0.060	17	<0.93	<0.19	<0.28	<0.26	1.2	2.2
SVP-7	1/18/2012	160	2.9	<0.082	19	<1.3	<0.26	<0.39	<0.35	1.9	2.6
SVP-7	5/16/2012	150	6.4	<0.082	26	<1.3	<0.26	<0.39	<0.35	1.4	2.9
SVP-7	6/15/2012	6.5	0.69	<0.043	1.9	<0.67	<0.14	<0.20	<0.18	0.37	0.51
SVP-7	7/20/2012	55.0	1.6	<0.042	11	<0.65	<0.13	<0.20	<0.18	6.30	3.30
SVP-7	8/23/2012	5.0	0.30	<0.039	1.5	<0.60	<0.12	<0.18	<0.16	4.00	0.59
SVP-7	9/21/2012	5.4	0.27	<0.040	1.6	<0.61	<0.12	<0.19	<0.17	3.50	0.57
SVP-7	10/26/2012	5.0	0.66	<0.041	1.3	<0.64	<0.13	<0.19	<0.18	0.81	0.57
SVP-7	11/28/2012	11	0.53	<0.041	1.5	<0.63	<0.13	<0.19	<0.17	1.10	0.63
SVP-8	07/21/2011	3,600	17	<7.2	560	<11	<11	<17	<15	<14	<21
SVP-8	08/17/2011	5,000	24	<8.4	740	<13	<13	<20	<18	<16	<25
SVP-8	09/21/2011	7,400	<25	<16	890	<25	<26	<38	<34	<31	<48
SVP-8	10/26/2011	5,800	14	<8.2	830	<13	<13	<19	<18	<16	36

Soil Gas Sample Analytical Results for VOCs
Former Spectra-Physics Lasers Inc. and Former Teledyne Semiconductor Site
Mountain View, California
(concentrations reported in micrograms per cubic meter)

Sample ID	Sample Date	TCE	cis-1,2-DCE	VC	PCE	trans-1,2-DCE	1,1-DCA	1,2-DCB	1,1,1-TCA	Chloroform	Freon 113
SVP-8	11/29/2011	87	<0.12	<0.039	18	<0.60	<0.12	<0.46	<0.16	0.42	0.59
SVP-8	12/27/2011	660	76	120	53	<12	<12	<18	<16	17	6,000
SVP-8	1/18/2012	290	29	0.10	34	<1.2	<0.26	<0.38	<0.34	15	29
SVP-8	2/15/2012	63	0.63	<0.042	15	<0.65	<0.13	<0.20	<0.18	7.7	1.6
SVP-8	3/14/2012	75	<0.13	<0.041	18	<0.64	<0.13	<0.19	<0.18	3.0	0.71
SVP-8	4/25/2012	140	<3.4	<2.2	32	<3.4	<3.5	<5.1	<4.7	<4.2	1,800
SVP-8	5/16/2012	40	<0.12	<0.040	13	<0.63	<0.13	<0.19	<0.63	1.3	0.78
SVP-8	6/15/2012	72	<0.13	<0.043	22	<0.67	<0.14	<0.20	<0.18	2.6	0.86
SVP-8	7/20/2012	12	<0.14	<0.045	4.4	<0.69	<0.14	<0.21	<0.19	2.0	0.68
SVP-8	8/23/2012	18	<0.13	<0.042	5.4	<0.65	<0.13	<0.20	<0.18	1.3	0.69
SVP-8	9/20/2012	14	<0.13	<0.042	4.0	<0.65	<0.13	<0.20	<0.18	0.91	0.80
SVP-8	10/26/2012	14	<0.13	<0.042	4.1	<0.65	<0.13	<0.20	<0.18	0.90	0.91
SVP-8	11/28/2012	5.4	<0.20	<0.065	1.6	<1.0	<0.20	<0.30	<0.28	0.59	0.53
SVP-9	6/20/2011	12,000	190	<19	3,100	<30	<30	<45	<41	<36	640
SVP-9	07/20/2011	12,000	140	<25	4,000	<39	<40	<59	<54	<48	410
SVP-9	08/17/2011	10,000	53	<17	3,000	<26	<26	<39	<36	<32	280
SVP-9	09/21/2011	5,800	19	<9.9	1,800	<15	<16	<23	<21	22	150
SVP-9	10/26/2011	6,200	72	<7.9	2,500	<12	<12	<19	<17	18	480
SVP-9	11/29/2011	43	<0.12	<0.039	45	<0.60	<0.12	<0.46	<0.16	1.5	0.91
SVP-9	12/27/2011	23	<0.12	<0.040	24	<0.61	<0.12	<0.19	<0.17	0.81	58
SVP-9	1/18/2012	16	<0.12	<0.038	19	<0.59	<0.12	<0.18	<0.16	0.58	6.1
SVP-9	2/15/2012	0.36	<0.13	<0.041	<0.22	<0.64	<0.13	<0.19	<0.18	0.22	0.3
SVP-9	3/14/2012	17	<0.13	<0.041	20	<0.64	<0.13	<0.19	<0.18	0.72	0.56

Soil Gas Sample Analytical Results for VOCs
Former Spectra-Physics Lasers Inc. and Former Teledyne Semiconductor Site
Mountain View, California
(concentrations reported in micrograms per cubic meter)

Sample ID	Sample Date	TCE	cis-1,2-DCE	VC	PCE	trans-1,2-DCE	1,1-DCA	1,2-DCB	1,1,1-TCA	Chloroform	Freon 113
SVP-9	4/25/2012	43	<0.28	<0.089	49	<1.4	<0.28	0.60	<0.38	1.8	97
SVP-9	5/16/2012	13	<0.13	<0.042	19	<0.65	<0.13	<0.20	<0.18	0.66	0.55
SVP-9	6/15/2012	10	<0.13	<0.043	15	<0.67	<0.14	<0.20	<0.18	0.76	0.72
SVP-9	7/20/2012	17	<0.14	<0.045	22	<0.69	<0.14	<0.21	<0.19	1.1	3.8
SVP-9	8/23/2012	41	0.32	<0.043	36	<0.67	<0.14	<0.20	<0.18	1.5	15
SVP-9	9/20/2012	100	0.89	<0.040	75	<0.61	<0.12	<0.19	<0.17	2.6	47
SVP-9	10/26/2012	110	1.2	<0.039	71	<0.60	<0.12	<0.18	<0.16	5.1	11
SVP-9	11/28/2012	130	0.91	<0.055	96	<0.86	<0.18	<0.26	<0.24	12	17
SVP-10	07/21/2011	700	<9.7	<6.2	170	<9.7	<9.9	<15	<13	<12	4,200
SVP-10	08/18/2011	2,200	<11	<6.8	320	<11	<11	<16	<15	<13	18,000 E
SVP-10	09/22/2011	140	0.22	<0.067	19	<1.0	<0.21	<0.32	0.67	0.39	200
SVP-10	10/27/2011	3,700	<10	<6.5	270	<10	<10	<15	22	<12	4,100
SVP-10	11/30/2011	6,200	<18	<12	410	<18	<19	<28	<25	<22	4,400
SVP-10	12/27/2011	5,000	<12	<7.9	410	<12	<12	<19	23	<15	3,500
SVP-10	1/19/2012	3,800	<12	<7.5	230	<12	<12	<18	<16	<14	1,700
SVP-10	2/16/2012	5,400	<15	<9.8	400	<15	<15	<23	<21	<19	1,200
SVP-10	3/15/2012	5,100	<13	<8.2	360	<13	<13	<19	17J	<16	1,300
SVP-10	4/26/2012	5,600	<13	<8.4	520	<13	<13	<20	<18	<16	2,900
SVP-10	5/17/2012	290	<1.2	<0.40	42	<6.1	<1.2	<1.9	<1.7	<1.5	1,600
SVP-10	9/20/2012	6,800	<17	<11	980	<17	<18	<26	<24	<21	9,600
SVP-10	10/26/2012	3,600	<32	<21	880	<32	<33	<49	<45	<40	19,000
SVP-10	11/29/2012	3,800	<310	<200	700	<310	<320	<470	<430	<380	180,000
SVP-10	1/17/2013	660	<75	<48	320	<75	<77	<110	<100	<93	24,000

Soil Gas Sample Analytical Results for VOCs
Former Spectra-Physics Lasers Inc. and Former Teledyne Semiconductor Site
Mountain View, California
(concentrations reported in micrograms per cubic meter)

Sample ID	Sample Date	TCE	cis-1,2-DCE	VC	PCE	trans-1,2-DCE	1,1-DCA	1,2-DCB	1,1,1-TCA	Chloroform	Freon 113
SVP-10	2/20/2013	180	<7.8	<5.0	72	<7.8	<8.0	<12	<11	<9.6	4,800
SVP-17	11/11/2011	12,000	330	<22	66	<35	<35	<53	<48	16,000	<67
SVP-17	11/30/2011	18,000	380	<40	<100	<61	<63	<93	<84	<76	<120
SVP-17	12/27/2011	10,000	130	<19	470	<30	<31	<46	<41	<37	<58
SVP-17	1/19/2012	11,000	160	<19	480	<30	<30	<45	<41	<37	<58
SVP-17	2/16/2012	11,000	180	<19	490	<30	<30	<45	<41	<36	<57
SVP-17	3/15/2012	9,500	160	<16	380	<24	<25	<37	<34	<30	<48
SVP-17	4/27/2012	10,000	170	<16	530	<24	<25	<37	<34	<30	<48
SVP-17	5/17/2012	11,000	170	<20	580	<32	<32	<48	<44	<39	<62
SVP-17	6/14/2012	13,000	200	<19	580	<30	<30	<45	<41	<36	<57
SVP-17	7/19/2012	11,000	220	<14	560	<21	<22	<32	<29	<26	<41
SVP-17	8/22/2012	2,300	33	<3.8	83	<5.9	<6.0	<9.0	<8.1	<7.3	<11
SVP-17	9/20/2012	11,000	160	<16	540	<24	<25	<37	<34	<30	<48
SVP-17	10/26/2012	8,400	240	<19	490	<30	<30	<45	<41	<36	<57
SVP-17	11/29/2012	7,400	230	<13	380	<20	<20	<30	<27	<24	<38
SVP-17	1/17/2013	5,300	200	<7.6	400	<12	13	<18	<16	<14	<23
SVP-17	2/20/2013	3,900	130	<6.4	190	<9.8	<10	<15	<14	<12	<19
SVP-18	11/11/2011	10,000	120	<14	380	<22	<23	<34	<30	8,700	55
SVP-18	11/30/2011	17,000	130	<24	610	<38	<39	<58	<52	<47	<74
SVP-18	12/27/2011	14,000	520	<21	100	<33	<34	<50	<46	<41	77
SVP-18	1/19/2012	13,000	450	<25	81	<39	<40	<60	<54	<48	<76
SVP-18	2/16/2012	13,000	420	<21	82	<32	<33	<49	<44	<40	<62
SVP-18	3/15/2012	14,000	460	<19	89	<30	<31	<46	<41	<37	<58

Soil Gas Sample Analytical Results for VOCs
Former Spectra-Physics Lasers Inc. and Former Teledyne Semiconductor Site
Mountain View, California
(concentrations reported in micrograms per cubic meter)

Sample ID	Sample Date	TCE	cis-1,2-DCE	VC	PCE	trans-1,2-DCE	1,1-DCA	1,2-DCB	1,1,1-TCA	Chloroform	Freon 113
SVP-18	4/26/2012	16,000	440	<21	120	<33	<34	<50	<46	<41	<64
SVP-18	5/17/2012	16,000	400	<32	100	<50	<51	<76	<69	<62	<97
SVP-18	6/14/2012	21,000	490	<29	140	<44	<45	<67	<61	<55	<86
SVP-18	7/19/2012	17,000	500	<23	170	<36	<37	<55	<50	<45	<70
SVP-18	8/22/2012	25,000	460	<40	210	<61	<63	<93	<84	<76	<120
SVP-18	9/20/2012	23,000	520	<39	200	<60	<62	<91	<83	<74	<120
SVP-18	10/26/2012	13,000	440	<28	150	<44	<45	<66	<60	<54	<85
SVP-18	11/29/2012	10,000	280	<20	130	<31	<32	<47	<43	<38	<60
SVP-18	1/17/2013	6,500	97	<7.6	150	<12	<12	<18	<16	<14	<23
SVP-18	2/20/2013	7,000	110	<11	120	<17	<17	<25	<23	<21	<32
SVP-19	11/11/2011	890	<16	<10	270	<16	<16	<24	<22	7,600	34
SVP-19	11/30/2011	790	<1.2	<0.39	270	<6.0	<1.2	<4.8	6.8	11	27
SVP-19	12/27/2011	830	<0.77	<0.25	210	<3.8	<0.78	<1.2	5.4	5.2	22
SVP-19	1/19/2012	960	<1.2	<0.39	250	<6.1	<1.2	<1.8	5.9	4.6	24
SVP-19	2/16/2012	610	<0.61	<0.20	200	<3.1	<0.63	<0.93	5.1	3.8	17
SVP-19	3/15/2012	130	<0.12	<0.040	42	<0.61	<0.12	<0.19	0.97	0.86	4.0
SVP-19	4/26/2012	890	0.87	0.32	240	<3.2	<0.66	<0.99	6.3	5.3	87
SVP-19	5/17/2012	730	3.0	0.62	260	<3.9	<0.80	<1.2	5.6	4.4	120
SVP-19	8/22/2012	4,600	49	<8.1	720	<12	<13	<19	<17	<15	47
SVP-19	10/26/2012	14,000	1,300	110	1,500	<39	<40	<59	<54	<48	<75
SVP-19	1/17/2013	5,800	1,800	28	970	24	<13	<19	<18	<16	30
SVP-19	2/20/2013	3,800	120	<6.4	570	<9.8	<10	<15	<14	<12	19

Soil Gas Sample Analytical Results for VOCs
Former Spectra-Physics Lasers Inc. and Former Teledyne Semiconductor Site
Mountain View, California
(concentrations reported in micrograms per cubic meter)

Sample ID	Sample Date	TCE	cis-1,2-DCE	VC	PCE	trans-1,2-DCE	1,1-DCA	1,2-DCB	1,1,1-TCA	Chloroform	Freon 113

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

VOC = volatile organic compound
TCE = trichloroethene
cis-1,2-DCE = cis-1,2-dichloroethene
VC = vinyl chloride
PCE = tetrachloroethene
trans-1,2-DCE = trans-1,2-dichloroethene
1,1-DCA = 1,1-dichloroethane
1,2-DCB = 1,2-dichlorobenzene
1,1,1-TCA = 1,1,1-trichloroethane

< = not detected above the laboratory reporting limit
J = estimated value; recovery of laboratory quality control sample results exceed quality control limits for vinyl chloride.
E = exceeds instrument calibration range

Table 3

Data Summary for Residential Indoor Air Sample Results
Former Spectra-Physics Lasers and Former Teledyne Semiconductor Facilities
Mountain View, California

(concentrations reported in micrograms per cubic meter)

(Updated July 2013)

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												
SSRB3-OA-5**	10/27/2010	OA	<0.38	<0.28	<0.089	<0.47	<1.4	<0.28	<0.42	<0.38	<0.34	0.62
SSRB11-OA-22	12/14/2010	OA	<0.19	<0.14	<0.045	<0.24	<0.69	<0.14	<0.21	<0.19	**0.22**	**0.77**
SSRB11-OA-22-EPA	12/14/2010	OA	<0.4 J,Q2	<0.3 J,Q2	<0.19 J,Q2	<0.51 J,Q2	<0.3 C1	<0.3 J,Q2	<0.45 J,Q2	<0.41 J,Q2	<0.37 J,Q2	**0.3 C1,J,Q2**
SSRB11-OA-23	12/14/2010	OA	<0.2	<0.14	<0.047	<0.25	<0.72	<0.15	<0.22	<0.2	<0.18	**0.54**
SSRB8-OA-30	12/15/2010	OA	<0.19	<0.14	<0.045	<0.24	<0.69	<0.14	<0.21	<0.19	<0.17	**0.53**
SSRB9-OA-36	12/15/2010	OA	**0.92**	<0.14	<0.047	<0.25	3	<0.15	<0.22	<0.2	<0.18	**0.59**
SSRB9-OA-42	12/16/2010	OA	**1.2**	<0.14	<0.044	<0.23	<0.68	<0.14	<0.2	<0.19	**0.26**	**0.63**
SSRB-13-50	09/01/2011	OA	<0.18	<0.14	<0.044	<0.23	<0.68	<0.14	<0.21	<0.19	**0.18**	**0.50**
NBRB-15-OA-56	7/18/2013	OA	<0.18	<0.13	<0.043	<0.23	<0.67	<0.14	<0.20	<0.18	0.26	0.58
Tier 2 - Comparison to Short-Term Health Risk-Based Screening Criteria[1]												
Acute Screening Level			10,748	793*	1,278	1,357	793	NA	NA	10,914	488	NA
Short-Term Screening Levels			537	793*	77	NA	793	NA	NA	3,820	244	NA
Tier 3 - Comparison to Long-Term Health Risk-Based Screening Criteria												
Residential Screening Level[2]			1.2	63	0.16	0.41	63	1.5	210	5,200	0.11	31,000
Residential Screening Level[3]			0.43	63#	0.16	9.4	63	1.5	210	5,200	0.11	31,000
Indoor Air Sample Results												
SSRB1-IA-1	10/27/2010	LR	<0.22	<0.16	<0.053	**0.63**	<0.82	<0.17	<0.25	<0.22	**0.58**	**0.58**
SSRB1-IA-2	10/27/2010	CS	<0.17	<0.12	<0.04	<0.21	<0.63	<0.13	<0.19	<0.17	**0.3**	**0.62**
SSRB2-IA-3	10/27/2010	LR***	**0.23**	<0.1	<0.033	<0.18	<0.52	<0.1	<0.16	<0.14	**1.5**	**0.99**
SSRB2-IA-4	10/27/2010	CS	**0.22**	<0.13	<0.041	<0.22	<0.64	<0.13	<0.19	<0.18	**0.28**	**0.57**
SSRB3-IA-6**	10/27/2010	LR	<0.41	<0.3	<0.098	<0.52	<1.5	<0.31	**2**	<0.42	**2.5**	**0.7**
SSRB3-IA-6-EPA	10/27/2010	LR***	**0.22 C1 J**	<0.2	<0.13	**0.23 C1 J**	<0.2	<0.2	**3.5**	<0.27	**3.1**	**0.61**
SSRB3-IA-7	10/27/2010	CS***	**0.36**	<0.11	<0.034	<0.18	<0.53	<0.11	<0.16	<0.15	**0.32**	**1.2**
SSRB3-IA-7-EPACS	10/27/2010	CS***	**0.4**	<0.2	<0.13	**0.25 C1 J**	<0.2	<0.2	<0.3	<0.27	**0.37**	**0.69**
SSRB4-IA-8	10/27/2010	LR	<0.16	<0.12	<0.039	<0.21	<0.6	<0.12	<0.18	<0.16	**1.4**	**0.55**
SSRB4-IA-8-EPA	10/27/2010	LR***	<0.27	<0.2	<0.13	<0.34	<0.2	<0.2	<0.3	<0.27	**2.4**	**0.56**
SSRB4-IA-9	10/27/2010	CS	<0.2	<0.14	<0.047	<0.25	<0.72	<0.15	<0.22	<0.2	**0.51**	**1**
SSRB4-IA-9-EPACS	10/27/2010	CS***	<0.27	<0.2	<0.13	<0.34	<0.2	<0.2	<0.3	<0.27	**0.3**	**0.57**
SSRB5-IA-10	10/27/2010	LR	**0.16**	<0.12	<0.037	<0.2	<0.58	<0.12	<0.18	<0.16	**1.1**	**0.99**
SSRB5-IA-11	10/27/2010	CS	**0.2**	<0.12	<0.04	<0.21	<0.61	<0.12	<0.19	<0.17	**0.33**	**0.65**
SSRB6-IA-12	10/27/2010	LR	**1.2**	<0.14	<0.045	**0.24**	<0.69	<0.14	<0.21	**0.19**	**0.54**	**0.71**
SSRB6-IA-34	12/15/2010	LR	**1.8**	<0.15	<0.048	**0.28**	<0.74	<0.15	<0.22	**0.2**	**0.5**	**0.54**
SSRB6-IA-13	10/27/2010	CS***	**0.81**	<0.1	<0.034	<0.18	<0.62	<0.11	<0.16	<0.14	**0.34**	**0.65**

Data Summary for Residential Indoor Air Sample Results
Former Spectra-Physics Lasers and Former Teledyne Semiconductor Facilities
Mountain View, California

(concentrations reported in micrograms per cubic meter)

(Updated July 2013)

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
SSRB6-IA-35	12/15/2010	CS	**0.75**	<0.14	<0.044	<0.23	<0.68	<0.14	<0.2	<0.19	**0.18**	**0.55**
SSRB7-IA-14	10/27/2010	LR	**0.98**	<0.11	<0.037	**0.46**	<0.57	<0.12	<0.17	**0.74**	**1.2**	**0.7**
SSRB7-IA-46	12/16/2010	LR	**1.2**	<0.14	<0.045	**0.52**	<0.69	<0.14	<0.21	**4.3**	**0.9**	**0.56**
SSRB7-IA-15	10/27/2010	CS	**1.2**	<0.11	<0.036	<0.19	<0.55	<0.11	<0.17	<0.15	**0.32**	**0.73**
SSRB7-IA-47	12/16/2010	CS	**0.88**	<0.12	<0.04	<0.21	<0.63	<0.13	<0.19	<0.17	**0.27**	**0.54**
SSRB8-IA-16	10/27/2010	LR	**1.8**	<0.13	<0.043	<0.23	<0.67	<0.14	<0.2	**1.9**	**3.7**	**0.79**
SSRB8-IA-16-EPA	10/27/2010	LR***	**1.8**	<0.2	<0.13	**0.32 C1 J**	<0.2	<0.2	<0.3	**1.9**	**3.2 RE2**	**0.7**
SSRB8-IA-31	12/15/2010	LR	**1.3**	<0.14	<0.047	**3.9**	<0.72	<0.15	<0.22	**2.8**	**2.8**	**0.64**
SSRB8-IA-31-EPA	12/15/2010	LR***	**0.78 J,Q2**	<0.25 J,Q2	<0.16 J,Q2	**4.2 J,Q2**	**0.13 J,C1**	<0.25 J,Q2	<0.38 J,Q2	**2.8 J,Q2**	**2.3 J,Q2**	**0.33 Q2,C1,J**
SSRB8-IA-17	10/27/2010	CS***	**0.8**	<0.1	<0.033	**0.19**	<0.52	<0.1	<0.16	<0.14	**0.42**	**0.68**
SSRB8-IA-17-EPACS	10/27/2010	CS***	**0.95**	**0.14 C1 J**	<0.13	**0.34**	<0.2	<0.2	<0.3	<0.27	**0.44**	**0.59**
SSRB8-IA-32	12/15/2010	CS	**0.59**	<0.13	<0.041	<0.22	<0.64	<0.13	<0.19	<0.18	**0.17**	**0.74**
SSRB8-IA-32-CSEPA	12/15/2010	CS***	<0.27 J,Q2	<0.2 J,Q2	<0.13 J,Q2	<0.34 J,Q2	<0.2 U	<0.2 J,Q2	<0.3 J,Q2	<0.27 J,Q2	<0.24 J,Q2	**0.29 C1,J,Q2**
SSRB8-IA-33	12/15/2010	BR	**1.2**	<0.14	<0.046	**4.8**	<0.71	<0.14	<0.22	**2.2**	**8.4**	**0.6**
SSRB9-IA-18	10/27/2010	LR	**0.56**	<0.11	<0.035	**0.19**	<0.54	<0.11	<0.16	<0.15	**1.7**	**0.71**
SSRB9-IA-37	12/16/2010	LR	**0.84**	<0.16	<0.053	**0.32**	<0.82	<0.17	<0.25	<0.22	**1.3**	**0.58**
SSRB9-IA-43	12/16/2010	LR	**0.82**	<0.14	<0.047	**0.26**	<0.72	<0.15	<0.22	<0.2	**1.2**	**0.6**
SSRB9-IA-19	10/27/2010	CS***	**0.95**	<0.1	<0.033	<0.18	<0.52	<0.1	<0.16	<0.14	**0.28**	**0.97**
SSRB9-IA-38	12/15/2010	CS	**0.89**	<0.14	<0.046	<0.24	<0.71	<0.14	<0.22	<0.2	<0.17	**0.6**
SSRB9-IA-44	12/16/2010	CS	**1.3**	<0.13	<0.042	<0.22	<0.65	<0.13	<0.2	<0.18	**0.26**	**0.65**
SSRB9-IA-39	12/15/2010	GR	**0.43**	<0.14	<0.047	<0.25	<0.72	<0.15	<0.22	**0.91**	<0.18	<0.28
SSRB9-IA-45	12/16/2010	GR	**0.84**	<0.14	<0.047	**1.4**	<0.72	<0.15	<0.22	**0.48**	**0.3**	**0.56**
SSRB10-IA-20	12/14/2010	LR	**0.53**	<0.15	<0.049	**0.33**	<0.76	<0.15	<0.23	<0.21	**3.2**	**0.59**
SSRB10-IA-20-EPA	12/14/2010	LR***	**0.27 J,Q2**	<0.2 J,Q2	<0.13 J,Q2	**0.29 C1,J,Q2**	<0.2 U	<0.2 J,Q2,U	<0.3 J,Q2	<0.27 J,Q2,U	**2.1 J,Q2**	**0.29 C1,J,Q2**
SSRB10-IA-21	12/14/2010	CS	**0.84**	<0.15	<0.049	<0.26	<0.76	<0.15	<0.23	<0.21	<0.19	**0.56**
SSRB10-IA-21-CSEPA	12/14/2010	CS	**0.57 J,Q2**	<0.33 J,Q2	<0.21 J,Q2	<0.56 J,Q2	<0.33 U	<0.34 J,Q2	<0.5 J,Q2	<0.45 J,Q2	<0.41 J,Q2	**0.32 C1,J,Q2**
SSRB11-IA-24	12/14/2010	LR***	**0.31**	<0.1	<0.034	**0.19**	<0.52	<0.11	<0.16	<0.14	**0.83**	**0.71**
SSRB11-IA-24-EPA	12/14/2010	LR	**0.21 C1,J,Q2**	<0.3 J,Q2	<0.19 J,Q2	<0.51 J,Q2	<0.3 U	<0.3 J,Q2	<0.45 J,Q2	<0.41 J,Q2	**0.53 J,Q2**	**0.3 Q2,C1,J**
SSRB11-IA-25	12/14/2010	CS	<0.2	<0.15	<0.048	<0.25	<0.74	<0.15	<0.22	<0.2	**0.19**	**0.58**
SSRB11-IA-25-CSEPA	12/14/2010	CS	<0.4 J,Q2	<0.3 J,Q2	<0.19 J,Q2	<0.51 J,Q2	<0.3 C1	<0.3 J,Q2	<0.45 J,Q2	<0.41 J,Q2	<0.37 J,Q2	**0.3 Q2,C1,J**
SSRB12-IA-26	12/14/2010	LR	**0.27**	<0.16	<0.05	<0.26	<0.78	<0.16	<0.24	<0.21	**5.2**	**0.51**
SSRB12-IA-27	12/14/2010	CS	**0.28**	<0.15	<0.049	<0.26	<0.76	<0.15	<0.23	<0.21	<0.19	**0.51**
SSRB13-IA-28	12/14/2010	LR	**0.85**	<0.16	<0.05	<0.26	<0.78	<0.16	<0.24	<0.21	**2.4**	**0.57**

Data Summary for Residential Indoor Air Sample Results
Former Spectra-Physics Lasers and Former Teledyne Semiconductor Facilities
Mountain View, California

(concentrations reported in micrograms per cubic meter)

(Updated July 2013)

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
SSRB13-IA-29	12/14/2010	CS	**0.56**	<0.14	<0.045	<0.24	<0.69	<0.14	<0.21	<0.19	**0.26**	**0.6**
SSRB-13-48	09/01/2011	LR	**1.5**	**1.4**	**0.068**	<0.23	<0.68	<0.14	<0.21	<0.19	**3.1**	**0.68**
SSRB-13-49	09/01/2011	CS	**0.26**	<0.14	<0.046	<0.24	<0.71	<0.14	<0.22	<0.20	**0.18**	**0.49**
SSRB-13-51	09/01/2011	LR	**1.6**	**1.4**	**0.07**	<0.33	<0.97	<0.20	<0.29	<0.27	**3.4**	**0.66**
SSRB14-IA-40-EPA-1	12/14/2010	LR***	**0.28 J,Q2**	<0.2 J,Q2	<0.13 J,Q2	**1.4 J,Q2**	<0.2 U	<0.2 J,Q2	<0.3 J,Q2	<0.27 J,Q2	**1.3 J,Q2**	**0.3 C1,J,Q2**
SSRB14-IA-40-EPA-2	12/14/2010	LR	<10	<8	<5	<10	<8	<8	<10	<10	<10	<20
SSRB14-IA-41-EPACS	12/14/2010	CS***	<8	<6	<4	<10	<6	<6	<9	<8	<7	<10
NBRB-15-CS-52	7/18/2013	CS	<0.18	<0.13	<0.042	<0.22	<0.66	<0.13	<0.20	<0.18	**0.21**	**0.57**
NBRB-15-CS-53	7/18/2013	CS	**0.22**	<0.13	<0.042	<0.22	<0.65	<0.13	<0.20	<0.18	**0.23**	**0.55**
NBRB-15-IA-54	7/18/2013	LR	**0.22**	<0.14	<0.046	<0.25	<0.72	<0.15	<0.22	<0.20	**0.77**	**0.55**
NBRB-15-IA-55	7/18/2013	LR	**0.25**	<0.14	<0.044	<0.23	<0.68	<0.14	<0.21	<0.19	**1.1**	**0.56**
NBRB-15-DUP (duplicate to IA-55)	7/18/2013	LR	**0.25**	<0.14	<0.046	<0.24	<0.72	<0.15	<0.22	<0.20	**1.2**	**0.56**

Notes:

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

1 = Tier 2 screening levels presented in the Work Plan to Evaluate Potential Vapor Intrusion in the Off-Property Study Area and at 1250 West Middlefield Road (ARCADIS 2010).

2 = Tier 3 screening levels presented in the Work Plan to Evaluate Potential Vapor Intrusion in the Off-Property Study Area and at 1250 West Middlefield Road (ARCADIS 2010).

3 = USEPA Regional Screening Level, revised May 2013 (USEPA 2013).

TCE = trichloroethene
cis-1,2-DCE = cis-1,2-dichloroethene
VC = vinyl chloride
PCE = tetrachloroethene

trans-1,2-DCE = trans-1,2-dichloroethene
1,1-DCA = 1,1-dichloroethane
1,2-DCB = 1,2-dichlorobenzene
1,1,1-TCA = 1,1,1-trichloroethane

LR = living area sample location
CS = crawl space sample location
OA = outdoor air sample location
BR = Bathroom

GR = Garage

NA = not available
J = The reported result for this analyte should be considered an estimated value
C1 = The reported concentration for this analyte is below the quantitation limit
Q2 = The laboratory control standard associated with this sample did not meet recovery criteria for this analyte
RE2 = Result is from a sample re-analysis

* = Trans-1,2-DCE MRLs and RSLs are used for cis-1,2-DCE
** = Sample canister had a high vacuum at the time of sample collection that resulted in a large dilution factor
*** = Sample considered a grab sample due to low vacuum measured at the time of sample collection

USEPA = United States Environmental Protection Agency
bold value = detected value

Table 4

Former Teledyne Semiconductor Spectra Physics Site
Mountain View, California
October 2013

Aquifer Unit	Monitoring Location	Collection Date	cis-1,2-DCE (µg/L)	PCE (µg/L)	TCE (µg/L)	VC (µg/L)	Total VOCs (µg/L)	Ethane (µg/L)	Ethene (µg/L)
Shallow Zone	A-1S	04/19/11	67	1.6	110		196.9	--	--
	A-2S	04/19/11	47		36		84.7	--	--
	A-3S	04/19/11	81		50		211.7	--	--
	A-4S	04/19/11	77	1	190		269.8	--	--
	A-5S	04/19/11	61	1.1	140		202.1	--	--
	A-6S	04/19/11	36		47		149.7	--	--
	A-7S	07/09/11	88	16	830		1073.0	--	--
	A-8S	07/08/11	5500	3600	220000	26	244881.3	--	--
		07/30/13	270000	340	33000	280	308650.0	--	--
	A-9S	07/09/11	220	3.4	430	1	680.9	--	--
		07/30/13	29		1.1	20	55.5	--	--
	A-10S	07/19/11	26		43		72.1	--	--
	A-11S	07/19/11	19		36		59.8	--	--
	A-14S	07/19/11	52	1.8	97		157.1	--	--
		07/30/13	6				153.8	--	--
	A-15S	09/20/11	5800	530	120000	13	127181.7	--	--
		07/30/13	85000			25000	112238.0	4.6	5500
	A-16S	09/20/11	60	2.7	190		268.6	--	--
	A-17S	10/06/11	8.8	2.5	63		86.3	--	--
	A-18S	10/06/11	14	2.7	2500		2523.5	--	--
		07/30/13	550			210	760.0	--	--
	A-19S	10/31/12	6.6		5.7		12.3	--	--
	TW-1	10/03/11	100		110		214.6	--	--
	TW-2	10/03/11	17		77		95.3	--	--
	TW-3	10/03/11	1.3		1.4		3.6	--	--
	TW-8	12/07/11	91		140		233.8	--	--
	TW-9	12/07/11	100	6.3	210		320.3	--	--
	TW-A-14S	11/09/11	1700	180	240	14	2295.9	--	--
	TW-A-16S	11/09/11	99	9.3	150		279.0	--	--
	TW-A-17S	11/09/11	20	20	270		346.9	--	--
	TW-A-19S	11/08/11	7.6		49		56.6	--	--
	TW-A-20S	11/08/11	7.3	1.1	61		71.3	--	--
	TW-A-22S	11/08/11	39	19	980		1077.4	--	--
	TW-A-23S	11/08/11	40		110		150.0	--	--
	B-2S	04/18/11	1.1		3.4		4.5	--	--
		07/30/13	1.5		1.2		4.2	--	--
	B-5S	04/20/11	1200	110	49000	3.2	50578.6	--	--
		07/30/13	1.1			1.2	20.2	--	--
	B-6S	05/12/11	480	47	17000	1.4	17711.5	--	--
		07/31/13	2.2		1.8		13.2	--	--
	B-7S	06/06/11			40		40.0	--	--
	B-8S	06/06/11	2100	320	64000	8.6	67338.2	--	--
		07/31/13	16		2.8	17	126.8	--	--
	B-9S	06/06/11	3000	69	77000	4.5	80371.6	--	--
		07/31/13	3.3		2.9		34.4	--	--
	B-10S	06/06/11	3300	200	87000	13	91032.7	--	--
		04/25/13	5.3			32	145.3	0.34	720
	B-12S	07/19/11	770	200	95000	2.4	96772.4	--	--
		08/01/13	260000	26	99	6300	281211.2	--	--
	B-13S	07/19/11	140		610	1.5	781.6	--	--
		07/29/13	4.1			2.7	11.7	--	--
	B-14S	07/19/11	55	13	13000		13134.7	--	--
	B-15S	07/19/11	4200	930	230000	11	238201.3	--	--
		04/25/13	320000	890	61000	430	432590.0	1.8	33
	B-16S	10/04/11	81	22	2100		2260.7	--	--
		08/01/13	0.9		0.58	2.7	44.9	--	--
	B-17S	09/30/11	1.8		10		11.8	--	--
	B-18S	10/06/11	370	31	5400		5851.1	--	--
	B-19S	10/06/11	16		64		81.0	--	--
		07/31/13	12		2.4	340	422.0	--	--
	B-20S	09/30/11					ND	--	--
	B-21S	09/30/11	100	1.2	2600		2706.9	--	--
		07/29/13	81000		2800	11000	95757.0	--	--

Former Teledyne Semiconductor Spectra Physics Site
Mountain View, California
October 2013

Aquifer Unit	Monitoring Location	Collection Date	cis-1,2-DCE (µg/L)	PCE (µg/L)	TCE (µg/L)	VC (µg/L)	Total VOCs (µg/L)	Ethane (µg/L)	Ethene (µg/L)
Shallow Zone	B-22S	09/21/11	190	5.7	64000	5.4	64243.7	--	--
		08/01/13	370		2.1	58	471.2	--	--
	B-23S	09/30/11	1.5		1		2.5	--	--
	B-24S	09/30/11	2.6		7.4		10.0	--	--
	B-25US	12/07/11	5.9		35		40.9	--	--
	B-26US	12/06/11	19		92		111.0	--	--
		07/31/13					2.9	0.049	3.1
	B-27US	12/06/11	5.1		36		41.1	--	--
	B-28US	12/06/11	4.3		34		38.3	--	--
	C-1S	07/31/13					7.4	0.025 U	0.21
	C-3S	07/31/13	0.53				3.9	--	--
	C-7S	07/31/13					10.6	--	--
	D-3S	04/18/11	30		9.8		40.3	--	--
	D-5S	04/19/11	230	2.7	170	2.1	424.0	--	--
		07/31/13					4.9	--	--
	D-7S	07/30/13	9.3			2.7	14.3	0.17	0.58
	D-10S	07/31/13	2.1		1.2	12	21.2	--	--
	D-11S	10/31/11	900	0.95	79	6.7	1007.1	--	--
		07/31/13	1.3		1.5	11	22.3	--	--
	E-3S	07/29/13					6.3	--	--
	E-5S	04/20/11	110	3.2	1100		1223.0	--	--
		07/30/13	0.89			1.8	86.7	--	--
	E-6S	06/06/11	180	3.4	1200		1391.2	--	--
		07/30/13	130	0.58	25	18	184.1	--	--
	E-7S	10/07/11	160		3.3	1000	1204.2	--	--
		04/24/13	0.74	0.6	0.88	6.6	71.7	9.2	56
	F-1S	04/20/11	15	2.5	510		567.6	--	--
		08/01/13	0.97				14.7	--	--
	F-3S	07/31/13					7.9	1.4	4.4
	F-4S	09/14/11			0.61	2.1	363.4	--	--
	F-5S	09/14/11	9.5		2.7	12	391.8	--	--
	MW-9S	04/19/11	80	2.2	330		422.1	--	--
		09/13/11	850		7.9	1300	2287.7	0.98	620
		12/13/11	1100		5	730	1905.8	0.72	100
		03/26/12	700			340	1109.9	3.0	53
		06/19/12	680		2.2	310	1024.7	3.3	22
		09/05/12	130			470	642.6	2.8	22
		11/27/12	260			590	887.0	3.0	12
		07/30/13	160			510	694.1	2.3	19
	MW-10S	04/19/11	84	18	4000		4459.3	--	--
		09/13/11	280		69	1400	1798.5	0.087	45
		12/13/11	2.7		4.2	5.9	98.2	0.87	220
		03/26/12	63		2.7	43	151.7	4.2	110
		06/19/12	4.7		2.2	13	58.9	22	120
		09/05/12	690		16	250	997.7	2.4	74
		11/27/12	850		50	440	1373.7	0.22	17
		04/23/13	270		11	470	799.9	1.2	34
	MW-11S	04/19/11	1.2		4.3		5.5	--	--
		09/14/11	13				13.0	0.17	0.054
		12/13/11	22				22.0		0.094
		03/26/12	12				12.0		0.080
		06/19/12	16		0.5		16.5	0.044	0.29
		09/05/12	12		0.84		13.5		0.16
		11/27/12	11		1.3		12.3		0.04
		07/29/13	4.3		1.5		5.8	0.025 U	0.07
	MW-19S	10/06/11	2600	230	49000	7.5	52339.1	--	--
		12/14/11	5900	140	1600	45	8717.1	0.10	0.74
		03/26/12	5300	210	3900	14	10641.7	0.60	2.1
		06/18/12	7000	150	1600	490	10386.7	0.56	54
		09/05/12	5400	88	800	150	7492.5	0.50	83
		11/27/12	6500	32	460	530	8396.0	0.23	390
		04/25/13	710		47		1020.0	0.86	500

Former Teledyne Semiconductor Spectra Physics Site
Mountain View, California
October 2013

Aquifer Unit	Monitoring Location	Collection Date	cis-1,2-DCE (µg/L)	PCE (µg/L)	TCE (µg/L)	VC (µg/L)	Total VOCs (µg/L)	Ethane (µg/L)	Ethene (µg/L)
Shallow Zone	MW-21S	12/12/11	17000	13	80000	97	97364.5	2.7	11
		03/26/12	140000		16	940	141452.0	3.2	18
		06/18/12	58000		45	59000	117791.8	1.6	510
		09/05/12	570		11	7600	8268.2	0.73	3800
		11/27/12	27		2.2	240	315.7	2.6	2300
		07/30/13	6.3			12	49.7	140	480
	MW-22US	12/12/11	13000	12	370	200	13989.8	--	--
		03/26/12	5200		8.6	50	5559.5	0.38	1.6
		06/18/12	190		1.8	4500	4930.0	1.0	360
		09/05/12	64			1100	1412.7	0.95	490
		11/27/12	0.86			96	488.1	13.0	290
		07/30/13	0.57			3.6	280.6	46	300
	MW-23US	12/12/11	23	9.3	730		777.4	--	--
		03/26/12	83	5.9	690		795.4	0.11	0.20
		06/18/12	250	8.2	580	8.6	870.5	0.061	0.077
		09/05/12	220	6.9	390	3	651.3	0.055	0.066
		11/27/12	230	7.7	550	1.6	809.6		0.047
		04/23/13	210	5.5	440		687.6	0.057	0.510
	PZ-2S	07/29/13	21	0.69	5.4	34	176.7	--	--
	PZ-5S	07/29/13	17			130	152.5	--	--
	T-6S	04/18/11	360		98	36	523.9	--	--
		09/13/11	450	1.1	91	33	607.1	0.12	0.44
		12/13/11	500	0.84	87	38	655.9	0.045	0.33
		03/26/12	470		67	27	583.0	0.04	0.21
		06/18/12	530	0.72	71	30	654.3		0.22
		09/05/12	410	0.55	51	19	502.3		0.24
		11/27/12	510	0.61	54	28	617.1		0.11
		04/24/13	360		26	55	476.0	0.32	0.17
Upper-Intermediate Zone	C-1UI	07/31/13					3.3	--	--
	C-2UI	07/31/13					0.0	0.77	2.5
	C-4UI	04/18/11	5.1	4.3	1300		1433.6	--	--
		07/31/13					3.2	--	--
	C-7UI	08/01/13	2				7.7	--	--
	D-1UI	07/30/13					0.0	--	--
	D-4UI	08/01/13	2.1				5.6	--	--
	D-7UI	04/20/11		10	310		386.1	--	--
		07/29/13					5.9	--	--
	D-9UI	07/31/13			0.94		2.6	--	--
	E-4UI	04/20/11		3.4	210		266.4	--	--
		07/29/13	3.4			4.9	250.5	--	--
	E-5UI	09/14/11	16000	1.7	50	320	24694.5	--	--
	E-7UI	10/07/11	5100	11	1600		8696.6	--	--
		04/24/13	16			55	134.8	3.7	84
	F-1UI	07/29/13	2.1		5.1		103.3	--	--
	F-3UI	04/19/11	3.4	2.8	2300		2422.0	--	--
		07/29/13				2.9	6.4	--	--
	F-4UI	09/14/11				30	340.0	--	--
	G-1UI	04/19/11	6.7	8.5	7400		7854.8	--	--
		07/29/13	1				4.1	--	--
	G-2UI	09/12/11	14			14	76.8	--	--
	G-3UI	09/12/11	71			14	2920.8	--	--
	H-1UI	07/29/13					0.9	--	--
	MW-12UI	04/18/11	12	13	1100		1136.8	--	--
		09/13/11	1300		1.2		1370.7	0.025	0.18
		12/13/11	1100		6.9	3.3	1132.7		0.15
		03/26/12	1200				1200.0	0.072	0.18
		06/19/12	1200		1.1	110	1331.0	0.10	0.38
		09/05/12	230			630	876.9	0.041	1.0
		11/27/12	29			830	869.0		0.0
		07/31/13	25			560	594.2	0.042	6.9
	MW-13UI	04/21/11	3.7	11	420		512.7	--	--
		09/13/11	1100		2.7	18	1183.6	0.92	0.91
		12/13/11	350		2.2	200	598.2	0.20	39
		03/26/12	18			29	88.2	0.28	25
		06/19/12	14			20	65.7	1.7	13
		09/05/12	4.2			9.2	39.8	2.9	12
		11/27/12	2.5		0.54	6.8	37.4	1.5	11
		08/02/13	2		1.4		25.6	2	7.4

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Former Teledyne Semiconductor Spectra Physics Site
Mountain View, California
October 2013

Aquifer Unit	Monitoring Location	Collection Date	cis-1,2-DCE (µg/L)	PCE (µg/L)	TCE (µg/L)	VC (µg/L)	Total VOCs (µg/L)	Ethane (µg/L)	Ethene (µg/L)
Upper-Intermediate Zone	MW-18UI	09/13/11	8.9		37		47.2	--	--
		12/13/11	12		0.85	2.3	15.2	0.078	0.10
		03/26/12	17	1.7	48		69.2	0.084	1.1
		06/19/12	69	3.9	100	1	181.1		0.25
		09/05/12	23	2.1	53		85.4		0.10
		11/27/12	12	0.89	25		40.5		0.10
		08/02/13	36	0.82	28		67.2	0.073	0.17
	PZI-1	04/19/11	62	2.6	110	18	196.2	--	--
		09/13/11	80			84	169.7		11
		12/14/11	0.76			62	68.2	0.48	54
		03/26/12				26	31.5	0.47	35
		06/18/12				52	58.4	0.42	35
		09/05/12	0.97		0.61	85	93.3	0.17	25
		11/27/12	0.71			79	87.9	0.078	17
		08/02/13	82		15	110	210.5	0.65	8.5
Lower-Intermediate Zone	A-8LI	09/20/11	3.1	86	5300		5973.4	--	--
		07/30/13	920		130		1050.0	--	--
	A-9LI	10/05/11			11		11.7	--	--
	A-11LI	10/04/11			1.1		1.1	--	--
	A-18LI	10/31/11					ND	--	--
	B-2LI	07/30/13	310		10	64	393.1	--	--
	B-5LI	09/14/11	2700	14	990	170	4208.2	--	--
		07/30/13	310			450	841.0	--	--
	B-6LI	10/05/11			2		2.0	--	--
	B-8LI	09/30/11	11	26	1800		1978.5	--	--
		08/01/13	4.3		0.82		26.8	--	--
	B-12LI	09/30/11			8.9		8.9	--	--
	B-13LI	09/30/11			4.4		4.4	--	--
	B-14LI	09/30/11			30		30.0	--	--
	B-15LI	07/19/11	3	80	5400		5909.1	--	--
		04/23/13					314.0	0.76	710
	B-16LI	10/04/11		0.95	45		49.0	--	--
	B-17LI	09/30/11			1.8		1.8	--	--
	B-18LI	10/06/11	1.7	0.86	41		49.7	--	--
		04/25/13					14.0	0.085	1.9
	B-20LI	09/30/11					ND	--	--
	B-21LI	09/30/11	0.89		290		290.9	--	--
		07/29/13					0.0	--	--
	B-22LI	09/21/11			450		450.0	--	--
		08/01/13	200		1.5	16	253.9	--	--
	C-2LI	07/31/13	0.62				1.7	0.025 U	0.26
	C-3LI	07/31/13					0.6	--	--
	C-7LI	07/31/13					9.0	--	--
	D-3LI	07/30/13	350		2.5	150	516.1	--	--
	D-5LI	08/01/13	1.2				102.5	--	--
	D-8LI	04/20/11			19		19.0	--	--
		07/29/13					2.7	--	--
	E-2LI	04/19/11	2		150		172.0	--	--
		07/29/13					23.2	--	--
	E-5LI	04/20/11	86	89	95000	1.6	99749.5	--	--
		07/30/13	0.72			4.4	6.7	--	--
	E-7LI	10/07/11	1.8		2100		2274.5	--	--
		04/24/13	2.1			1.8	9.2	9.4	20
	F-2LI	07/29/13	1.7			32	76.3	--	--
	F-3LI	04/19/11			54		55.4	--	--
		08/02/13	5.3			9.1	15.3	0.039	3.1
	MW-14LI	04/18/11		12	970		1092.7	--	--
		09/13/11	96	9.2	430		585.9		0.061
		12/13/11	290	7.8	500		833.8	0.087	0.30
		03/26/12	540	4.7	150		715.5	0.073	0.16
		06/19/12	620	3.5	120	10	768.6	0.045	0.19
		09/05/12	380	2.1	55	83	553.5	0.036	6.6
		11/27/12	390	1.8	64	48	516.1		2.0
		04/24/13	550		63	25	693.5	0.28	0.2

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Former Teledyne Semiconductor Spectra Physics Site
Mountain View, California
October 2013

Aquifer Unit	Monitoring Location	Collection Date	cis-1,2-DCE (µg/L)	PCE (µg/L)	TCE (µg/L)	VC (µg/L)	Total VOCs (µg/L)	Ethane (µg/L)	Ethene (µg/L)
Lower-Intermediate Zone	MW-15LI	04/19/11		2.1	1100		1283.9	--	--
		09/13/11	1200		12 J	27	1258.9	0.9	1.4
		12/14/11	320		1.8		325.3	0.06	0.12
		03/26/12	57				57.0	0.20	10
		06/18/12	72			22	111.8	1.0	16
		09/05/12	5.5				6.2	2.2	11
		11/27/12	5.6			3.8	9.4	2.7	6.8
		08/02/13	3.2				4.1	0.82	4.5
	MW-16LI	04/19/11			4.6		4.6	--	--
		09/14/11	11				11.0	0.2	0.13
		12/13/11	17		55		73.1	0.033	0.069
		03/26/12	2.6				2.6		0.94
		06/19/12	3		1.7	5.7	10.4		0.74
		09/05/12	1.9		1.2		3.1		0.52
		11/27/12				2.5	3.1	0.10	13
		07/29/13	1.2		0.59	1.5	3.3	0.027	0.44
	MW-17LI	04/20/11			160		168.7	--	--
		09/13/11	1.9		67		71.3		0.12
		12/13/11	4.7		39		45.3		0.15
		03/26/12	4.6		32		37.8		0.16
		06/19/12	6		23	1.4	32.6		0.11
		09/05/12	5.4		15		21.8		0.14
		11/27/12	6.1		20		27.6		0.14
		08/02/13	0.76		11		12.4	0.085	0.25
	MW-20LI	10/06/11	1.2	11	1500		1588.4	--	--
		12/14/11	130	12	1700		1903.0		0.12
		03/26/12	390	7.3	1700		2155.4	0.028	0.74
		06/18/12	120	6.3	1100		1264.9		0.13
		09/05/12	47	5.8	920	2.7	1010.2	0.029	0.53
		11/27/12	96	10	1200	1.3	1382.9		0.26
		04/23/13	81	16	3300		3644.9		0.06

Note: An empty cell indicates the compound was not detected at that location.
ND - not detected
J - Estimated value

cis-1,2-DCE = cis-1,2-dichloroethene
PCE = tetrachloroethene
TCE = trichloroethene
VC = vinyl chloride
VOCs = volatile organic compounds

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Appendix G: Data Analysis Figures

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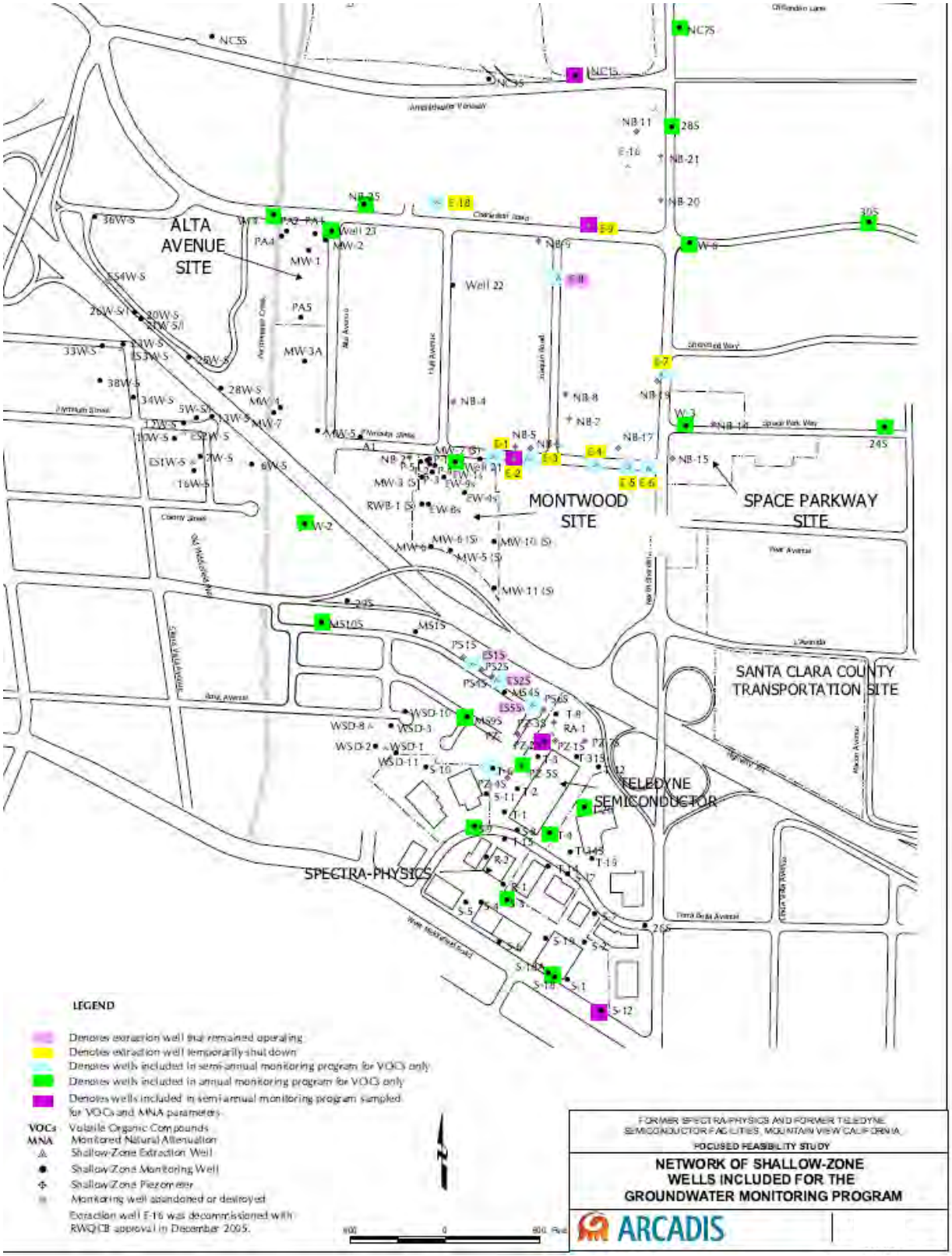

Figure G1 Network of shallow-zone wells included for the groundwater monitoring program.

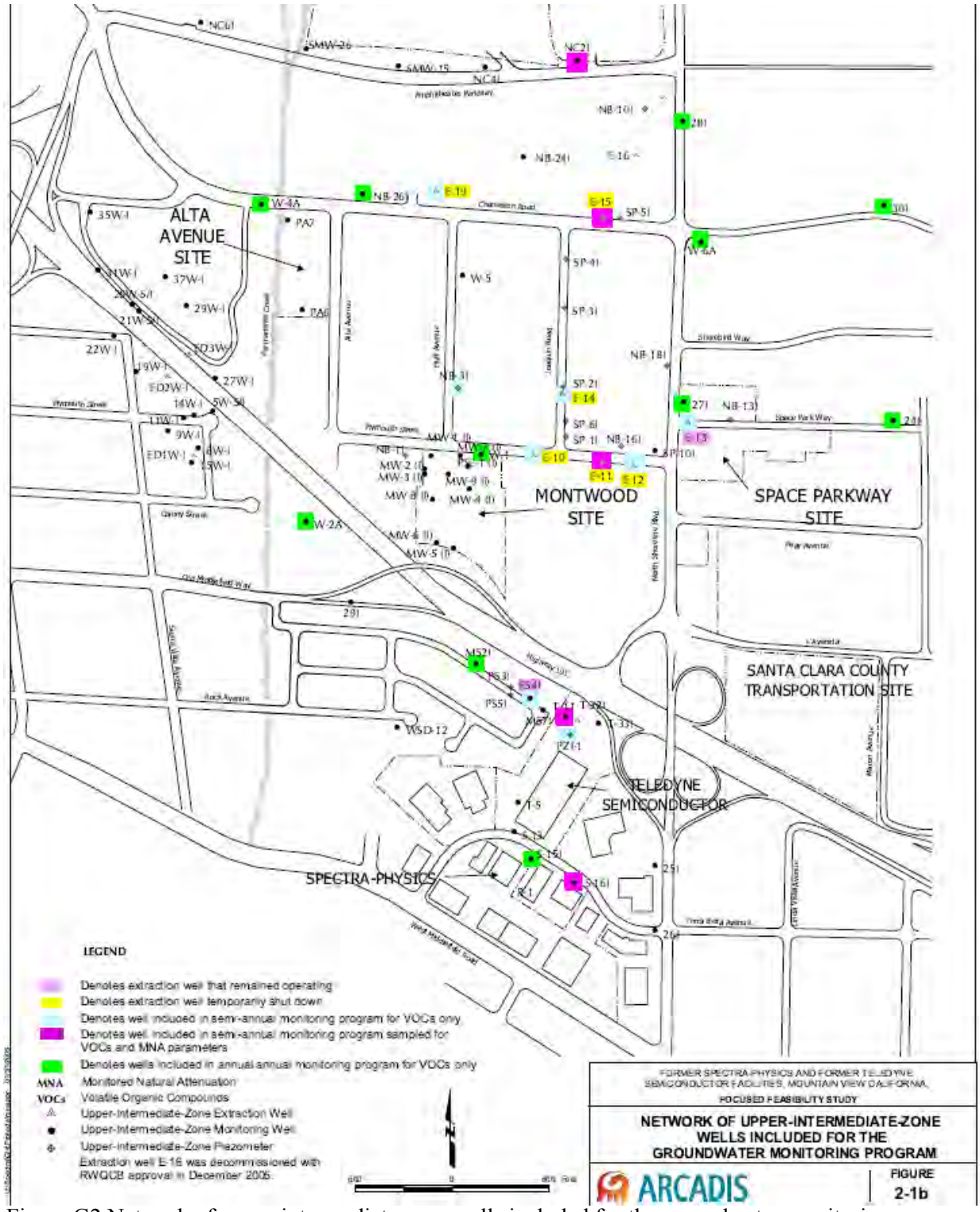

Figure G2 Network of upper-intermediate zone wells included for the groundwater monitoring program

Figure G3 Network of lower intermediate-zone and vertical wells included for the groundwater monitoring program

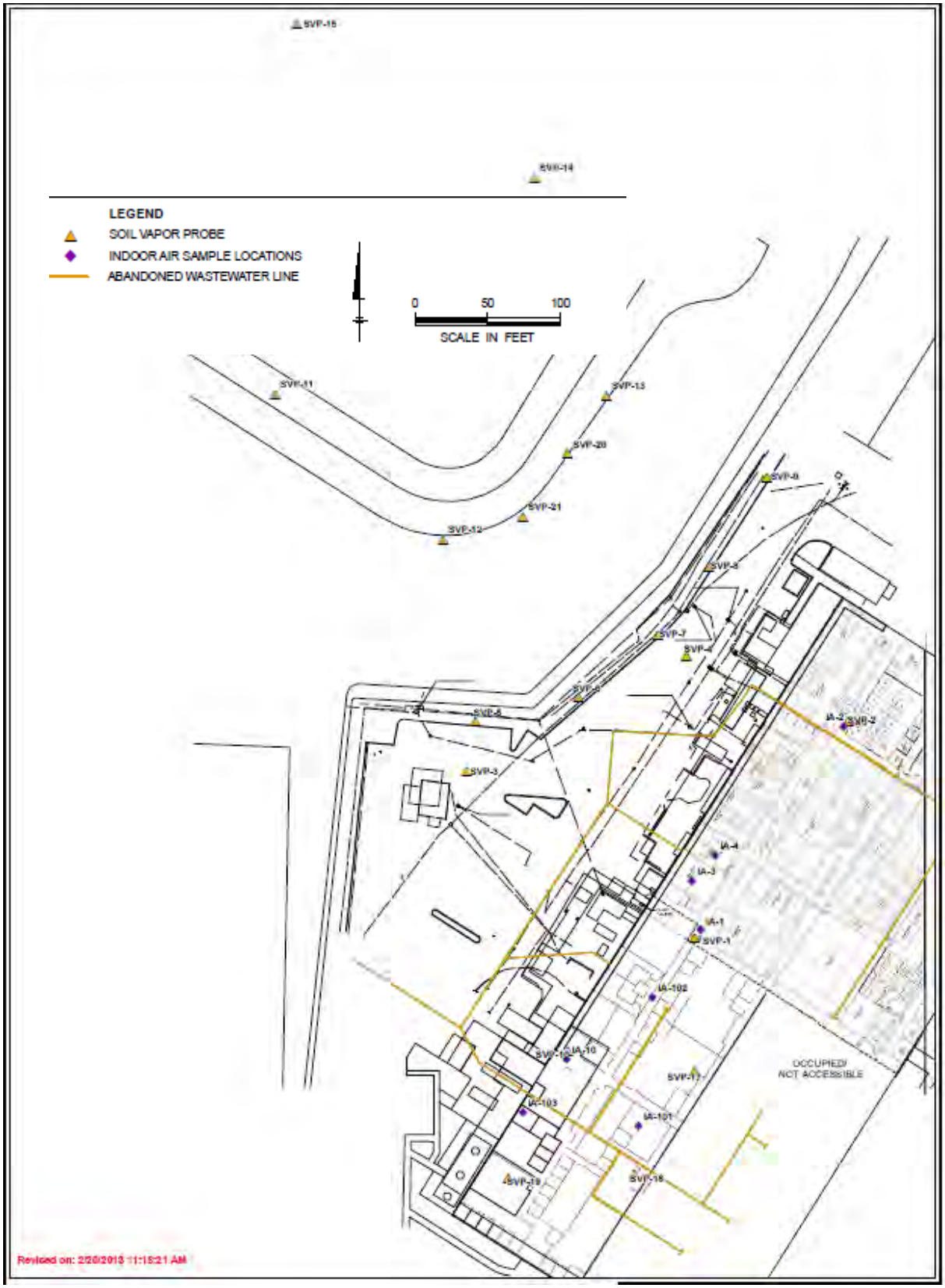

Figure G4 Soil vapor monitoring locations at Teledyne site.

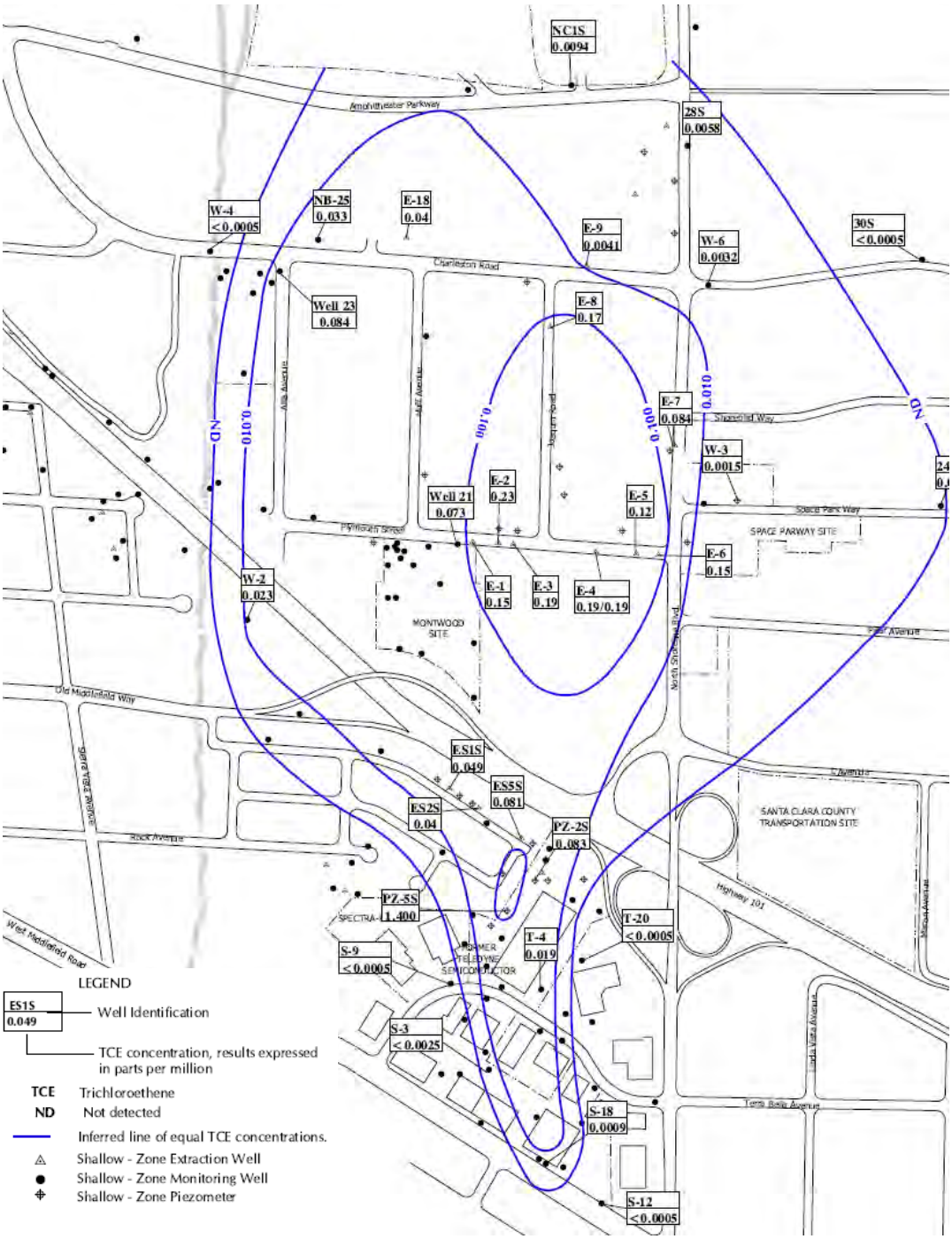

Figure G5. Shallow-Zone TCE Concentrations November 2009.

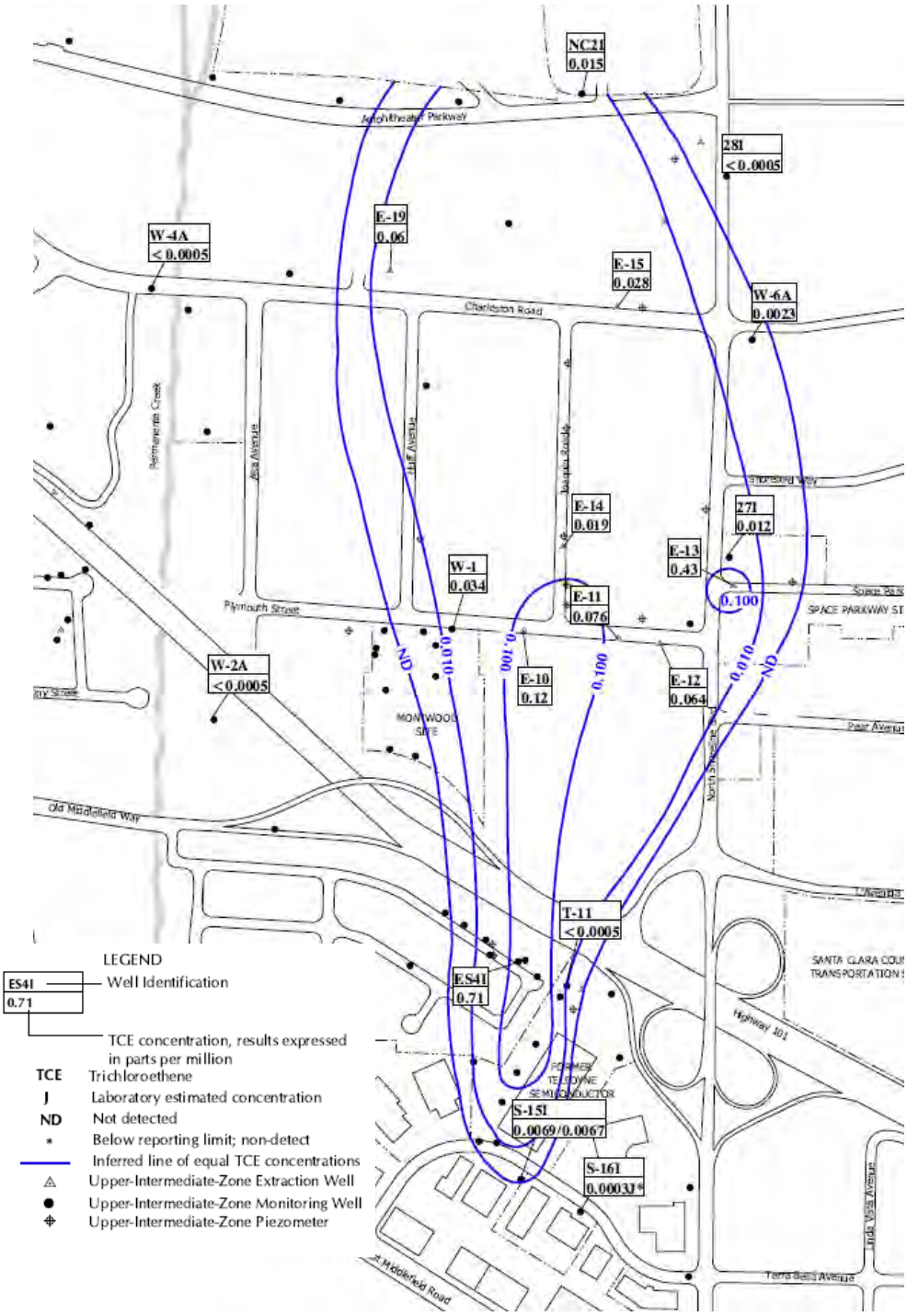

Figure G6 Upper-Intermediate-Zone TCE Concentrations November 2009.

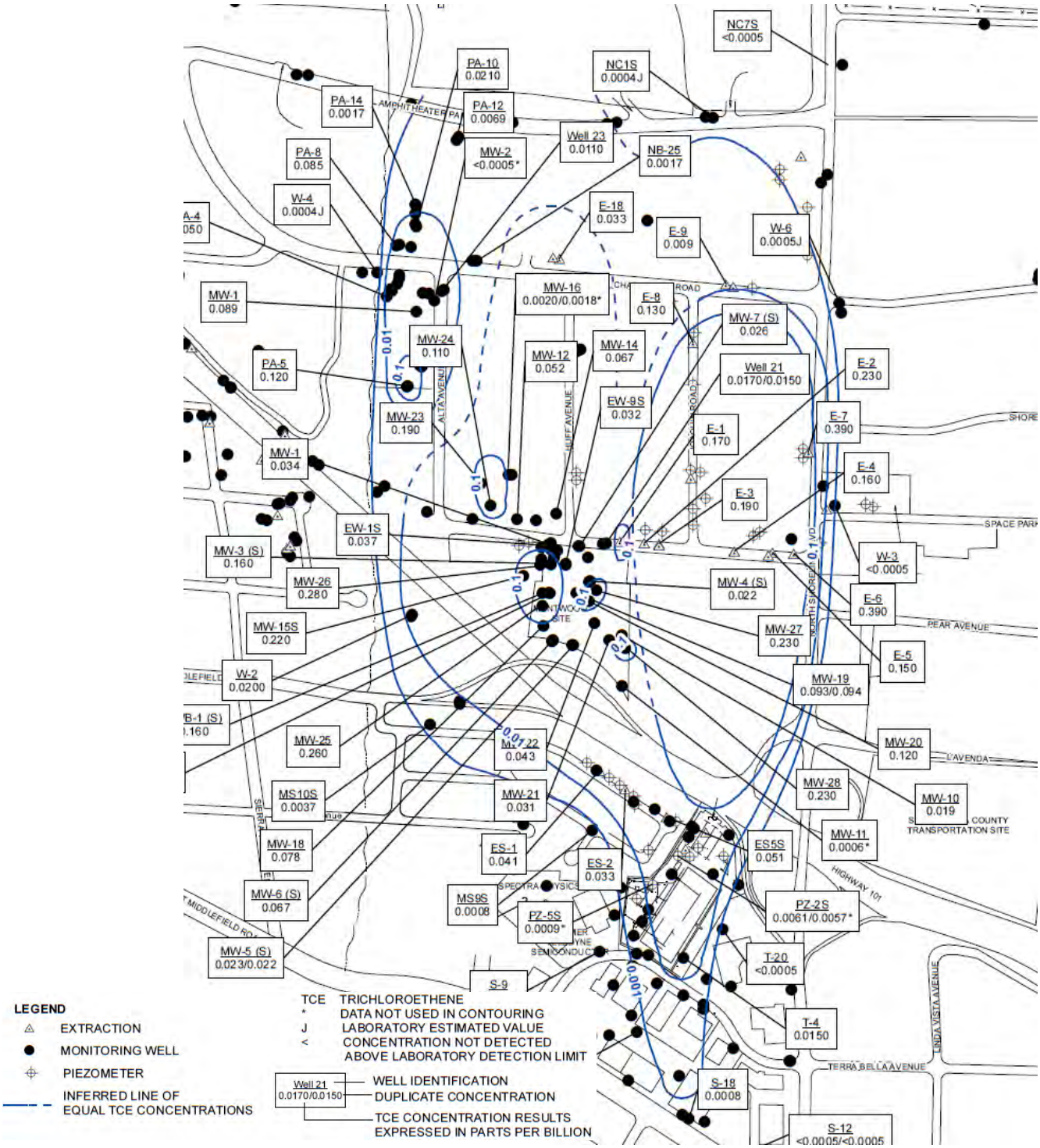

Figure G7. Shallow –Zone TCE Concentrations Fourth Quarter 2012

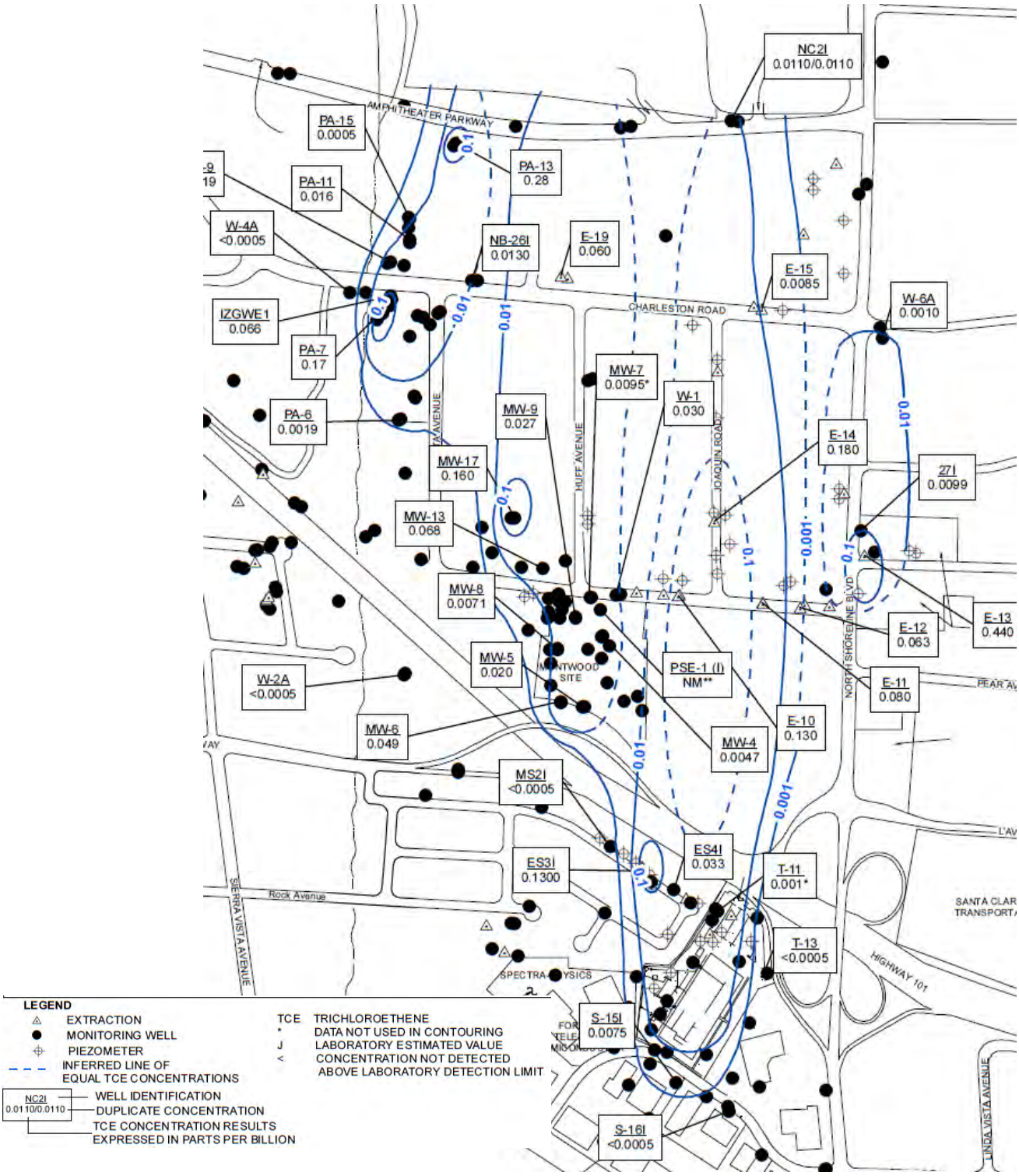

Figure G8. Upper Intermediate-Zone TCE Concentrations Fourth Quarter 2012.

Appendix H: GSI Mann-Kendall Trend Analysis Results

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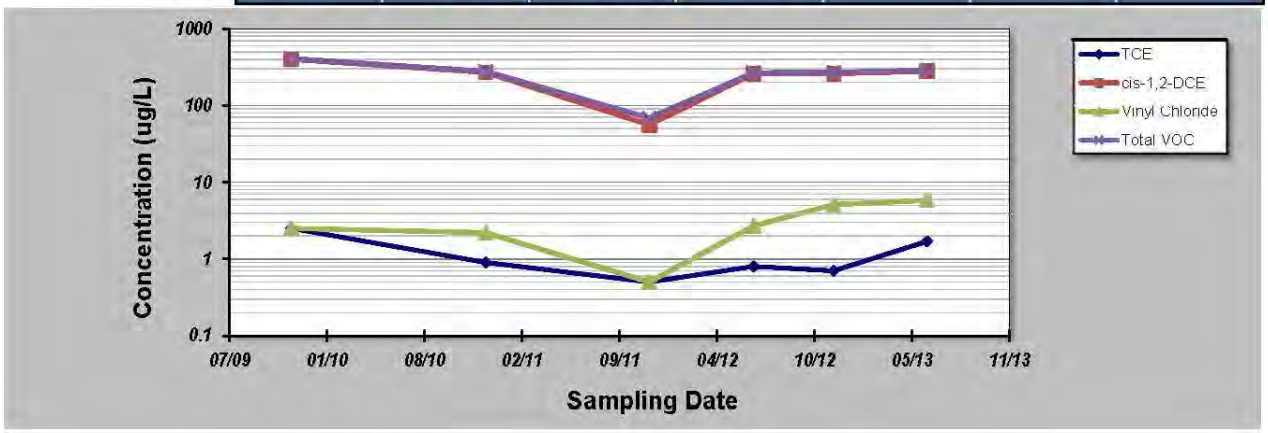
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 31-Dec-13
Facility Name: Teledyne/ Spectra-Physics
Conducted By:

Job ID: S-3
Constituent:
Concentration Units: ug/L

Sampling Point ID:		TCE	cis-1,2-DCE	Vinyl Chloride	Total VOC			
Sampling Event	Sampling Date	CONCENTRATION (ug/L)						
1	10-Nov-09	2.5	400	2.5	409			
2	14-Dec-10	0.9	270	2.2	278.6			
3	14-Nov-11	0.5	56	0.5	68.6			
4	15-Jun-12	0.8	260	2.7	267			
5	26-Nov-12	0.7	260	5.1	270.8			
6	6-Jun-13	1.7	280	5.8	289.1			
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.65	0.44	0.63	0.42			
Mann-Kendall Statistic (S):		-3	-2	9	-1			
Confidence Factor:		64.0%	57.0%	93.2%	50.0%			
Concentration Trend:		Stable	Stable	Prob. Increasing	Stable			



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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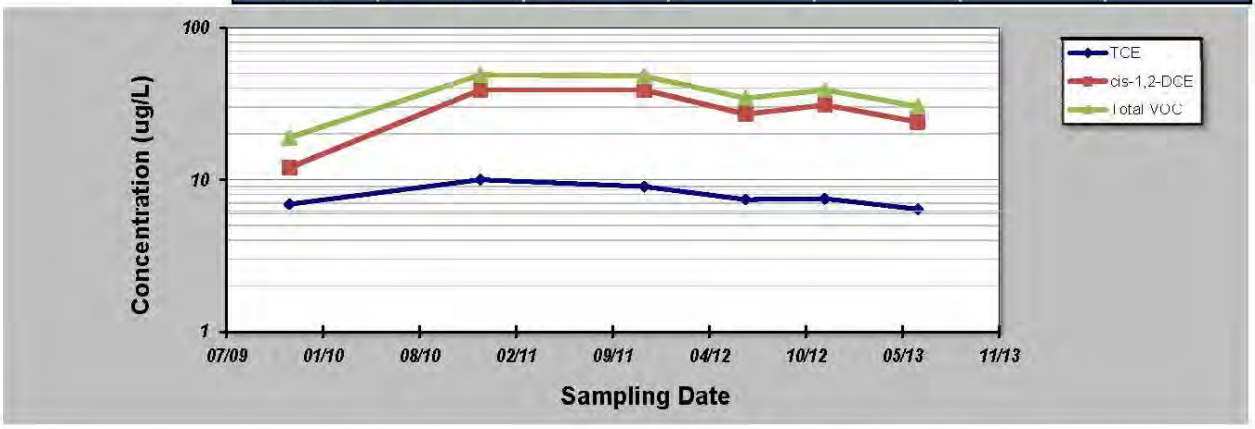
Figure H1 Trend analysis results for Well S-3

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 31-Dec-13
Facility Name: Teledyne/ Spectra-Physics
Conducted By:

Job ID: S-15I
Constituent:
Concentration Units: ug/L

Sampling Point ID:		TCE	cis-1,2-DCE	Total VOC				
Sampling Event	Sampling Date	CONCENTRATION (ug/L)						
1	13-Nov-09	6.9	12	18.9				
2	14-Dec-10	10	39	49				
3	18-Nov-11	9	39	48				
4	15-Jun-12	7.4	27	34.4				
5	26-Nov-12	7.5	31	38.9				
6	6-Jun-13	6.4	24	30.4				
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.17	0.36	0.31				
Mann-Kendall Statistic (S):		-5	-2	-3				
Confidence Factor:		76.5%	57.0%	64.0%				
Concentration Trend:		Stable	Stable	Stable				



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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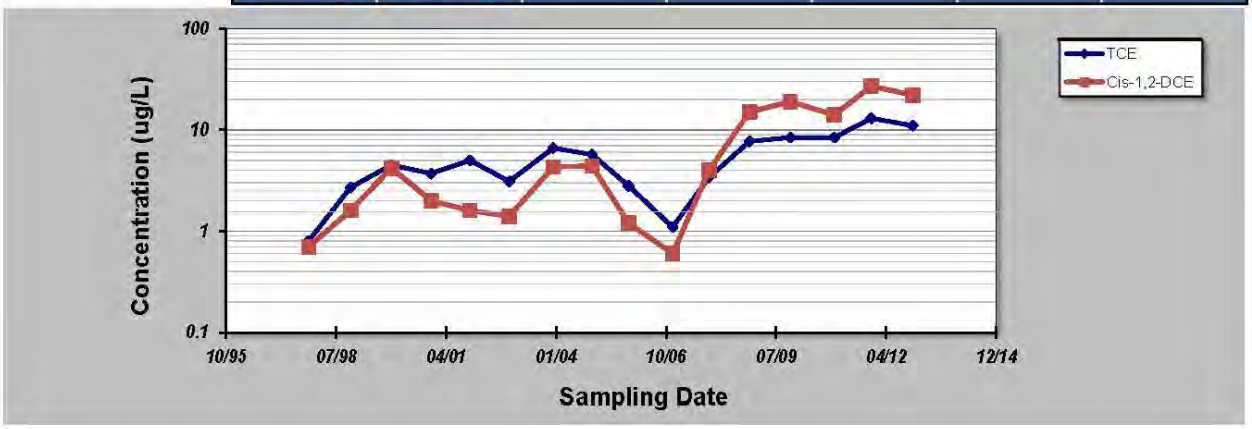
Figure H2 Trend analysis results for Well S-15I

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 31-Dec-13
Facility Name: Teledyne/ Spectra-Physics
Conducted By:

Job ID: Well 23
Constituent:
Concentration Units: ug/L

Sampling Point ID:		TCE	Cis-1,2-DCE					
Sampling Event	Sampling Date	CONCENTRATION (ug/L)						
1	17-Nov-97	0.8	0.7					
2	3-Dec-98	2.7	1.6					
3	9-Dec-99	4.5	4.2					
4	4-Dec-00	3.7	2					
5	21-Nov-01	5	1.6					
6	14-Nov-02	3.1	1.4					
7	19-Dec-03	6.6	4.3					
8	6-Dec-04	5.7	4.4					
9	3-Nov-05	2.8	1.2					
10	8-Dec-06	1.1	0.6					
11	5-Nov-07	3.4	4					
12	6-Nov-08	7.7	15					
13	11-Nov-09	8.4	19					
14	17-Dec-10	8.4	14					
15	17-Nov-11	13	27					
16	28-Nov-12	11	22					
17								
18								
19								
20								
Coefficient of Variation:		0.63	1.13					
Mann-Kendall Statistic (S):		69	61					
Confidence Factor:		99.9%	99.8%					
Concentration Trend:		Increasing	Increasing					



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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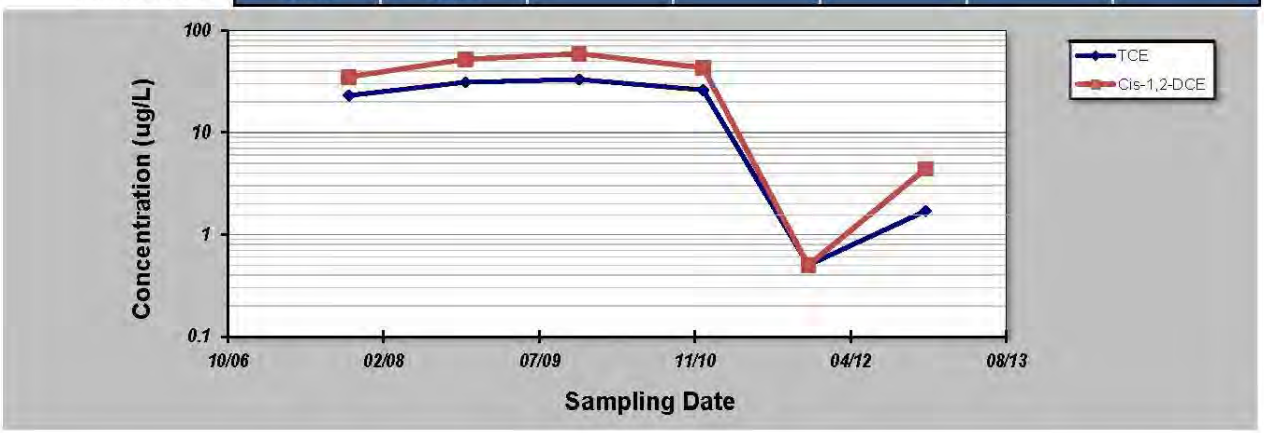
Figure H3 Trend analysis results for Well 23

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 31-Dec-13
Facility Name: Teledyne/ Spectra-Physics
Conducted By:

Job ID: NB-25
Constituent:
Concentration Units: ug/L

Sampling Point ID:		TCE	Cis-1,2-DCE					
Sampling Event	Sampling Date	CONCENTRATION (ug/L)						
1	2-Nov-07	23	35					
2	10-Nov-08	31	52					
3	11-Nov-09	33	59					
4	14-Dec-10	26	43					
5	17-Nov-11	0.5	0.5					
6	28-Nov-12	1.7	4.4					
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.75	0.76					
Mann-Kendall Statistic (S):		-5	-5					
Confidence Factor:		76.5%	76.5%					
Concentration Trend:		Stable	Stable					



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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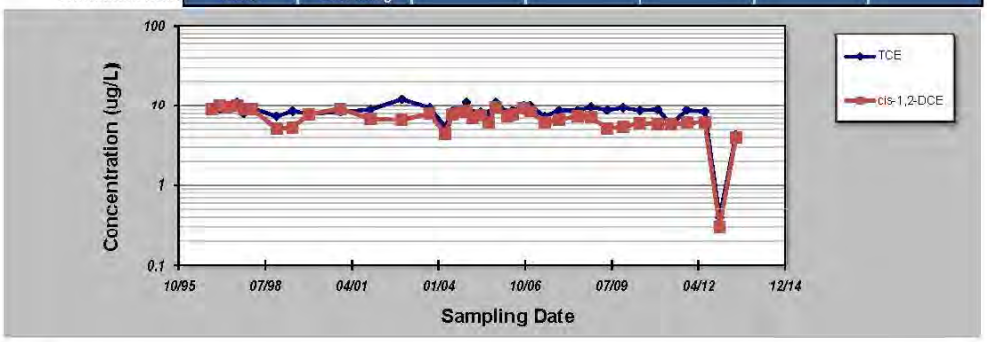
Figure H4 Trend analysis results for Well NB-25

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 31-Dec-13
Facility Name: Teledyne/ Spectra-Physics
Conducted By:

Job ID: NC-1S
Constituent:
Concentration Units: ug/L

Sampling Point ID:	TCE	cis-1,2-DCE					
Sampling Event	**Sampling Date**	**CONCENTRATION (ug/L)**					
1	13-Nov-96	9.0000	9.0000				
2	13-Feb-97	9.2000	10.0000				
3	13-May-97	9.1000	9.5000				
4	27-Aug-97	11.0000	10.0000				
5	14-Nov-97	8.0000	9.0000				
6	18-Feb-98	9.3000	9.1000				
7	1-Dec-98	7.3400	5.1000				
8	2-Jun-99	8.5100	5.3400				
9	9-Dec-99	7.8800	7.7500				
10	5-Dec-00	8.3600	9.1600				
11	19-Nov-01	8.9000	6.8000				
12	13-Nov-02	12.0000	6.6000				
13	1-Oct-03	9.4000	7.9000				
14	31-Mar-04	5.4000	4.4000				
15	23-Jun-04	8.5000	7.7000				
16	21-Sep-04	8.3000	8.4000				
17	1-Dec-04	11.0000	8.7000				
18	9-Feb-05	8.0000	7.0000				
19	11-May-05	8.3000	7.5000				
20	16-Aug-05	8.0000	6.1000				
21	1-Nov-05	11.0000	9.6000				
22	14-Mar-06	8.2000	7.4000				
23	18-May-06	8.6000	7.8000				
24	20-Sep-06	10.0000	9.3000				
25	5-Dec-06	10.0000	8.5000				
26	21-May-07	7.3000	6.1000				
27	1-Nov-07	8.7000	6.7000				
28	3-Jun-08	8.7000	7.3000				
29	6-Nov-08	9.6000	7.2000				
30	12-May-09	8.8000	5.2000				
31	16-Nov-09	9.4000	5.4000				
32	27-May-10	8.7000	6.0000				
33	16-Dec-10	9.0000	5.9000				
34	19-May-11	5.8000	5.8000				
35	18-Nov-11	8.8000	6.1000				
36	13-Jun-12	8.4000	6.2000				
37	30-Nov-12	0.4000	0.3000				
38	6-Jun-13	4.3000	4.0000				
39							
40							
Coefficient of Variation:		0.23	0.28				
Mann-Kendall Statistic (S):		-85	-304				
Confidence Factor:		85.3%	>99.9%				
Concentration Trend:		Stable	Decreasing				



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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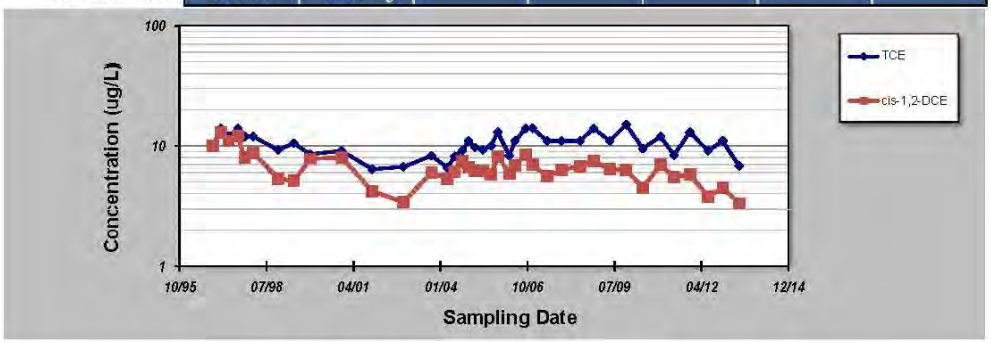
Figure H5 Trend analysis results for Well NC-1S

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 31-Dec-13
Facility Name: Teledyne/ Spectra-Physics
Conducted By:

Job ID: NC2I
Constituent:
Concentration Units: ug/L

Sampling Point ID:	TCE	cis-1,2-DCE					
Sampling Event	Sampling Date	CONCENTRATION (ug/L)					
1	13-Nov-96	10.00	10.00				
2	13-Feb-97	14.00	13.00				
3	13-May-97	12.00	11.00				
4	27-Aug-97	14.00	12.00				
5	14-Nov-97	12.00	8.00				
6	18-Feb-98	12.00	8.80				
7	1-Dec-98	9.27	5.37				
8	2-Jun-99	10.50	5.12				
9	9-Dec-99	8.54	7.82				
10	5-Dec-00	9.09	8.01				
11	19-Nov-01	6.40	4.20				
12	13-Nov-02	6.70	3.40				
13	1-Oct-03	8.30	6.00				
14	31-Mar-04	6.60	5.30				
15	23-Jun-04	8.20	6.10				
16	21-Sep-04	9.20	7.50				
17	1-Dec-04	11.00	6.70				
18	9-Feb-05	9.70	6.20				
19	11-May-05	9.30	6.20				
20	16-Aug-05	10.00	5.80				
21	1-Nov-05	13.00	8.20				
22	14-Mar-06	8.30	5.90				
23	18-May-06	11.00	6.90				
24	20-Sep-06	14.00	8.50				
25	5-Dec-06	14.00	7.00				
26	21-May-07	11.00	5.60				
27	1-Nov-07	11.00	6.30				
28	3-Jun-08	11.00	6.80				
29	6-Nov-08	14.00	7.50				
30	12-May-09	11.00	6.40				
31	16-Nov-09	15.00	6.30				
32	27-May-10	9.50	4.50				
33	16-Dec-10	12.00	7.00				
34	19-May-11	8.40	5.50				
35	18-Nov-11	13.00	5.80				
36	13-Jun-12	9.10	3.80				
37	30-Nov-12	11.00	4.50				
38	6-Jun-13	6.80	3.30				
39							
40							
Coefficient of Variation:		0.22	0.32				
Mann-Kendall Statistic (S):		41	-231				
Confidence Factor:		69.1%	99.8%				
Concentration Trend:		No Trend	Decreasing				



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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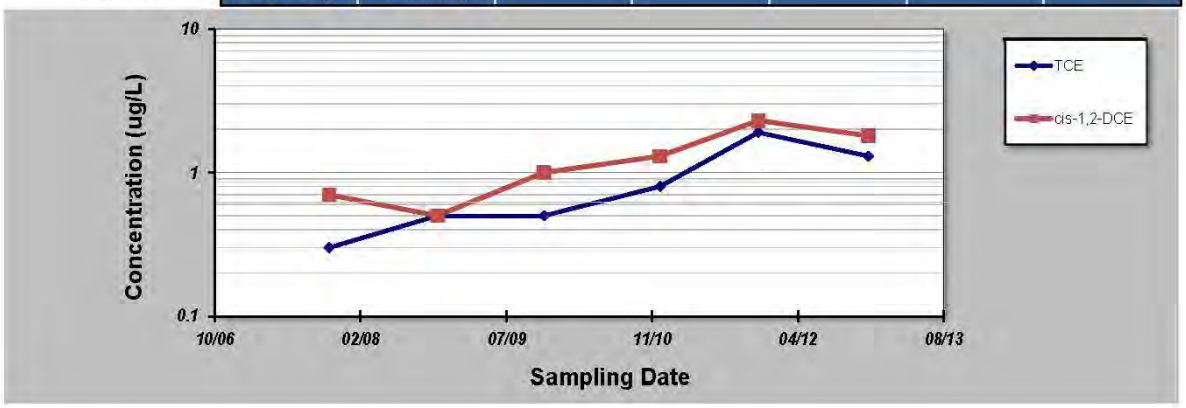
Figure H6 Trend analysis results for Well NC-2I

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 31-Dec-13
Facility Name: Teledyne/ Spectra-Physics
Conducted By:

Job ID: NB-26
Constituent:
Concentration Units: ug/L

Sampling Point ID:		TCE	cis-1,2-DCE					
Sampling Event	Sampling Date	CONCENTRATION (ug/L)						
1	6-Nov-07	0.30	0.70					
2	11-Nov-08	0.50	0.50					
3	12-Nov-09	0.50	1.00					
4	15-Dec-10	0.80	1.30					
5	17-Nov-11	1.90	2.30					
6	28-Nov-12	1.30	1.80					
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.69	0.54					
Mann-Kendall Statistic (S):		12	11					
Confidence Factor:		98.2%	97.2%					
Concentration Trend:		Increasing	Increasing					



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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Figure H7 Trend analysis results for Well NB-25