FIFTH FIVE-YEAR REVIEW REPORT FOR

FAIRCHILD SEMICONDUCTOR CORPORATION SOUTH SAN JOSE PLANT SUPERFUND SITE

San Jose, Santa Clara County, California

PREPARED BY

Army Corps of Engineers Seattle District

Approved by: _____ Date: 8/4/14

Stephen A. Hill, Division
Toxics Cleanup Division
California Regional Water Quality Control Board

Approved by: _____ Date: 9/13/14

John Lyons, Acting Chief
Superfund Site Cleanup Branch
U.S. Environmental Protection Agency, Region 9

[This page is intentionally left blank.]

Executive Summary

This is the fifth Five-Year Review (FYR) of the Fairchild Semiconductor San Jose Site located at 101 Bernal Road San Jose, Santa Clara County, California (Fairchild Site). The purpose is to determine if the remedy is and will continue to be protective of human health and the environment. The triggering action for this FYR was the signing of the previous FYR on September 9, 2009.

The Fairchild Site was used for electronics manufacturing and semiconductor fabrication from 1977 through 1983. The manufacturing process involved etching, cleaning, coating, and inspecting of silicon wafers and required the use of solvents. In 1981, a failed underground storage tank (UST) containing waste solvents was discovered that had released a mixture of solvents into the subsurface. A public drinking water supply well located approximately 1,800 feet down-gradient from the Site was impacted by the release.

Initial actions following the discovery of the release included removing the impacted drinking water well from service, decommissioning private wells located down-gradient of the site in potentially impacted areas, soil excavation within the UST source area, groundwater extraction and treatment on-site and off-site, and installation of a slurry cutoff wall to contain contaminants within the on-site boundaries. In 1989, a ROD was issued that included continued groundwater extraction and treatment, soil vapor extraction in the source area, and soil flushing in the source area. In total, approximately 147,000 pounds of volatile organic compounds (VOCs) were removed by these actions. Groundwater extraction was suspended in 1998, and no remediation has been performed at the Site since that time. Fairchild is currently conducting long-term monitoring.

Groundwater data indicate that the slurry wall is effectively containing contaminants on-site. Only one off-site well currently contains contaminants at levels above the cleanup standard. Contamination near this well is thought to be localized and not emanating from within the slurry wall area. Recent data indicate contaminant concentrations at this well may be decreasing. Contaminants within the slurry area wall remain at levels above cleanup standards. Analysis of long term trends indicates that 1,1,1-TCA is decreasing near the source area but 1,1-DCE and 1,1-DCA do not show strong evidence of overall decreasing trends. 1,4-dioxane was identified as a potential COC in the second FYR. Recent concentrations indicate 1,4-dioxane contamination is limited to wells inside the slurry wall area. A restrictive covenant was recorded in 1989; however, a new restrictive covenant should be completed because the existing covenant was recorded prior to the passage of California Civil Code section 1471, which establishes the framework for environmental covenants in California

The groundwater cleanup levels and toxicity factors for several COCs have changed since the ROD. These changes do not affect the protectiveness of the remedy. The land use has not changed on-site or off-site since the last FYR. Vapor intrusion was evaluated in 2008 and 2013 with a focus on risks from groundwater, with results suggesting no potential indoor air exposures from groundwater contamination on-site for commercial uses. However, the vapor intrusion evaluation indicated a potential for vapor intrusion in the source area under residential scenario land use, and did not consider off-gassing from the former source area or vadose zone lateral transport under the current conditions.

The remedy at the Fairchild Semiconductor San Jose Site is currently protective of human health and the environment because all exposure pathways are currently controlled. However, to be protective in the

long-term, a remedy that addresses 1,4-dioxane needs to selected and a new restrictive convent needs to be placed on the property. Additionally, a vapor intrusion assessment for current land use and in consideration of future residential use needs to be completed for sources other than groundwater (including from the former source area and due to lateral vadose zone transport and via subsurface preferential pathways).

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Fairchild Semiconductor Corporation South San Jose Plant		
EPA ID: CAD097012298		
Region: 9	**State:** CA	**City/County:** San Jose/Santa Clara

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

REVIEW STATUS
Lead agency: State **If "Other Federal Agency" was selected above, enter Agency name:**
Author name (Federal or State Project Manager): Melanie Morash, EPA; Max Shahbazian, RWQCB
Author affiliation: EPA, RWQCB
Review period: August 29, 2013 – May 30, 2014
Date of site inspection: October 23, 2013
Type of review: Policy
Review number: 5
Triggering action date: September 30, 2009
Due date *(five years after triggering action date)*: September 30, 2014

Five-Year Review Summary Form (continued)

Issues/Recommendations				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s):	**Issue Category: Remedy Performance**			
	Issue: 1,4-dioxane is present in groundwater inside the slurry wall, but is not identified in the ROD and does not have a cleanup level.			
	Recommendation: Finalize the FFS and amend the ROD to reflect a change in remedy.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	September 2015
OU(s):	**Issue Category: Institutional Controls**			
	Issue: The existing restrictive covenant was recorded prior to the passage of California Civil Code section 1471, which establishes the framework for environmental covenants in California.			
	Recommendation: Finalize and record the new restrictive covenant for the site that is consistent with current California law.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	State	September 2015
OU(s):	**Issue Category: Remedy Performance**			
	Issue: The FYR vapor intrusion evaluation indicated a potential for vapor intrusion in the source area under residential scenario land use and did not consider all potential sources of risk for the vapor intrusion pathway.			
	Recommendation: Complete vapor intrusion assessment for current land use and in consideration of future residential use for sources other than groundwater (including from the former source area and due to lateral vadose zone transport and via subsurface preferential pathways).			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	September 2015

Protectiveness Statement(s)		
Operable Unit: Click here to enter text.	***Protectiveness Determination:*** **Short-term Protective**	***Addendum Due Date (if applicable):*** Click here to enter date.
Protectiveness Statement: The remedy at the Fairchild Semiconductor San Jose Site is currently protective of human health and the environment because all exposure pathways are currently controlled. However, to be protective in the long-term, a remedy that addresses 1,4-dioxane needs to be selected and a new restrictive convent needs to be placed on the property. Additionally, a vapor intrusion assessment for current land use and in consideration of future residential use needs to be completed for sources other than groundwater (including from the former source area and due to lateral vadose zone transport and via subsurface preferential pathways).		

Contents

Executive Summary ..... **iii**
List of Figures ..... **vii**
List of Tables ..... **vii**
List of Abbreviations ..... **ix**
1. Introduction **1**
2. Site Chronology **2**
3. Background **3**
3.1. Physical Characteristics 3
3.2. Hydrology 4
3.3. Land and Resource Use 5
3.4. History of Contamination 6
3.5. Initial Response 6
3.6. Basis for Taking Action 8
4. Remedial Actions **8**
4.1. Remedy Selection 8
4.2. Remedy Implementation 10
4.3. Operation and Maintenance (O&M) 10
5. Progress Since the Last Five-Year Review **11**
5.1. Previous Five-Year Review Protectiveness Statement and Issues 11
5.2. Work Completed at the Site During this Five Year Review Period 12
6. Five-Year Review Process **12**
6.1. Administrative Components 12
6.2. Community Involvement 13
6.3. Document Review 13
6.4. Data Review 21
6.5. Site Inspection 29
6.6. Interviews 30
6.7. Institutional Controls 30
7. Technical Assessment **31**
7.1. Question A: Is the remedy functioning as intended by the decision documents? ... 31

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? 33
7.3. Question C: Has Any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy? 34
7.4. Technical Assessment Summary 34
8. Issues 35
9. Recommendations and Follow-up Actions 35
10. Protectiveness Statement 36
11. Next Review 36
Appendix A: List of Documents Reviewed 37
Appendix B: Press Notices 40
Appendix C: Interview Forms 43
Appendix D: Site Inspection Checklist 46
Appendix E: Photographs from Site Inspection Visit 58
Appendix F: Data Summary 63

List of Figures

Figure 1. Location Map for Fairchild, San Jose Superfund Site 4
Figure 2. Detailed Map of the Fairchild On-Site Area 7
Figure 3. Monitoring Well Locations 22
Figure 4. Groundwater Level Contours for Aquifer Zone B, September 2013 24
Figure 5. 1,1-DCE Concentrations in B Zone September 2013 25
Figure 6. 1,4-Dioxane Concentrations in Well WCC-41(A) 27
Figure 7. 1,1,1-TCA and 1,1-DCE Concentrations in Well RW-25(B) Over Time 29

List of Tables

Table 1. Chronology of Site Events 2
Table 2. ROD cleanup standards 9
Table 3. Status of Recommendations from the 2009 FYR 11
Table 4. Summary of Groundwater ARAR Changes 14
Table 5. Applicable or Relevant and Appropriate Requirements Evaluation 15

Table 6. On-Site Maximum Groundwater Concentrations Compared to Target Groundwater Concentrations 17
Table 7. Toxicity Values Changed Since the Previous Five-Year Review..... 19
Table 8. Example comparison of ROD groundwater cleanup levels against November 2013 RSLs..... 20
Table 9. Results of Mann-Kendall Test for Trend at Wells Inside the Slurry Wall, 2006-2013... 26
Table 10. 1,4-Dioxane Concentrations in Wells Inside the Slurry Wall 27
Table 11. Results of Mann-Kendall Test for Trend at Off-Site Wells, 1998-2013..... 28
Table 12. Institutional Controls Summary Table..... 30
Table 13. Current Issues for the Fairchild Site 35
Table 14. Recommendations to Address Current Issues at the Fairchild Site 35

List of Abbreviations

ARAR	applicable or relevant and appropriate requirements
bgs	below ground surface
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemical of concern
DCE	dichloroethene
DHS	California Department of Health Services
EPA	Environmental Protection Agency
FFS	Focused Feasibility Study
Freon 113	1,1,2-trichloro-1,2,2-trifluoroethane
FYR	Five-Year Review
gpm	gallons per minute
GWET	groundwater extraction and treatment
HI	hazard index
IARC	International Agency for Research on Cancer
IC	institutional control
IPA	isopropyl alcohol
IRIS	Integrated Risk Management System
IUR	inhalation unit risk
MCL	maximum contaminant level
ug/L	micrograms per liter
NCP	National Contingency Plan
NPL	National Priorities List
PCE	tetrachloroethene
ppm	parts per million
RA	remedial actions
RWQCB	Regional Water Quality Control Board
RfCi	reference concentration (inhalation)
RfDo	reference dose (oral)
RPD	relative percent difference
RPM	Remedial Project Manager
RSL	risk screening level
ROD	Record of Decision
SCR	site cleanup requirements
SFi	slope factor (inhalation)
SFo	slope factor (oral)
SCR	Site Cleanup Requirements
STC	Schlumberger Technology Corporation
SVE	soil vapor extraction

TCA	trichloroethane
USACE	United States Army Corps of Engineers
UST	underground storage tank
VISL	vapor intrusion screening level
VOC	volatile organic compound

Fifth Five-Year Review Report

for

Fairchild Semiconductor

1. Introduction

The purpose of a Superfund 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*."

The Seattle District Army Corps of Engineers conducted the FYR and prepared this report regarding the remedy implemented at Fairchild Semiconductor Corporation South San Jose Plant, in Santa Clara County, California (Fairchild Site; Site). The State of California, represented by the Regional Water Quality Control Board (RWQCB), is the lead agency for developing and implementing the remedy for the Fairchild Site. The EPA provides technical review and guidance for the Site.

This is the fifth FYR for the Fairchild Site. The triggering action for this policy review is the previous FYR. This FYR is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site at levels above those that would allow for unlimited use and unrestricted exposure.

2. Site Chronology

The following table lists the dates of important events for the Fairchild Site.

Table 1. Chronology of Site Events

Event	Date
Fairchild began electronics manufacturing at the site.	1977
Initial investigations identified leaking underground waste solvent storage tank as well as associated soil and groundwater contamination.	Nov-Dec 1981
Great Oaks Water company public supply well GO-13 was found to contain 1,1,1-trichloroethane (TCA) and is taken out of service.	Dec 1981
Fairchild removed the leaking tank and associated piping. Fairchild also excavates a 50-foot by 65-foot area around the tank to a depth of approximately 50 feet.	1982
Fairchild began groundwater extraction.	1982
Fairchild stopped industrial operation at the site.	1983
Fairchild installed slurry wall	1986
Fairchild San Jose Site was added to the National Priorities List.	1989
Fairchild conducted on-property soil vapor extraction (SVE) from aquifer A and B zones between January 1989 and April 1990.	Jan 1987 – Apr 1990
RWQCB adopted Final Site Cleanup Requirements Order 89-016.	Jan 1989
EPA issued Record of Decision.	Mar 1989
Fairchild-Schlumberger sold Site property to SRDC, Inc.	1990
Fairchild terminated off-property pumping.	Dec 1991
Preliminary Close-Out Report completed	Mar 1992
Fairchild submitted first Five-Year Review Report to RWQCB.	Feb 1994
RWQCB adopted Site Cleanup Requirements Order No. 95-084, an amendment of Order No. 89-016, curtailing soil remediation (SVE system).	April 1995
A Supplemental Health Risk Assessment was conducted to access vapor	Nov 1995

Event	Date
intrusion.	
Fairchild submitted a Containment Zone Application.	March 1998
Fairchild terminated on-property groundwater extraction and treatment.	July 1998
Site Status is changed to Open with verification monitoring	July 2002
RWQCB and EPA completed the Third Five-Year Review.	September 2004
1,1,-dichloroethene (DCE) is detected at a concentration above the maximum contaminant level (MCL) of 6 micrograms per liter (µg/L) in well RW-25B located outside the slurry wall.	October 2005
Fairchild initiated quarterly sampling of wells RW-25B and 127B to evaluate concentration changes. No COCs were ever detected in well 127B, so frequency of sampling in this well reverted back to annual in January 2008.	January 2007
The Self Monitoring Program requirement was issued and monitoring and reporting requirements were changed from semi-annual to annual.	July 2007
Groundwater sampling and analysis results for 1,4-dioxane in wells WCC-6(C), WCC-41(A), 127(B), and 128(B) indicated a maximum of 79 µg/L detected.	September 2008
A vapor intrusion evaluation using RWQCB multi-tiered evaluation was conducted.	October 2008
RWQCB and EPA completed the Fourth Five-Year Review.	September 2009
Groundwater sampling at 10 wells was completed to support a Focused Feasibility Study (FFS).	February 2011
The draft FFS was completed.	June 2011

3. Background

3.1. Physical Characteristics

The Fairchild Site is located approximately 9 miles southeast of downtown San Jose and is near the intersection of Monterey Highway and Highway 85, about 20 miles southeast of San Francisco Bay (Figure 1). The Superfund Site consists of two portions: the area contained within the slurry wall is referred to as “on-site” and the area site outside the slurry wall and down-gradient is referred to as “off-site.”

The Site is located within a light industrial and commercial area. Most buildings in the area are low-rise developments containing offices, warehouses, and research and development facilities. One large

industrial building formerly occupied the 22-acre Site. The property was redeveloped during 1998 to 2000 into a retail shopping center and currently contains retail shops, a grocery market, restaurants and parking. Groundwater contamination at the Site consists primarily of 1,1,1-trichloroethane (1,1,1-TCA) and its breakdown product 1,1-dichloroethene (1,1-DCE), along with other chlorinated and non-chlorinated compounds such as xylenes and acetone. Groundwater contamination from the Site formed a plume that migrated about one mile northwestward toward the San Francisco Bay. Down-gradient contamination was limited to 1,1,1-TCA and 1,1-DCE.

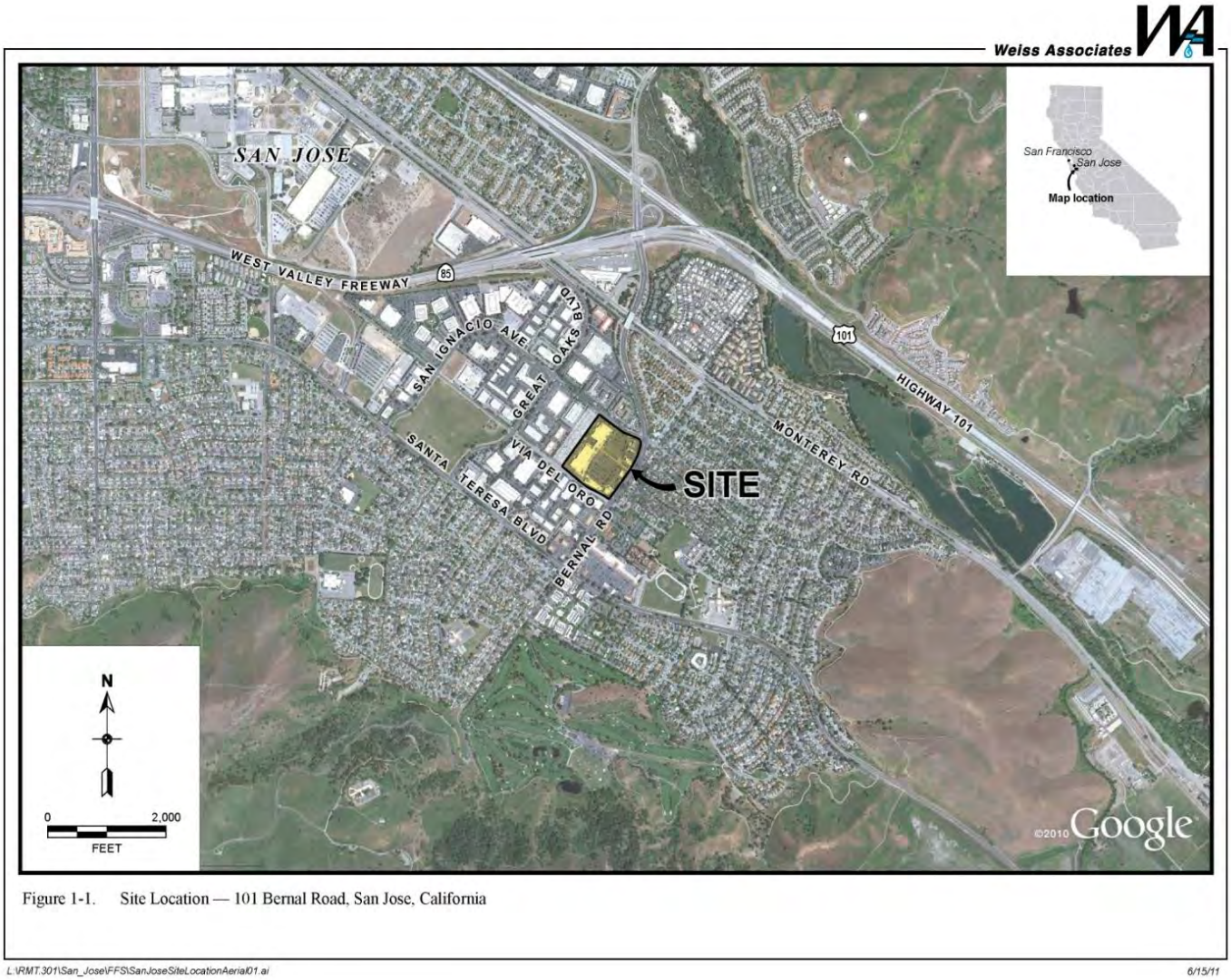

Figure 1. Location Map for Fairchild, San Jose Superfund Site

3.2. Hydrology

The Site is located in the Santa Teresa Basin, a southern extension of the Santa Clara Valley at higher elevation. The Santa Clara Valley is a fault-bounded structural basin filled with marine and alluvial sediments. Alternating layers of coarse and fine deposits result in a heterogeneous sequence of

interbedded sands, gravels, silts, and clays. The Santa Teresa Basin is bounded by the bedrock outcrops of Coyote Narrows and Tulare Hill on the southeast, and the Diablo Range on the northeast.

Groundwater at the site occurs in the alluvial sediments that extend from ground surface to bedrock at a depth of about 330 to 360 feet. The alluvial aquifer is separated into four water bearing zones, designated as "A," "B," "C," and "D." These zones are composed of transmissive, coarse-grained sediments (sand or sandy gravel) and separated by silt and silty clay aquitards up to 60 feet thick. The shallowest zone (A) is 10 to 40 feet thick and is first encountered at depths of 10 to 20 feet below ground surface (bgs). The A zone is laterally discontinuous in the off-site areas. The B zone is generally located between 60 and 120 feet bgs; the C zone between 150 and 190 feet bgs; and the D zone greater than 300 feet bgs. The B, C, and D zones are laterally continuous and are actively used in the basin as a source of drinking water.

The natural groundwater flow direction at the Site is northwest towards San Francisco Bay. There is some hydraulic communication between the A and B zones. The C zone appears to be hydraulically isolated from the B zone, as demonstrated by lack of contaminants detected within the C zone in the on-site area. In the off-site area, agricultural and supply wells were direct conduits for vertical migration between the B and C zones.

3.3. Land and Resource Use

The site was primarily used for agriculture during the early 1900s. Transition from agricultural to industrial and commercial land use occurred in the 1960s and 1970s. In 1975, the site was purchased by Fairchild Semiconductor Corporation to construct a manufacturing plant for electronic devices. From 1977 through 1983, the facility was used for electronics and semiconductor fabrication. The operations required on-site use, handling, repackaging, and storage of industrial solvents. In 1979, Schlumberger Technology Corporation (STC) acquired Fairchild and, as a result, also acquired the Site. In 1990, STC sold the property to a retail property developer; however, STC continues its remediation efforts on the Site.

Between 1998 and 2000, the Site was redeveloped into a retail shopping center which currently contains a grocery market, restaurants, other retail businesses, and a surface parking lot. The area surrounding the Site consists of commercial buildings.

Groundwater in the area is used for municipal water supply and agriculture. Great Oaks Water Company, a local water purveyor, operates wells for municipal use within one mile of the site. The closest operating well located down-gradient is about 5,000 feet west of the Site. Two additional wells are located cross-gradient (2,000 feet northeast and 2,000 feet north), but are outside the Site's monitoring area. A covenant is currently in place that prohibits the installation of groundwater wells on the property except in connection with the remedial action.

3.4. History of Contamination

The manufacturing process for electronics and semiconductor fabrication involved etching, cleaning, coating, and inspecting of silicon wafers. These operations required use of solvents such as 1,1,1-TCA, 1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113), acetone, and isopropyl alcohol (IPA). Waste solvents and waste hydrofluoric acid were transferred through piping from disposal sinks and/or floor drains to storage tanks located outside the building (see Figure 2 for tank locations).

In 1981, a fractured acid-neutralization pipeline was discovered. In response, exploratory borings were completed and volatile organic compounds (VOCs) were encountered. A subsequent investigation discovered the source was a 5,940-gallon underground storage tank (UST) containing solvent waste that had failed and released a mixture of solvents to the subsurface. A public drinking water supply well, Great Oaks Water Company well number GO-13, located approximately 1,800 feet down-gradient from the Site, was impacted by the release with 1,1,1-TCA detected in the well at concentrations up to of 5,700 micrograms per liter (µg/L). The Fairchild Semiconductor South San Jose Plant was listed on the NPL in January 1989.

3.5. Initial Response

Following the discovery of VOCs in the subsurface, a series of interim actions were completed. Water supply well GO-13 was immediately removed from service following the detection of contamination in 1981. A survey to identify existing water wells near the Site was completed in 1981 and 1982. Twenty-five private wells were identified; eight of these were decommissioned because they were located down-gradient of the Site in potentially impacted areas.

Additional remedial actions included soil excavation and disposal, groundwater extraction and treatment, and installation of a slurry wall. In 1982, soil within the area of the UST source (see Figure 2) was removed using an augured caisson. Approximately 3,400 cubic yards of impacted soil were removed and disposed off-site. Estimates indicated that approximately 38,000 pounds of VOCs were removed.

Between 1982 and 1998 groundwater extraction and treatment was conducted to remove VOCs from the groundwater and hydraulically control VOC migration. Former drinking water supply well, GO-13, was converted into a remediation extraction well. Extraction wells were also installed in the on-site area completed within the A and B aquifer zones and in the off-site areas within the B and C aquifer zones. The extracted water was treated using granular activated carbon and aeration towers.

In 1986, a cutoff wall was constructed, using soil-bentonite slurry, creating a physical barrier to slow or prevent off-site migration of contaminants and to facilitate remediation of on-site VOC “hot spots.” The cutoff wall surrounds an approximately rectangular-shaped area about 1,260 feet long by 1,125 feet wide. The cutoff wall is about 3 feet thick and varies in depth from 55 to 148 feet bgs. It is keyed in a minimum of 2 feet into the aquitard between the aquifer B zone and C zone.

Figure 2. Detailed Map of the Fairchild On-Site Area

3.6. Basis for Taking Action

The primary contaminants of concern (COCs) for the Fairchild Site are the following VOCs: 1,1,1-TCA, 1,1-DCE, Freon-113, xylenes, acetone, IPA, and tetrachloroethene (PCE) in groundwater and soils. Contaminants 1,1,1-TCA, 1,1-DCE, and Freon 113 were detected in groundwater off-site. A public health assessment was completed in 1988 for the Site to evaluate risks posed by contaminated drinking water. The presence of these contaminants above DHS action levels provided the basis for taking action under CERCLA. No known potential carcinogens were noted off-site. The only known potential carcinogen noted on-site was PCE. The primary threat to human health was posed by ingestion of groundwater containing the COCs.

4. Remedial Actions

4.1. Remedy Selection

The RWQCB is the lead agency overseeing cleanup of the Site. The RWQCB adopted the Final Site Cleanup Requirements (SCR) Order No. 89-016 for the Site in January 1989. A Record of Decision (ROD) was issued by EPA in March 1989 which incorporates the SCR order.

The objective of the final cleanup plan is overall protection of human health and the environment. SCR Order No. 89-016 stated:

> *The proposed final cleanup plan protects human health and the environment by requiring on-site aquifers to be cleaned up to drinking water actions levels and by requiring off-site aquifers to be cleaned up to a level at least 4 times more stringent than drinking water action levels. The plan therefore prevents migration of chemicals above cleanup levels into drinking water supply wells. Human health is also protected by requiring a deed restriction to prohibit use of on-site groundwater until health standards are achieved. Until cleanup levels are achieved in off-site aquifers, wells could potentially be drilled in areas of the plume containing chemical concentrations in excess of drinking water criteria. However, as part of their permitting process, the Santa Clara Valley Water District (SCVWD) would advise the potential well owner of the risks associated with such well installation. The proposed plan protects human health and the environment by preventing further vertical or horizontal migration of chemical concentrations above cleanup levels in the aquifers.*

The final cleanup plan described in the ROD includes:

- Continued groundwater extraction from off-site aquifers until a Hazard Index (HI) of 0.25 is achieved.
- Continued groundwater extraction from on-site aquifers until drinking water quality is achieved, if feasible. If these levels are determined to be infeasible, on-site groundwater extraction shall continue as long as significant quantities of chemicals are being removed through groundwater extraction. If drinking water quality cannot be achieved, the dischargers must demonstrate to the satisfaction of the RWQCB that the conditions for waiving an ARAR are met and that alternative proposals will be protective of human health and the environment.

- Treatment by air stripping and reinjection or reuse of groundwater extracted on-site and from off-site well RW-25(B). If reinjection or reuse is attempted and determined to be infeasible by the RWQCB, the water will be treated using air stripping and discharged into storm drains leading to Canoas Creek.
- Nozzle aeration of groundwater extracted from off-site wells except well RW-25(B) and then discharge into storm drains leading to Canoas Creek.
- Cleanup of on-site soils containing TCA at levels greater than 1 part per million (ppm) using in-situ soil aeration.
- A goal of 100 percent for reusing off-site groundwater.
- A laboratory and field study of biodegradation of on-site chemicals.
- A re-evaluation of the feasibility and effectiveness of on-site groundwater flushing.
- A deed restriction. The dischargers shall be required to file a deed restriction prohibiting use of on-site groundwater for drinking water and limiting other subsurface activities in order to protect and maintain the integrity of the slurry wall. The deed restriction shall remain in place until safe drinking water levels are achieved on-site
- Additional monitoring wells. Additional monitoring wells will be required to define the boundaries of the plume in the area bordered by Bernal Road, Via del Oro, Great Oaks Boulevard, and Santa Teresa Boulevard. Piezometers may also be required to determine extraction well capture zones.
- Long-term monitoring (for approximately 30 years) after cleanup levels are achieved.

Groundwater cleanup standards were set at the drinking water action levels established by California Department of Health Services (DHS) or the federal Maximum Contaminant Levels (MCLs), whichever was more stringent for each contaminant. Note that DHS is now the California Department of Public Health (CDPH). The cleanup standards identified in the ROD for the on-site and off-site areas are listed in Table 2 below.

Table 2. ROD cleanup standards

Chemical	Cleanup Standard (µg/L)	
	On-Site	Off-Site
1,1,1-TCA	200	See Note 1 below
1,1-DCE	6	See Note 1 below
Freon 113	18,000	-
Xylenes[2]	620	-
Acetone	3,500[3]	-
IPA	3,500[3]	-
PCE	5[4]	-

1 - For the off-site area, groundwater cleanup standards were set at a 0.25 hazard index for 1,1,1-TCA and 1,1-DCE, the only COCs that have been detected in off-property groundwater. As defined in the ROD, the hazard index is the sum of concentrations 1,1,1-TCA and 1,1-DCE over their respective cleanup standard at the time of the ROD which is 200 µg/L for TCA and 6 µg/L for DCE.
2 – The xylenes MCL is for either a single isomer or the sum of isomers.
3 – The MCLs and DHS drinking water action levels were not established for these chemicals. The value for acetone is based on the oral reference doses in the EPA Integrated Risk Management Information System (IRIS). The value for IPA is based on the DHS site specific remediation criteria for IPA.
4 – The value at the time of the ROD was the proposed state MCL, 2 µg/L. The ROD provides that if the final MCL is not the proposed value, the final cleanup goal shall be modified. The final MCL that was promulgated later in 1989 was 5 µg/L.

A soil cleanup goal of 1 mg/kg was established for on-site soils for 1,1,1-TCA, 1,1-DCE, xylenes, Freon-113, and PCE. No soil cleanup goals were established for acetone and IPA because of the low

rate of migration from soils to groundwater, their potential for biodegradation, and the lower toxicity of these chemicals.

4.2. Remedy Implementation

At the time the Final SCR order was adopted in 1989, soil excavation and construction of the slurry wall were complete and the groundwater extraction and treatment (GWET) system and groundwater monitoring program were fully implemented. A discussion of the actions prescribed in the ROD is presented below. In total, approximately 146,000 pounds of VOCs were removed from the Site through soil excavation, groundwater extraction, and soil vapor extraction (SVE).

Groundwater remediation at the Site began in 1982 and extraction rates increased rapidly, reaching a peak flow of about 9,500 gallons per minute (gpm). At its peak the extraction system consisted of 2 wells in the aquifer A and B zones inside the slurry wall area and 19 wells outside the slurry wall/off-site in the aquifer B and C zones. By 1989, off-site groundwater extraction from the C zone was terminated and, in 1991, all off-site pumping ended. In 1989, six additional B zone wells were installed on-site to dewater the A and B zones and facilitate the SVE system; pumping from all but 2 of these on-site wells ceased by 1990. With concurrence from the RWQCB, groundwater extraction and treatment was suspended completely in July 1998 after demonstrating that asymptotic VOC concentrations and other conditions had been reached. During operation of the GWET system between 1982 and 1998, a total of 93,285 pounds of VOCs were removed from groundwater by this method.

An SVE system operated at the Site between 1987 and 1990 to extract and treat vadose-zone soil contamination. The system was permanently shut down and removed in 1995 when Fairchild demonstrated that soil cleanup goals established in the SCR had been achieved. In 1995, an SCR amendment (Order No. 95-084) was issued by the Regional Board allowing the SVE system to be decommissioned. A total of 15,906 pounds of VOCs were removed by SVE.

An on-site flushing program was implemented for the aquifer B zone from September 1990 to June 1991. It consisted of extracting and re-injecting water into wells near the former UST. Since VOC concentrations in wells near and down-gradient of the former tank did not decrease, the program was terminated.

A restrictive covenant was prepared for the property and recorded with the Santa Clara County Records Office on May 17, 1989. The covenant prohibits the installation of groundwater wells on the property except in connection with the remedial actions, restricts excavation below a depth of 5 feet, and prohibits damage or interference with the operation of the remedial actions.

4.3. Operation and Maintenance (O&M)

No active remediation has been performed at the Site since July 1998. Fairchild is currently conducting long-term monitoring. In 2007, Fairchild revised the Self-Monitoring Program required in SCR Order No. 95-084. Groundwater elevation measurements and samples are collected annually at

30 monitoring wells. Samples are collected using micropurge sampling techniques. Note that this technique replaced the three-well purge methodology in 2006. All samples are analyzed for VOCs using EPA Test Method 8260B or the updated EPA-approved SW-846 method. Reports are submitted annually. The annual costs for the groundwater monitoring, which includes sampling and reporting, range between $40,000 and $50,000.

5. Progress Since the Last Five-Year Review

5.1. Previous Five-Year Review Protectiveness Statement and Issues

The protectiveness statement from the 2009 FYR for the Fairchild Site stated:

> *"The remedy at the Fairchild-San Jose Superfund Site at 101 Bernal Road in San Jose, California is currently protective of human health and the environment. The groundwater plume has been reduced and contained. In the meantime, institutional controls are in place to prevent exposure. There is no exposure risk from vapor intrusion. To be protective in the long term, the feasibility of alternative remedies or improvements to the existing system need to be evaluated to insure that the remedial objectives are achieved. The ROD will need to be amended to reflect the change in remedy and to identify 1,4-dioxane as a chemical of concern. Also, a new environmental restriction covenant consistent with current California law should be recorded to ensure long-term protectiveness."*

The 2009 FYR included three issues and recommendations. Each recommendation and the current status are discussed below.

Table 3. Status of Recommendations from the 2009 FYR

Issues from previous FYR	Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
1,4-dioxane is present in the contaminated groundwater plume, but is not identified in the ROD and does not have a cleanup level.	The ROD will need to be amended to reflect the change in remedy and the new contaminant of concern.	RWQCB	2012	No ROD amendment has been issued.	NA
The slurry cut-off wall around the Site is preventing off-property migration of contaminated groundwater but it may not be capable of achieving groundwater cleanup standards within the slurry wall for many years. The GWET system was shut off in 1998.	Fairchild should continue to assess the long-term success of the slurry cut-off wall in preventing off property migration of contaminated groundwater and evaluate other remedies such as in-situ bioremediation in terms of accelerating groundwater cleanup.	Fairchild	2013	A draft focused feasibility study (FFS) was completed to evaluate other remedies.	2011
The existing restrictive covenant was recorded prior to the passage of California Civil Code section 1471, which establishes the framework for environmental covenants.	A new restrictive covenant should be recorded for the Site that is consistent with current California law.	Current Site owner	2011	No new restrictive covenant has been recorded.	NA

First Recommendation

1,4 dioxane was identified as a potential COC in the 1999 FYR. Samples were collected and analyzed for 1,4-dioxane at select wells in 2001, 2008, and 2011. Recently observed concentrations indicate contamination is limited to wells inside the slurry wall area. 1,4-dioxane is known to cause damage to the central nervous system, liver, and kidneys has and been classified by the International Agency for Research on Cancer (IARC) as a Group 2B carcinogen. The EPA and California, under proposition 65, also classify 1,4 dioxane as a probable human carcinogen. The fourth FYR recommended that the ROD be amended to reflect this potential COC. A draft focused feasibility study (FFS) was completed in 2011 which includes 1,4-dioxane as a proposed COC. A ROD amendment has not been issued.

Second Recommendation

The draft FFS completed in 2011 evaluated several remedial technologies including in-situ chemical oxidation to treat groundwater within the slurry wall. The draft FFS is currently under review by the RWQCB and EPA.

Third Recommendation

Attorneys representing Fairchild and EPA have been negotiating a new restrictive covenant that is consistent with current California law; however, it has not been finalized and recorded.

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

A draft FFS was completed in 2011 to address the addition of 1,4-dioxane as a COC and evaluate remedial alternatives for the area within the slurry wall. These alternatives included: no action, long-term groundwater monitoring, in-situ groundwater remediation using in-situ chemical oxidation, and groundwater extraction and treatment, in conjunction with the existing slurry wall and institutional controls. The draft FFS also proposes new cleanup levels for Freon 113 and xylenes: 1,200 µg/L and 1,750 µg/L, respectively. These proposed cleanup goals correspond to the most recent CDPH MCLs. A cleanup level for 1,4-dioxane is currently in discussions. The draft FFS recommended the second alternative, which consists of long-term groundwater monitoring, slurry wall, and institutional controls. The draft FFS is currently under review by the RWQCB and EPA.

6. Five-Year Review Process

6.1. Administrative Components

EPA Region 9 initiated this FYR in August 2013 and scheduled its completion for September 2014. The review team was led by Max Shahbazian of RWQCB, Project Manager for the Fairchild Site, and Melanie Morash of EPA, Remedial Project Manager (RPM) for the Fairchild Site, and included Marlowe Laubach (chemical engineer), Sharon Gelinas (geologist), Aaron King (environmental engineer), and Ellen Engberg (geologist) with USACE, Seattle District. In August 2013, EPA and the State of California 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. A review schedule was established that consisted of the following:

- Community notification;
- Document review;
- Data collection and review;
- Site inspection;
- Local interviews; and
- Five-Year Review Report development and review.

6.2. Community Involvement

On June 2, 2014, a public notice was published in the *San Jose Mercury News* announcing the commencement of the Five-Year Review process for the Fairchild Semiconductor San Jose Site, providing EPA's and RWQCB'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.

The Five-Year Review report will be made available to the public once it has been finalized. Copies of this document will be placed in the designated public repository: Regional Water Quality Control Board, San Francisco Bay Region, 2101 Webster Street, Suite 500, Oakland, CA 94612.

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>

Section 121 (d)(2)(A) of CERCLA specifies that Superfund remedial actions (RAs) must meet any federal standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). ARARs are those standards, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action (RA), location, or other circumstance at a CERCLA site.

Chemical-specific ARARs identified in the selected remedy within the ROD for the groundwater at this Site and considered for this FYR for continued groundwater treatment and monitoring are listed in Table 4. State primary drinking water standards are the same as federal primary drinking water standards except for the state standards for Freon 113 and xylenes, which are more stringent than the federal standards.

Table 4. Summary of Groundwater ARAR Changes

Contaminant of Concern	1989 ROD ARARs[1] (µg/L)		Current[2] Regulations (µg/L)		ARARs Changed?
	On-site	Off-site	On-site	Off-site	
1,1,1-TCA	200	See Note 4	200	See Note 4	No
1,1-DCE	6	See Note 4	6	See Note 4	No
Freon 113	18,000	NA	1,200	NA	More stringent
Xylenes	620	NA	1,750	NA	Less stringent
Acetone	3,500[3]	NA	3,500[6]	NA	No
IPA	2,250[3]	NA	2,250[6]	NA	No
PCE	5[5]	NA	5	NA	No

1 – Cleanup levels specified in the ROD are DHS drinking water action levels.
2 – Current cleanup levels are the most stringent of either California Department of Public Health or federal MCLs.
3 – MCLs or DHS drinking water action levels were not established. The value for acetone is based on the oral reference dose in EPA IRIS. The value for IPA is based on the DHS site specific remediation criteria for IPA.
4 – The ROD specifies that off-site cleanup levels for 1,1,1-TCA and 1,1-DCE be equal to or less than a HI of 0.25.
5 – The value at the time of the ROD was the proposed state MCL, 2 µg/L. The ROD provides that if the final MCL is not the proposed value, the final cleanup goal shall be modified. The final MCL that was promulgated later, in 1989, was 5 µg/L.
6 – Current regulations do not have MCLs for either acetone or IPA. These are the cleanup levels specified in the ROD.
NA – not available.

Changes to MCLs for Freon 113 and xylenes have occurred since the ROD was issued. The newer Freon 113 MCL is more stringent than the cleanup level in the ROD; however, this change does not affect the protectiveness of the remedy because Freon 113 has not been detected in any groundwater wells since 1993. Xylenes have been detected in groundwater wells within the slurry wall area; however the newer MCLs for xylene are less stringent than those specified in the ROD. These proposed changes to clean up levels are included in the draft FFS prepared for the proposed ROD amendment.

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 5. ARARs identified in the 1989 ROD that are no longer pertinent, due to the phase of the remedy, are not included in the table. Changes to the non-promulgated requirements in Table 5 do not affect the protectiveness of the remedy. Of the laws and regulations that have been revised, none affect the protectiveness of the remedy.

Table 5. Applicable or Relevant and Appropriate Requirements Evaluation

Type of Requirement	Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
Hazardous Waste	42 U.S.C ch 82 6901-6991{i}; Resource Conservation and Recovery Act	1989 ROD	Provides criteria for determining whether a solid or liquid waste is RCRA-regulated hazardous waste.	Changes to this requirement do not affect protectiveness.	This primarily is applicable to purge water from groundwater monitoring activities.	1984, 1992, 1996.
Hazardous Waste	22 CCR Division 4.5 Ch 11	1989 ROD	Provides criteria for determining whether a solid or liquid waste is a California hazardous waste	Changes to this requirement do not affect protectiveness.	This primarily is applicable to purge water from groundwater monitoring activities.	Several changes from 1991 through 2010 which appear administrative in nature.
State Water Quality	SWRCB 68-16, "Statement of Policy with Respect to maintaining High Quality of Waters in California"	1989 ROD	This provides that any changes in water quality must be consistent with maximum public benefit and not unreasonably affect beneficial use.	There has been no change to this non-promulgated requirement and it does not affect protectiveness.		
State Drinking Water Quality	SWRCB Resolution 88-63,"Sources of Drinking Water"	1989 ROD	Provides the definition of drinking water.	Revisions do not affect protectiveness.	The revised resolution specifies that all surface and ground waters are potential sources of groundwater except in specific instances. The cited exceptions include groundwater that is contaminated that could not be reasonably treated for domestic using either Best Management Practices or best economically achievable treatment practices. The revised resolution does not affect the initial evaluation.	SWRCB Resolution 88-63 – February 1, 2006
Waste Management Units	23 CCR Chapter 3, subchapter 15, article 3	1989 ROD	Provides siting criteria for Waste Management Units	Revisions do not affect protectiveness.	Wastes left on-site that are contained by the slurry wall are subject to this requirement. Revisions to this repealed two specific classes of waste management units.	July 1997

Human Health Risk Assessment Review

A public health assessment was completed in 1988 for the Site to evaluate risks posed by contaminated drinking water. As stated earlier in this report (Section 3.6, Basis of Action), the primary threat to the public was through the consumption of drinking water containing chemicals in excess of DHS drinking water action levels. This exposure pathway was addressed by removing drinking water supply well GO-13 from service, by containing the contaminated groundwater plume within a slurry wall to prevent additional drinking water wells from being contaminated, and recording a covenant prohibiting the installation of new drinking water wells. Drinking water well GO-4, located approximately 5,000 feet down-gradient of the site is not currently active and is monitored annually. The only contaminant detected in GO-4 during the last five years was IPA at a concentration of 9 µg/L in August 2012. The well was re-sampled in November 2012, and no contaminants were detected. Other drinking water wells in the area are located cross-gradient of the site and are not included in the monitoring program.

Exposures to contaminated air emissions, surface waters, and surface soils were considered minimal in the 1989 ROD. In 1995, an additional assessment specific to the vapor intrusion pathway was performed. The assessment determined that vapor migration from soil and groundwater to on-site buildings posed no significant health threat to the building occupants. Vapor intrusion is further discussed below.

As part of this FYR, an assessment was made to determine if exposure pathways and receptors have changed since the time of the ROD. The current use of the Site is a shopping center open during normal business hours Monday through Sunday. There are no current exposures to drinking water because an existing covenant prevents the installation of new drinking water wells in this area and existing drinking water wells that had contamination were either abandoned (officially closed) or taken off-line.

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.

The potential for vapor intrusion is evaluated following a "multiple lines of evidence" approach. The COCs at the Site described in the ROD are 1,1,1-TCA, 1,1-DCE, Freon 113, xylenes, acetone, IPA, and PCE. With the exception of IPA, these compounds are considered volatile and toxic.

The on-site boundary is the slurry wall. A shopping center and adjacent parking is located within the slurry wall area. In addition to the large shopping center, smaller buildings with single retail businesses are located along the edges of the parking lot. These smaller buildings are also located within the slurry wall area. The existence of preferential pathways is currently unknown. However, it is possible for these pathways to exist because utilities that service the shopping center and other retail businesses are likely present within the slurry wall area, which may serve as contaminant indoor air pathways.

A vapor intrusion assessment was performed in 2008 which followed RWQCB protocol for determining vapor intrusion exposures from groundwater. The RWQCB protocol at the time used environmental screening levels (ESLs), which have since been updated as the understanding of vapor instruction has

evolved. The results of this assessment indicated there was no potential concerns associated vapor intrusion due to groundwater contamination.

In December 2013, the RWQCB sent a letter to the responsible parties (RPs) to re-assess vapor intrusion. This letter requested that RPs perform an evaluation that analyzes the most recent groundwater data in accordance with the EPA's December 2013 letter to evaluate vapor intrusion per EPA Region 9 guidelines. The evaluation assessed the existing risk to the commercial buildings within the slurry wall, and the potential off-site risk to residential and industrial exposure. The responsible parties concluded that there are no vapor intrusion concerns due to groundwater contamination at the Site.

Vapor intrusion screening was also completed as part of this FYR comparing the maximum 2013 groundwater data to groundwater target concentrations for both residential and industrial scenarios calculated using the EPA vapor intrusion screening level (VISL) calculator, which uses the most current toxicity values. This vapor intrusion screening assessment for on-site and off-site is presented below.

On-Site

The highest 2013 chemical concentrations were used to evaluate whether vapor intrusion is a concern within the slurry wall. Table 6 compares the maximum site groundwater concentrations to the target groundwater concentrations.

Table 6. On-Site Maximum Groundwater Concentrations Compared to Target Groundwater Concentrations

Compound	2013 Maximum Site Groundwater Concentration (µg/L)	VISL Target Groundwater Concentration (residential) (µg/L)	VISL Target Groundwater Concentration (industrial) (µg/L)
Acetone	ND (50)	2,3000,000	950,000,000
1,1-DCE	150	200	820
Freon 113	ND (0.5)	1,500	6,100
IPA	ND (100)	-	-
1,1,1-TCA	41	7,400	31,000
PCE	1.6	13	65
Xylenes	ND (1.0)	490	2,100
1,1-DCA	**30**	6.6	33
1,2-DCA	0.72	1.9	9.8
1,2-DCB	-	2,700	11,000

ND – not detected above listed detection limit.
Bold – exceeds target groundwater concentration

The calculated indoor air concentration for 1,1-DCA exceeds the residential air screening levels but not industrial air screening levels. The indoor air RSL for 1,1-DCA is driven by non-cancer toxicity. Because the area within the slurry wall is commercial, groundwater contamination is unlikely to pose an indoor air

risk to buildings within the slurry wall. Should the land use change in the future, from commercial to residential, then there would be a potential for indoor air risk to those residents whereby additional indoor air assessments are recommended.

Although, the risks of indoor air concentrations are within the risk range from off-gassing from groundwater contamination, another possible source to indoor air contamination is the off-gassing from the original source area. A soil cleanup goal of 1 mg/kg was established for on-site soils for 1,1,1-TCA, 1,1-DCE, xylenes, Freon-113, and PCE based solely on protection of groundwater. In 1982, Fairchild excavated the leaking tank and 3,400 cubic yards of surrounding contaminated soil to a maximum depth of 50 feet below grade. As part of the selected remedy, an SVE system operated at the Site between 1987 and 1990 to extract and treat vadose-zone soil contamination not removed during the excavation. A total of 15,906 pounds of VOCs were removed by SVE before it was demonstrated that soil cleanup goals of 1 mg/kg had been achieved. The residual TCA soil contamination was deep, between 34 and 66 feet below surface grade. The current depth to water in the A-zone with in the slurry wall is approximately 45 feet below grade. The mean concentration of the post-SVE sampling for 1,1,1 TCA was 0.18 mg/kg over the 34 to 66 feet below surface grade interval.

As discussed in EPA's April 21, 2014 memorandum to RWQCB in response to the responsible parties' vapor intrusion assessment, there are four main scenarios where vapor intrusion may occur: off-gassing from groundwater source, off-gassing from a historic source, lateral movement through the vadose zone and underground conduits, such as utility lines, where soil gas can migrate. At the Fairchild Site, scenarios that still need to be evaluated include the potential for vapor intrusion from the former source areas and due to lateral movement through the vadose zone, including along subsurface preferential pathways.

Off-site

Wells off-site (i.e., outside of the slurry wall area) are monitored annually. Of these, well RW-25(B) had the highest concentrations of site COCs from the most recent groundwater event (September 2013.) This well is located just west of the slurry wall. This well is also screened within the B water-bearing zone. The off-site area is a mix of commercial buildings and vacant lots.

Table 7 presents a comparison of groundwater concentrations observed in well RW-25B with VISL calculated target groundwater concentrations for both residential and industrial scenarios.

Table 7. Off-Site Maximum Groundwater Concentrations Compared to Target Groundwater Concentrations

Compound	2013 Maximum Site Groundwater Concentration (µg/L)	VISL Target Groundwater Concentration (residential) (µg/L)	VISL Target Groundwater Concentration (industrial) (µg/L)
Acetone	ND (50)	23,000,000	950,000,000
1,1-DCE	6.0	200	820

Compound	2013 Maximum Site Groundwater Concentration (µg/L)	VISL Target Groundwater Concentration (residential) (µg/L)	VISL Target Groundwater Concentration (industrial) (µg/L)
Freon 113	ND (0.5)	1,500	6,100
Isopropyl alcohol	ND (100)	-	-
1,1,1-TCA	7.2	7,400	31,000
PCE	ND (0.5)	13	
Xylenes	ND (1.0)	490	2,100
1,1-DCA	0.93	6.6	33
1,2-DCA	ND (0.5)	1.9	9.8
1,2-DCB	-	2,700	11,000

ND – not detected above listed detection limit.
Bold – exceeds target groundwater concentration

The maximum off-site groundwater concentrations are below the target groundwater concentrations. Therefore, off-site groundwater contamination is unlikely to pose an indoor air risk to buildings overlying the groundwater plume.

Toxicity values: EPA's Integrated Risk Information System (IRIS) has a program to update toxicity values used by the Agency in risk assessment when newer scientific information becomes available. In the past five years, toxicity values have been changed for several contaminants of concern at the Site as presented in Table 7.

Table 7. Toxicity Values Changed Since the Previous Five-Year Review

Contaminant of Concern	Toxicity Values[1]				Change[2]
	Cancer		Non-Cancer		
	IUR	SFo (1/mg-kg-d)	RfCi	RfDo (mg/kg-d)	
1,1,1-TCA	OLD: NA NEW:NA	OLD: NA NEW: NA	OLD: 0.63 mg/kg-d [2.2mg/m^3] NEW:5.0mg/m^3	OLD:0.28 NEW: 2	RfCi: less stringent RfDo: less stringent
1,1-DCE	OLD: NA NEW: NA	OLD: NA NEW: NA	OLD: 0.14 (mg/kg-d) [0.49 mg/m^3] NEW: 2.0E-01 mg/m^3	OLD: 0.1 NEW: 0.05	RfCi: more stringent RfDo:more stringent
Freon 113	OLD: NA NEW: NA	OLD:NA NEW: NA	OLD: NA NEW: 30 mg/m^3	OLD: NA NEW: 30	NC: New value
Xylenes	OLD: NA NEW: NA	OLD: NA NEW: NA	OLD: 0.029 mg/kd-d [0.029 mg/m^3] NEW: 0.1 mg/m^3	OLD: 0.2 NEW: 0.2	RfCI: less stringent RfDo: unchanged
Acetone	OLD: NA NEW: NA	OLD: NA NEW: NA	OLD: 0.9 mg/kg-d [3.2 mg/m^3] NEW: 31 mg/m^3	OLD: 0.9 NEW: 0.9	RfCi: less stringent RfDo: unchanged

Contaminant of Concern	Toxicity Values[1]				Change[2]
	Cancer		Non-Cancer		
	IUR	SFo (1/mg-kg-d)	RfCi	RfDo (mg/kg-d)	
IPA	OLD: NA NEW: NA	OLD: NA NEW: NA	OLD: NA NEW: 7.0 mg/m^3	OLD: NA NEW: NA	NC: New value
PCE	OLD: 0.021 [1/mg-kg-d] NEW: 0.00000026/µg/m^3	OLD: 0.54 NEW: 0.0021	OLD: 0.01 mg/kg-d [0.035 mg/m^3] NEW:0.04 mg/m^3	OLD: 0.01 NEW: 0.006	C: less stringent RfCi: less stringent RfDo: more stringent

1 – The 1989 ROD did not provide toxicity values as part of the risk discussion. To compare changes, 2004 EPA Preliminary Remediation Goals (PRGs) toxicity values were used as the "old" values.
2 – C – cancer; NC – non-cancer.
EPA no longer recommends using inhalation toxicity values that are derived from oral data (i.e., no longer using inhalation slope factor [SFi] or inhalation reference doses [RfCi]). For comparison with newer IURs (in units of µg/m^3)-1), older inhalation toxicity values are converted to inhalation unit risk values (IURs) for cancer risks using the following formulas: IUR (µg/m^3)-1 = [SFi(mg/kg-day)-1 x 20 m^3/day x 0.001 mg/µg]/70 kg; F. Non-cancer inhalation reference doses are converted to non-cancer hazards. Converted IUR and RfCi values are shown in brackets "[ ]" following the original inhalation toxicity value.

In general since the ROD, new non-cancer toxicity values are now available for many of the COCs and several toxicity values have been revised. Revisions of cancer risk toxicity values have generally been towards less stringent values. Revisions of non-cancer toxicity values have generally been towards less stringent values with the exception of 1,1-DCE and PCE. However, these changes in more stringent toxicity values do not affect the protectiveness of the remedy.

As an example, Table 8 illustrates the impact of toxicity value revisions in a comparison of November 2013 EPA tapwater multi-pathway RSLs with ROD cleanup standards for all COCs.

Any concentration below the cancer RSL indicates that no cancer risk is expected, while concentrations significantly above the cancer RSL may indicate an increase in cancer risk. Any concentration below the non-cancer RSL indicates that no adverse health effect from exposure is expected, while concentrations significantly above the non-cancer RSL may indicate an increased potential for non-cancer effects. As shown in Table 8, the ROD cleanup levels are less than the RSLs, which are therefore still considered protective, for all COCs.

Table 8. Example comparison of ROD groundwater cleanup levels against November 2013 RSLs

Contaminant of Concern	ROD Cleanup Level (µg/L)	Tapwater multi-pathway cancer RSL (µg/L)	Tapwater multi-pathway non-cancer RSL (µg/L)	RSL < ROD Cleanup Level?
1,1,1-TCA	200	-	7,500	No
1,1-DCE	6	-	260	No
Freon 113	18,000	-	53,000	No
Xylenes	620	-	**190**	Yes
Acetone	3,500	-	12,000	No

Contaminant of Concern	ROD Cleanup Level (µg/L)	Tapwater multi-pathway cancer RSL (µg/L)	Tapwater multi-pathway non-cancer RSL (µg/L)	RSL < ROD Cleanup Level?
IPA	450	-	-	-
PCE	2	9.7	35	No

Notes: Bolded values are less than the ROD cleanup levels.

Xylenes have not been detected in off-site wells. Xylenes have been detected in only one on-site well, AE-1(B), in September 2012; this well had no other xylene detections in the last five years. The one detected concentration, 80 µg/L, is much lower than the cleanup level and the RSL. Given the xylene concentration observed, the remedy at Fairchild is still considered protective.

Based on the above evaluation, toxicity value revisions do not impact the protectiveness of the remedy.

Ecological Review

The 1989 ROD does not discuss ecological exposure pathways or receptors. The Site is currently commercial space surrounded by additional commercial use areas. Because the contamination is primarily in groundwater, terrestrial and avian receptors, if present, would not be exposed to site contamination.

6.4. Data Review

Groundwater data collected from 1998 through 2013 were reviewed as part of this FYR. A summary of detected constituents for the last five years (2009 through 2013) is presented in Appendix F. The current monitoring program requires annual measurements of groundwater elevations and sampling of 30 wells in September of each year (see Figure 3 for locations). Samples are analyzed for VOCs. In February 2011, a separate sampling event was conducted to support the FFS and groundwater samples were collected from 10 monitoring wells and analyzed for VOCs, 1,4-dioxane, nitrate, sulfate, and/or metals.

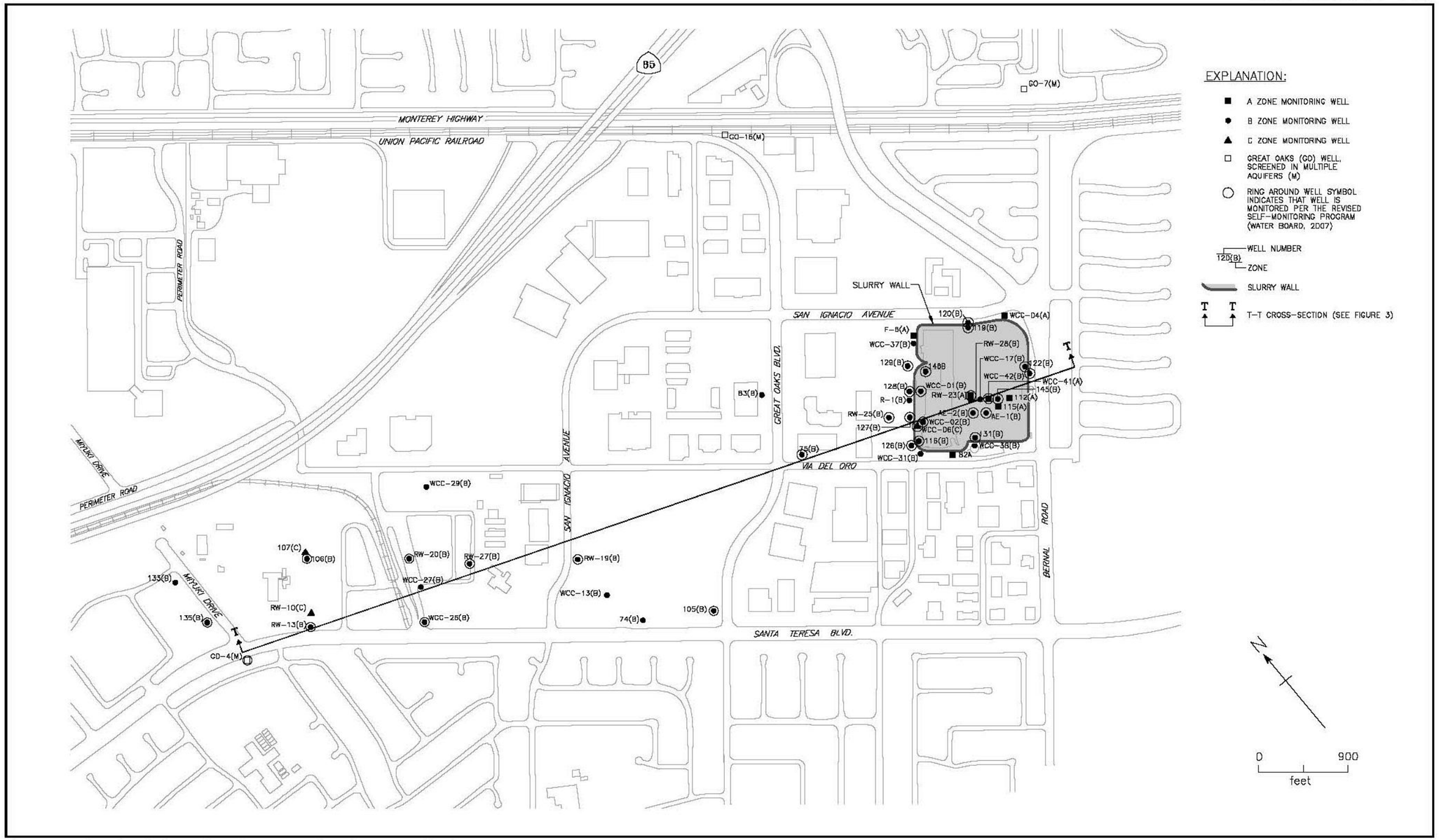

Figure 3. Monitoring Well Locations

Groundwater Elevations

Groundwater elevation measurements indicate that off-site groundwater flow in the aquifer B zone is toward the northwest (see Figure 4). This is consistent with regional flow patterns and historical observations. The gradient off-site is typically about 0.001 feet per foot as determined by the elevation contours. Within the slurry wall area, there were no discernible flow directions or patterns.

To evaluate groundwater containment, six pairs of B zone monitoring wells are located across the slurry wall from each other (one just inside and the other just outside the wall). Water level measurements collected since the groundwater extraction system was shut down in July 1998 have generally indicated an inward hydraulic gradient along the northeastern and southeastern portions of the wall. A seasonal variation in gradient across the wall is indicated in the well pairs along the northwestern (down-gradient) portion of the wall. During wetter times of the year (spring), flow is inward, while in drier periods (fall), flow is outward. This variation may be a function of fluctuations in water levels outside the wall rather than a failure in the wall. Between 2009 and 2013, water levels were only measured in the fall and indicated an outward flow based on head differential of about 1 to 2 feet.

Vertical flow across the aquitard between the B and C zones inside the slurry wall is evaluated using wells WCC-02(B) and WCC-06(C). Water level data consistently indicate a downward gradient. Between 2009 and 2013, water levels in the B zone were typically about 9 to 10 feet higher than in the C zone. Although a downward gradient is present, the B-C aquitard is effective at containing contamination within the B zone as VOCs were not detected in the C-zone well.

Contaminant Concentrations Inside the Slurry Wall

COCs detected above cleanup standards within the slurry wall area include PCE and 1,1-DCE. PCE was detected at a level above the cleanup standard once in 2012, in well AE-1(B). 1,1-DCE was detected at levels above the cleanup standard in aquifer A zone wells WCC-41(A) and RW-23(A) and B zone wells 131(B), AE-1(B), AE-2(B) and WCC-01(B). The highest 1,1-DCE concentrations were detected in well AE-1(B), located near the source area (i.e. the former underground storage tank), with a maximum concentration at 2,600 µg/L detected in 2010 and 2012. The latest 2013 concentrations of 1,1-DCE in the B zone are presented in Figure 5. Note that concentrations in 2013 at monitoring wells near the source area are some of the lowest seen at the site since the extraction system was shut down. The cause for this is unknown, but may be associated with the low water table in 2013.

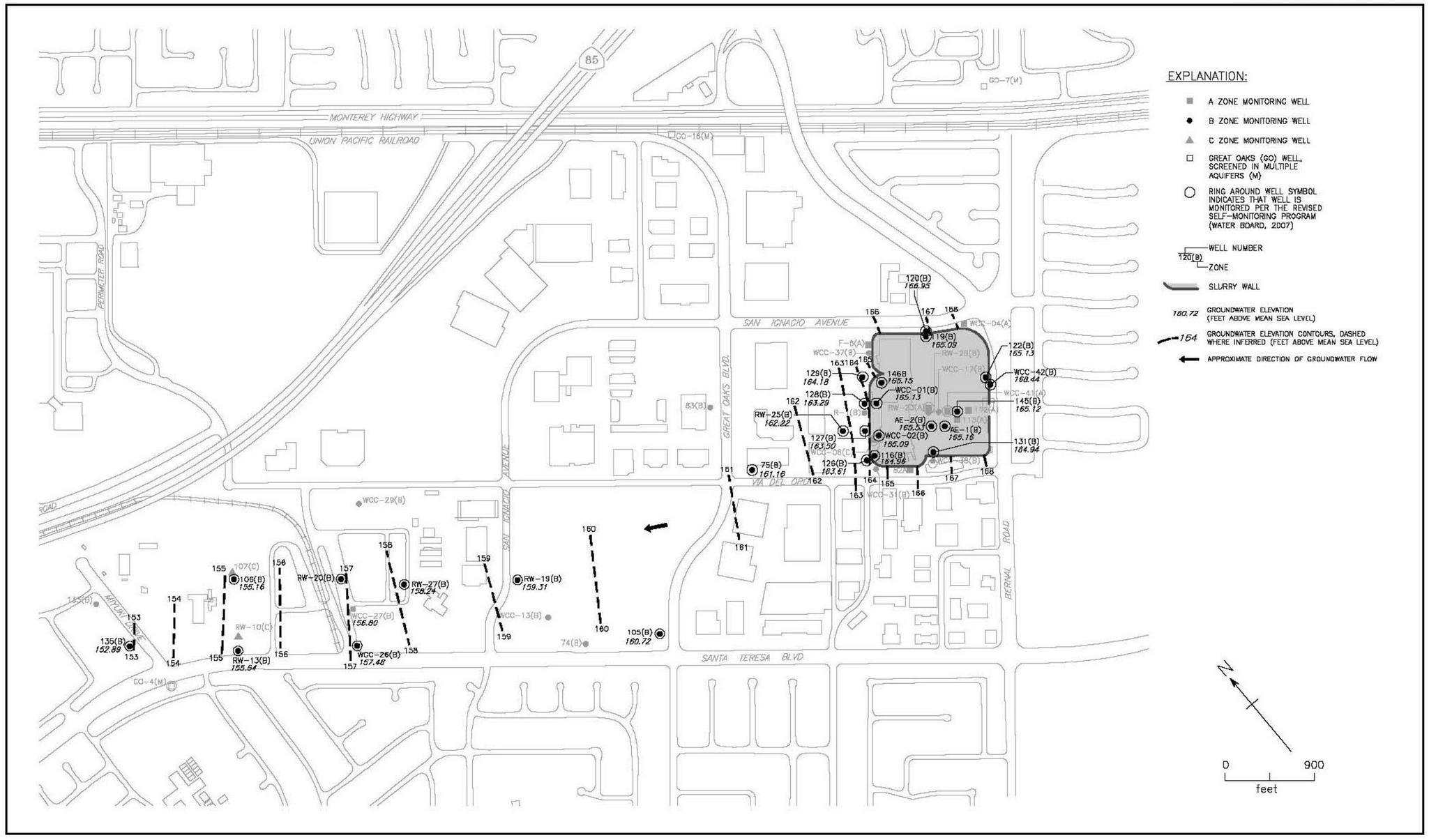

Figure 4. Groundwater Level Contours for Aquifer Zone B, September 2013

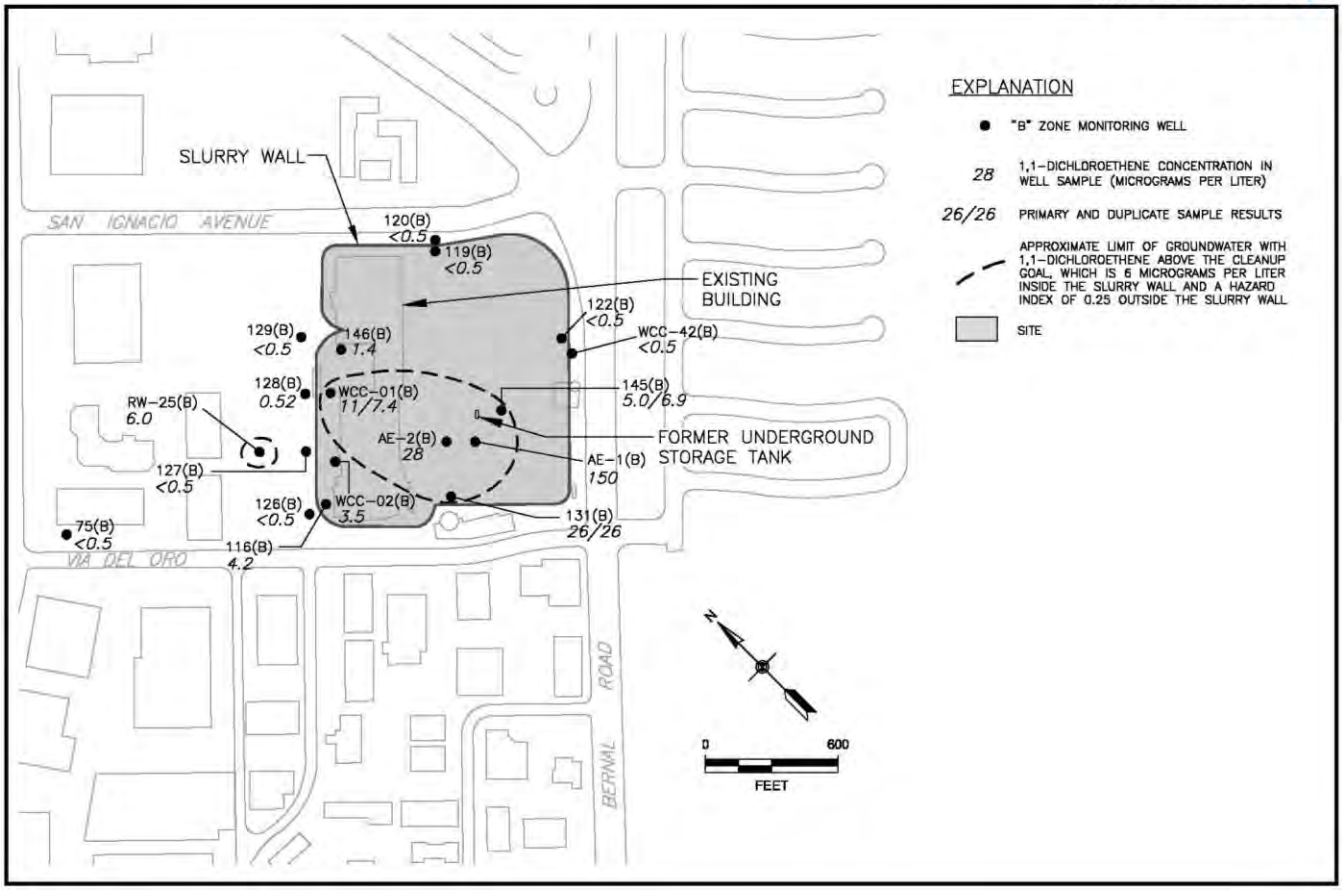

Figure 5. 1,1-DCE Concentrations in B Zone September 2013

Several VOCs that were not included in the ROD were detected above levels that exceed their California MCLs. 1,1-DCA and vinyl chloride are degradation products of 1,1,1-TCA that may have accumulated in groundwater since the ROD was completed. 1,2-DCA could be a parent compound or degradation product of an impurity in the 1,1,1-TCA, such as 1,1,2-TCA. Exceedances include the following:

- 1,1-DCA in wells AE-1(B), AE-2(B), RW-23(A) and WCC-41(A). 1,1-DCA has a California MCL of 5 µg/L. Maximum concentrations within the last five years were detected in well AE-1(B) at 180 µg/L.

- 1,2-DCA in wells AE-1(B), AE-2(B), and WCC-41(A). 1,2-DCA has a California MCL of 0.5µg/L. Maximum concentrations within the last five years were detected in well AE-1(B) at 20µg/L.

- Vinyl chloride was detected once in well AE-1(B) at a concentration of 1.4 µg/L in 2012. Vinyl chloride has a California MCL of 0.2 µg/L.

Data collected from 1998 through 2013 were evaluated to determine the cleanup progress inside the slurry wall area. Following the shutdown of the extraction system, concentrations of VOCs inside the slurry wall area were redistributed as the gradients induced by the extraction system were no longer present. The dominant transport mechanism switched from advective to diffusive, so that residual VOCs remaining in low-permeability soil are able to desorb and accumulate in the more permeable aquifer zones. During this time period, concentrations of VOCs in some wells increased while others decreased. Concentrations of VOCs appeared to reach a peak in 2006/2007.

1,1,1-TCA, one of the primary constituents in the former underground storage tank, can degrade through biological mechanisms to 1,1-DCA or through abiotic mechanisms to 1,1-DCE. Concentrations of both 1,1-DCA and 1,1-DCE are found at the site indicating that both of these mechanisms are likely occurring. Long-term data trends since 2006 (when VOC concentrations peaked) were evaluated for 1,1,1-TCA, 1,1-DCE, and 1,1-DCA using the Mann-Kendall nonparametric test for trend (see Table 9). All probable or definite trends indicated concentrations are decreasing. 1,1,1-TCA appears to be decreasing in the aquifer B zone near the source area as shown by the trend at wells 131(B), 145(B), AE-1(B), and AE-2(B) at a rate faster than its daughter products 1,1-DCE and 1,1-DCA. 1,1-DCE and 1,1-DCA do not show strong evidence of decreasing trends; only wells AE-2(B) and 146(B) had a decreasing or probably decreasing trend in concentrations of these two constituents. This could indicate that contaminant back-diffusion rates from the low permeability zones are approximating natural attenuation rates. Since back-diffusion could continue for an extended time, it is unknown when cleanup standards will be reached. The 2011 draft FFS evaluated alternatives to accelerate groundwater cleanup within the slurry wall area. It is currently under review by RWQCB and EPA.

Table 9. Results of Mann-Kendall Test for Trend at Wells Inside the Slurry Wall, 2006-2013

Well	1,1,1-TCA		1,1-DCE		1,1-DCA	
	Trend (2006-2013)	Confidence Factor	Trend (2006-2013)	Confidence Factor	Trend (2006-2013)	Confidence Factor
116(B)	No Trend	64.0%	No Trend	54.8%	NA	NA
131(B)	Probably Decreasing	92.9%	Stable	54.8%	No Trend	50.0%
145(B)	Decreasing	99.9%	No Trend	72.6%	Stable	86.2%
146(B)	Stable	80.1%	Stable	88.7%	Decreasing	95.8%
AE-1(B)	Probably Decreasing	94.6%	Stable	59.4%	Stable	83.2%
AE-2(B)	Decreasing	98.9%	Probably Decreasing	91.1%	Probably Decreasing	94.6%
RW-23(A)	Stable	37.9%	No Trend	72.6%	Increasing	95.8%
WCC-01(B)	Stable	72.6%	No Trend	50%	No Trend	59.4%
WCC-02(B)	Stable	64.0%	No Trend	76.4%	NA	NA
WCC-41(A)	Stable	77.8%	Probably Decreasing	94.6%	Stable	50.0%

NA – All concentrations non-detect

1,4 dioxane was first detected at monitoring wells inside the slurry wall in 2001. Since then, there have been several sampling events where 1,4-dioxane was analyzed and detected, and data indicates detected

concentrations are limited to within the slurry wall area. Table 10 summarizes the 1,4-dioxane data collected at the wells inside the slurry wall. The data indicate that the highest concentrations are located near the source area, in the vicinity of wells WCC-41A and AE-1(B). One monitoring well, WCC-41(A), has been analyzed annually since 2008 for 1,4-dioxane. A review of the time-series graph indicates that 1,4-dioxane concentrations have stabilized since annual sampling began in 2008 with concentrations ranging from 78 to 110 µg/L (see Figure 6). 1,4-dioxane can be resistant to biodegradation; however, the degradation pathway is not well understood and it is unknown if natural degradation is occurring at the site. Since 1,4-dioxane is highly miscible in water, the decrease in concentrations between 2001 and 2008 may have been due to dispersion during the adjustment period following groundwater extraction shutdown. 1,4-dioxane has been included as a COC in the draft 2011 FFS. The FFS is currently under review by RWQCB and EPA.

Table 10. 1,4-Dioxane Concentrations in Wells Inside the Slurry Wall

Well	September 2001	September 2008	February 2011
82(A)	<0.97	--	--
112(A)	--	--	6.4
115(A)	--	--	77
AE-1(B)	<4	--	180
AE-2(B)	--	--	56
F-6(A)	--	--	<0.97
RW-23(A)	--	--	<1.0
WCC-02(B)	<2	--	--
WCC-04(A)	--	--	<0.96
WCC-06(C)	--	<1.0	
WCC-41(A)	890	79	95

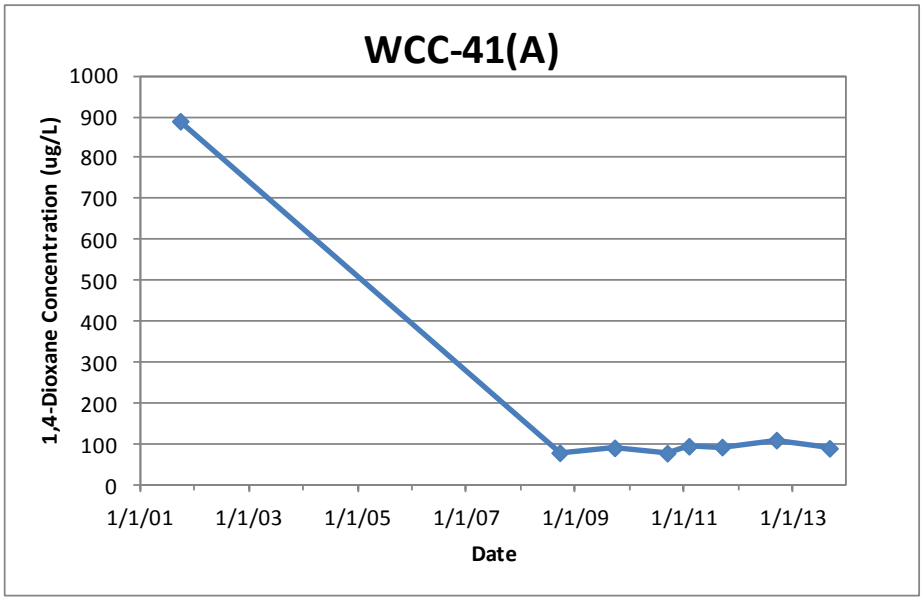

Figure 6. 1,4-Dioxane Concentrations in Well WCC-41(A)

Contaminant Concentrations Outside the Slurry Wall

The primary contaminants remaining in off-site wells are 1,1,1-TCA and 1,1-DCE. Cleanup standards are set at a hazard index (HI) of 0.25 for a combination 1,1,1-TCA and 1,1-DCE. The HI was exceeded once in well RW-19(B) in 2009 and in all samples collected from well RW-25(B) between 2009 and 2013. As specified in SCR Order No. 95-084, if the relative percent difference (RPD) between each subsequent sampling is at or above 50%, the RWQCB must be immediately notified. There were no instances of an RPD greater than 50% in off-site monitoring wells between 2009 and 2013. 1,4-dioxane was not detected at any off-site monitoring wells sampled.

Concentrations of VOCs in the wells outside the slurry wall were evaluated to determine effectiveness of the slurry wall. Concentrations of 1,1,1-TCA and 1,1-DCE in monitoring wells 126(B), 129(B), 120(B), and WCC-24(B) have not been detected (analysis results are "non-detect") since the extraction system was shut down in 1998. Monitoring well 127(B) had some low detected concentrations of 1,1,1-TCA after 1998, but has not contained detectable 1,1,1-TCA concentrations since 2007. Monitoring well 128(B) had detections of 1,1,1-TCA and 1,1-DCE, but all concentrations were well below cleanup levels.

Long-term trends at off-site wells were evaluated using the Mann-Kendall test for trend. Only data from wells with more than 50% of samples having detected concentrations of 1,1,1-TCA or 1,1-DCE were evaluated. Table 11 shows that most wells evaluated have no trend or a stable trend for 1,1,1-TCA and 1,1-DCE, indicating that the slurry wall is effectively containing contaminants.

Table 11. Results of Mann-Kendall Test for Trend at Off-Site Wells, 1998-2013

Well	1,1,1-TCA		1,1-DCE	
	Trend (1998-2013)	Confidence Factor	Trend (1998-2013)	Confidence Factor
106(B)	No Trend	81.3%	NA	NA
128(B)	Stable	67.1%	NA	NA
135(B)	Stable	70.3%	NA	NA
RW-19(B)	No Trend	85.7%	No Trend	76.1%
RW-20(B)	No Trend	88.6%	NA	NA
RW-25(B)	No Trend	81.3%	Increasing	97.1%
RW-27(B)	No Trend	62.2%	NA	NA

NA – not applicable, more than 50% of data non-detect

One well, RW-25(B), showed an increasing trend for 1,1-DCE. Figure 7 shows the concentrations of 1,1,1-TCA and 1,1-DCE in well RW-25(B) over time. Concentrations were on a decreasing trend following the shutdown of the off-site extraction system in 1992. In 2004, concentrations started to increase with a maximum 1,1,1-TCA concentration of 21 µg/L in December 2008 and a maximum 1,1-DCE concentration of 15 µg/L in January 2007. Following this increase, replacement of well RW-25(B) was proposed to be replaced because it is a 24-inch diameter, 94-foot deep, former extraction well with a 30-foot screen and was not thought to be appropriate for monitoring. Depth-discrete sampling was completed at well RW-25(B) in September 2010 to assist in the design of a replacement well.

Samples were collected at depths of 65 feet bgs, 75 feet bgs, and 90 feet bgs. The 90-foot sample interval was observed to contain the highest concentrations, within a range similar to that of historical samples. It was later determined that the well did not need to be replaced as it had a similar screen interval to other nearby B-Zone wells and data was representative of aquifer conditions. The last several sampling events indicate that concentrations may be decreasing. The increase in concentrations at well RW-25(B) is not thought to be due to slurry wall issues, as monitoring well 127(B), is located between RW-25(B) and the slurry wall, and does not indicate any increases in VOC concentrations. It is likely that the increase in concentrations was due to localized conditions within the aquifer.

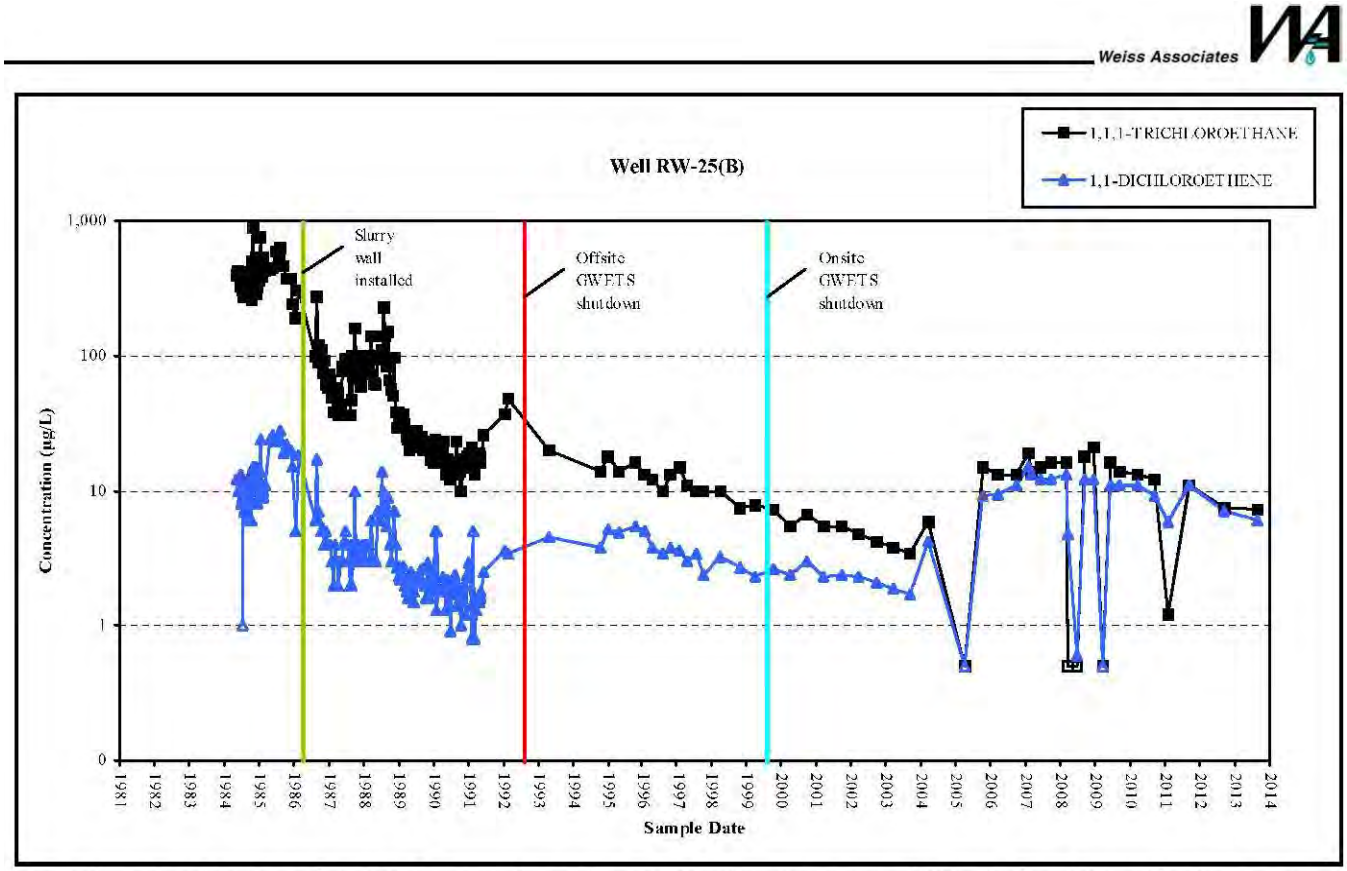

Figure 7. 1,1,1-TCA and 1,1-DCE Concentrations in Well RW-25(B) Over Time

6.5. Site Inspection

A site inspection was conducted on October 23, 2013. Participants included Melanie Morash (RPM) from EPA, Max Shahbazian from the RWQCB, Trish Eliasson (Project Engineer) from Weiss Associates, Thomas Fojut (Principal Engineer) from Weiss Associates, and Ellen Engberg and Aaron King from USACE. The Site Inspection Checklist is presented in Appendix D. Photos from the site inspection are presented in Appendix E.

The participants walked the site to evaluate the current conditions. Monitoring wells appeared to be properly secured and there was no evidence of vandalism. In summary, the site inspection determined the Site 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 or aware of the Site. 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. Consultants for the Site owner were interviewed during the Site visit on October 23, 2013. The interviewees stated that the off-site plume has decreased significantly, with only a small spot where concentrations are above the cleanup level, and that hydraulic control of the on-site plume has been achieved. There have been some problems with wells being paved over; otherwise, there were no problems with O&M cited. Completed interview documents are included in Appendix C.

6.7. Institutional Controls

A restrictive covenant was recorded in 1989 by STC prohibiting the installation of groundwater wells on the property except in connection with the remedial action; excavating or otherwise disturbing soils below a depth of 5 feet; and destroying, damaging, or otherwise interfering with the operation of the remedial program. In 1990, the restrictive covenant was transferred to SDRC, Inc. and an easement was granted. No disturbance of wells or soil was observed during the site inspection.

In the fourth FYR, it was recommended that a new restrictive covenant be completed because the existing covenant was recorded prior to the passage of California Civil Code section 1471, which establishes the framework for environmental covenants in California. Attorneys representing Fairchild and EPA have been negotiating this new covenant; however, it has not been finalized and recorded.

Fairchild completed a title search in December 2013. The 1989 restrictive covenants for the on-site parcels were confirmed to be recorded by the Santa Clara County Records Office.

Table 12lists the Institutional Controls (IC) associated with areas of interest at the Site.

Table 12. Institutional Controls Summary Table

Media	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Instrument in Place	Notes
Ground Water	Yes	706-1-73	Restrict installation of ground water wells and ground water use.	A covenant was recorded in 1989 with STC and in 1990 with SDRC Inc. with these restrictions.	Groundwater in the surrounding area is used for drinking water. No currently used drinking water well is affected by site contaminants.

Media	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Instrument in Place	Notes
Soil	No	NA	No IC necessary as only ground water was found to have contaminants at unacceptable risk levels in the 1995 ROD.	None	None

7. Technical Assessment

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

No, the remedy is not functioning as intended by the ROD. The rationale behind this conclusion is discussed below.

Remedial Action Performance

The ROD prescribed GWET, SVE, and soil flushing. At the time the ROD was signed, the slurry wall had already been installed. The GWET started operation in 1982, shortly after contamination was discovered. Off-site wells of the GWET were shut down in 1991 and the remaining on-site wells were shutdown in 1998. The SVE system operated from 1987 and 1990 and the soil flushing program was implemented from September 1990 to June 1991. No active remediation has been performed at the site since 1998.

The slurry wall installed in 1986 appears to be effective in containing contaminants on-site. Water level data collected near the northeastern and southeastern portion of the wall indicate an inward gradient. Water level data collected near the down-gradient, northwest portion of the slurry wall show seasonal variations in gradient; inward during the wet season and outward during the dry season; however this may just be a function of water level fluctuations outside the wall. A downward vertical gradient between the B and C zones is consistently observed within the slurry wall. COC concentration data do not indicate that there is contaminant migration moving off-site from within the slurry wall area. VOCs (1,1-DCA, 1,2-DCA, and vinyl chloride) that were not included in the ROD have also been detected inside the slurry wall near the source area at levels above CDPH MCLs. Since the slurry wall appears to be effectively containing contaminants, these detections do not affect protectiveness. Monitoring wells directly down-gradient of the slurry wall have either not detected COCs or if detected, have found them at concentrations well below cleanup standards. The one off-site well with concentrations above cleanup standards is RW-25(B). Contamination near this well is thought to be localized and not emanating from within the slurry wall area. Recent data indicate contaminant concentrations may be decreasing.

Groundwater data indicate that COCs remain at levels above cleanup standards within the slurry wall area. Analysis of long term trends indicates that 1,1,1,-TCA is decreasing in the aquifer B zone near the source zone (i.e., near the former underground storage tank), but its degradation products 1,1-DCE and 1,1-DCA do not show strong evidence of overall decreasing trends. Some natural attenuation is thought to be occurring within the slurry wall area; however, rates for 1,1-DCE and 1,1-DCA do not appear to be in exceedance of the back-diffusion rates from the low-permeability zones. It is unknown when cleanup standards within the slurry wall area will be reached. A 2011 draft FFS evaluated alternatives to accelerate groundwater cleanup and is currently under review by RWQCB and EPA.

System Operations/O&M

No active remediation has been performed at the Site since July 1998. Fairchild is currently conducting long-term monitoring. Groundwater elevation measurements and samples are collected annually at 30 monitoring wells. The annual costs for the groundwater monitoring, which includes sampling and reporting, range between $40,000 and $50,000.

Opportunities for Optimization

Fairchild is proposing to evaluate the use of HydraSleeve samplers in 2014. The data collected will be compared to results from samples obtained using the micropurge method. If results are comparable, sampling using HydraSleeves be used in the future, which will reduce sampling costs.

Early Indicators of Potential Issues

1,4 dioxane was identified as a potential COC in the second FYR. Samples were collected and analyzed for 1,4-dioxane at select wells in 2001, 2008, and 2011. Recent concentrations indicate 1,4 dioxane contamination is limited to wells inside the slurry wall area.

1,4-dioxane was included as a proposed COC in the 2011 draft FFS. The draft FFS is currently under review by the RWQCB and EPA.

Implementation of Institutional Controls and Other Measures

A restrictive covenant was recorded in 1989 by STC prohibiting the installation of groundwater wells on the property except in connection with the remedial action; excavating or otherwise disturbing soils below a depth of 5 feet; and destroying, damaging, or otherwise interfering with the operation of the remedial program. In 1990, the restrictive covenant was transferred to SDRC Inc. and an easement was granted. No disturbance of wells or soil was observed during the site inspection.

In the fourth FYR, it was recommended that a new restrictive covenant be completed because the existing covenant was recorded prior to the passage of California Civil Code section 1471, which establishes the framework for environmental covenants in California. Attorneys representing Fairchild and EPA have been negotiating this new covenant; however, it has not been finalized and recorded.

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, and cleanup levels used at the time of the ROD 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 final groundwater cleanup goals be equal or less than DHS (now CDPH) drinking water action levels or MCLs, whichever is more stringent; meaning that if the current state or federal MCL for a contaminant is equal to or less than the standard specified in the ROD, then the current MCL is the cleanup goal. Of the cleanup levels that have changed since the ROD, the one for xylene is less stringent and the one for Freon 113 is more stringent. These proposed changes to clean up levels are included in the draft FFS prepared for the proposed ROD amendment. Other ARARs have also changed since the ROD. These changes do not affect the protectiveness of the remedy.

Changes in Exposure Pathways

The land use has not changed on-site or off-site since the last FYR. Vapor intrusion was evaluated in 2008 in accordance with RWQCB protocol and in this Five Year Review. Results from both evaluations suggested no potential indoor air exposures from groundwater contamination on-site under current commercial use. However, if the land use changes, vapor intrusion may pose a risk to future residents. In addition, the residual soil contamination on-site may also contribute to vapor intrusion. Initial calculations indicate that the potential for vapor intrusion from residual soil contamination is low; however, it is recommended that an on-site vapor intrusion assessment is needed to confirm this conclusion.

1,4-dioxane has been detected and reported since 2001. There are currently no cleanup goals for this compound. Sampling results from February 2011 show concentrations up to 180 µg/L within the slurry wall area. The draft 2011 FFS proposes that 1,4-dioxane become a site COC.

Changes in Toxicity and Other Contaminant Characteristics

Toxicity factors for several COCs changed as described in Section 6.3. 1,1-DCA, 1,2-DCA, and vinyl chloride, which were not included in the ROD, have been detected inside the slurry wall area at levels above CDPH MCLs. These changes do not affect the current protectiveness of the remedy.

Changes in Risk Assessment Methods

No changes in risk assessment methodologies have occurred.

Expected Progress Toward Meeting RAOs

The objective in the ROD was to protect human health and the environment. Because of institutional controls regarding drinking water wells, no exposures to this pathway are complete. The slurry wall appears to be containing contaminants and there is no migration off-site. The remedy is progressing toward meeting this RAO.

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. There have been no impacts from earthquakes or other natural disasters at the site in the last five years.

7.4. Technical Assessment Summary

No active remediation has been performed at the site since 1998. Fairchild is currently conducting long-term monitoring. Groundwater data indicate that the slurry wall is effectively containing contaminants on-site. Only one off-site well, RW-25(B), currently contains COCs at levels above the cleanup standard. Contamination near this well is thought to be localized and not emanating from within the slurry wall area. Recent data indicate contaminant concentrations at this well may be decreasing. COCs within the slurry area wall remain at levels above cleanup standards. Analysis of long term trends indicates that 1,1,1-TCA is decreasing near the source area but 1,1-DCE and 1,1-DCA do not show strong evidence of overall decreasing trends. 1,4-dioxane was identified as a potential COC in the second FYR. Recent concentrations indicate 1,4-dioxane contamination is limited to wells inside the slurry wall area. The 2011 draft FFS evaluated alternatives to accelerate groundwater cleanup within the slurry wall area and included 1,4-dioxane as a proposed COC. It is currently under review by RWQCB and EPA.

A restrictive covenant was recorded in 1989; however, a new restrictive covenant should be completed because the existing covenant was recorded prior to the passage of California Civil Code section 1471, which establishes the framework for environmental covenants in California. Attorneys representing Fairchild and EPA have been negotiating this new covenant; however, it has not been finalized and recorded.

The groundwater cleanup levels and toxicity factors for several COCs have changed since the ROD. These changes do not affect the protectiveness of the remedy. The land use has not changed on-site or off-site since the last FYR. Vapor intrusion was evaluated in 2008 and 2013 with results suggesting no potential indoor air exposures from groundwater contamination on-site. However, the vapor intrusion evaluation indicated a potential for vapor intrusion in the source area under residential scenario land use, and did not consider off-gassing from the former source area or vadose zone lateral transport under the current conditions.

8. Issues

Table 13 summarizes the current issues for the Fairchild Site.

Table 13. Current Issues for the Fairchild Site

Issue	Affects Current Protectiveness (Yes or No)	Affects Future Protectiveness (Yes or No)
1,4-Dioxane is present in groundwater in-side the slurry wall, but is not identified in the ROD and does not have a cleanup level.	No	Yes
The existing restrictive covenant was recorded prior to the passage of California Civil Code section 1471, which establishes the framework for environmental covenants in California.	No	Yes
The FYR vapor intrusion evaluation indicated a potential for vapor intrusion in the source area under residential scenario land use and did not consider all potential sources of risk for the vapor intrusion pathway.	No	Yes

9. Recommendations and Follow-up Actions

Table 14 provides recommendations to address the current issues at the Fairchild Site.

Table 14. Recommendations to Address Current Issues at the Fairchild Site

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Yes or No)	
					Current	Future
1,4-Dioxane is present in groundwater in-side the slurry wall, but is not identified in the ROD and does not have a cleanup level.	Finalize the FFS and amend the ROD to reflect a change in remedy.	Fairchild	RWQCB/ EPA	09/2015	No	Yes
The existing restrictive covenant was recorded prior to the passage of California Civil Code section 1471, which establishes the framework for environmental covenants in California.	Finalize and record the new restrictive covenant for the site that is consistent with current California law.	Fairchild	RWQCB	09/2015	No	Yes

The FYR vapor intrusion evaluation indicated a potential for vapor intrusion in the source area under residential scenario land use and did not consider all potential sources of risk for the vapor intrusion pathway.	Complete vapor intrusion assessment for current land use and in consideration of future residential use for sources other than groundwater (including from the former source area and due to lateral vadose zone transport and via subsurface preferential pathways).	Fairchild	EPA	09/2015	No	Yes

In addition, the following are recommendations that could improve effectiveness of remedy but do affect current protectiveness and were identified during the Five-Year Review:

- Finalize the FFS to determine if cleanup inside the slurry wall can be accelerated.

10. Protectiveness Statement

The remedy at the Fairchild Semiconductor San Jose Site is currently protective of human health and the environment because all exposure pathways are currently controlled. However, to be protective in the long-term, a remedy that addresses 1,4-dioxane needs to be selected and a new restrictive convent needs to be placed on the property. Additionally, a vapor intrusion assessment for current land use and in consideration of future residential use needs to be completed for sources other than groundwater (including from the former source area and due to lateral vadose zone transport and via subsurface preferential pathways).

11. Next Review

This is a policy review 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.

Appendix A: List of Documents Reviewed

[This page is intentionally blank]

List of Documents Reviewed

CRWQCB, 2009. Fourth Five-Year Review, Fairchild Semiconductor – San Jose Site, 101 Bernal Road, San Jose, Santa Clara County, CA. California Regional Water Quality Control Board (CRWQCB), September 2009.

U.S. Environmental Protection Agency (EPA), 1989. Record of Decision, Fairchild Semiconductor Corp. (South San Jose Plant), San Jose, CA., March 20, 1989.

Weiss Associates, 2008. 2008 Annual Status Report for Former Fairchild Facility, 101 Bernal Road, San Jose, California. November 10, 2008.

Weiss Associates, 2009. 2009 Annual Status Report for Former Fairchild Semiconductor Corporation Facility, 101 Bernal Road, San Jose, California. November 9, 2009.

Weiss Associates, 2010. 2010 Annual Status Report for Former Fairchild Facility, 101 Bernal Road, San Jose, California. November 10, 2010.

Weiss Associates, 2011. Draft Groundwater Focused Feasibility Study, Former Fairchild Semiconductor Facility, 101 Bernal Road, San Jose, California. June 16, 2011.

Weiss Associates, 2011. 2011 Annual Status Report for Former Fairchild Facility, 101 Bernal Road, San Jose, California. November 11, 2011.

Weiss Associates, 2012. 2012 Annual Status Report for Former Fairchild Facility, 101 Bernal Road, San Jose, California. November 13, 2012.

Weiss Associates, 2013. 2013 Annual Status Report for Former Fairchild Facility, 101 Bernal Road, San Jose, California. November 5, 2013.

Weiss Associates, 2014. 2013 Fifth Five-Year Review Report for Former Fairchild Facility, 101 Bernal Road, San Jose, California. January 31, 2014.

Appendix B: Press Notices

[This page is intentionally blank]

PUBLIC NOTICE

REGIONAL WATER BOARD AND EPA BEGIN FIFTH FIVE-YEAR REVIEW OF CLEANUP AT THE FORMER FAIRCHILD SEMICONDUCTOR CORP. (SOUTH SAN JOSE PLANT) SUPERFUND SITE

101 Bernal Road, San Jose, 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 Fairchild Semiconductor Corp. (South San Jose Plant) Superfund Site at 101 Bernal Road, San Jose, California. The review will evaluate whether the cleanup actions for the Site remain protective of human health and the environment.

This is the fifth Five-Year Review for the Fairchild Semiconductor Corp. (South San Jose Plant) Superfund Site at 101 Bernal Road. 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 1,1,1-TCA and other solvents. Cleanup actions at the Site began in 1982 with the removal of a leaking tank and contaminated soils. A soil vapor extraction and treatment system was operated at the Site between 1989 and 1990 to treat soil contamination. A slurry wall was installed underground to prevent contamination from leaving the property. In 1982, a groundwater extraction and treatment system began operation to prevent off-property migration. In 1998, the system was shutdown with Regional Water Board approval. Long - term groundwater monitoring has continued, and a deed restriction was recorded on the property to prevent exposure.

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 Max Shahbazian at (510) 622-4824, or mshahbazian@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 number for this Site, which is SL720361208. Then click on "Report".

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.

SJMN#5188383 **June 2,2014**

Appendix C: Interview Forms

[This page is intentionally blank]

Interview Forms

Five-Year Review Interview Record

Site:	Fairchild Semiconductor (SSJP)	**EPA ID No:**	CAD097012298

Interview Type: Visit

Location of Visit: At site- 101 Bernal Rd, San Jose, Ca

Date: 23 October, 2013 **Time:** 12:00

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

Individual Contacted

Name:	Trish Eliasson	**Title:**	Project Engineer	**Organization:**	Weiss Associates
Telephone:	510-450-6138	**Address:**	2200 Powell Street, Suite 925 Emeryville, Ca		
Name:	Thomas Fojut	**Title:**	Principal Engineer	**Organization:**	Weiss Associates
Telephone:	510-450-6143	**Address:**	2200 Powell Street, Suite 925 Emeryville, Ca		

Summary of Conversation

1) What is your overall impression of the project?

It's been 30 years of investigation and remediation. Comparing 82' to now shows a tremendous difference- The plume is large, and offsite COCs are mostly below cleanup standards., except 1-1 DCE, which is a degradation product. TCA, PCE, Isopropenol Xylene all below. There is also a size difference- it is now limited to the plume onsite, with a small spot offsite with low detections of 1,1 DCE- 2013 monitoring showed levels right at MCL 1/4 MCL, which is the cleanup goal.

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

Yes. Hydraulic control of the plume has been achieved. There are no open exposure pathways.

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

Offsite- Long term there has been incredible attenuation, it is basically gone. One well has a low concentration the C zone is completely cleaned up- contamination was in B & C zones.
Onsite- contamination was in A & B zones, C was always clean. A&B concentrations have declined over time. The treatment shut down in 1998, and there was a rebound of 1,1 DCE post shutdown for 4 or 5 years, until 2004. It has been stable since 2004. Concentration declined dramatically this year.

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.

No. There is only annual monitoring of wells.

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.

No.

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

Estimated $20-30k

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

Nothing unexpected. Access to wells, risk of losing wells are issues- 1 has been damaged (WCC 13-B), some have been paved over patios, driveways and fields. Inventory was done recently.

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

Looking forward to no purge sampling with HydraSleeves- allows for 1-4 dioxane sampling.

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

RSLs and Vapor intrusion- FFS proposes 1-4 Dioxane cleanup, as state currently only has a notification level.

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

None.

Appendix D: Site Inspection Checklist

[This page is intentionally blank]

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Fairchild Semiconductor Corp	**Date of inspection:** 10/23/2013
Location: San Jose, CA	**EPA ID:**CAD097012298
Agency, office, or company leading the five-year review: State of California	**Weather/temperature:** Sunny, 65°

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☐ Monitored natural attenuation

☐ Access controls ☐ Groundwater containment

☒ Institutional controls ☒ Vertical barrier walls

☒ Groundwater pump and treatment (shut down)

☐ Surface water collection and treatment

☒ Other: *Groundwater monitoring, soil vapor extraction (permanently shutdown), soil excavation (prior to ROD)*

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager representatives** Trish Eliasson and Thomas Fojut 23 October, 2013

Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____

Problems, suggestions; ☒ Report attached _____

Interviewed representatives from the contractor for RP, Weiss Associates. 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 _____

_____

4. **Other interviews** (optional) ☐ Report attached.

N/A

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			
3.	**O&M and OSHA Training Records**	☒ Readily available	☒ Up to date	☐N/A
	Remarks			
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			
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			

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		
2.	**O&M Cost Records**		
	☒ Readily available	☒ Up to date	
	☐ Funding mechanism/agreement in place		
	Original O&M cost estimate__$20-30k_____		☐ Breakdown attached
	Total annual cost by year for review period if available		
	Not available		

3.	**Unanticipated or Unusually High O&M Costs During Review Period** Describe costs and reasons: none

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: A restrictive covenant was recorded in 1989; however, a new restrictive covenant should be completed as the existing covenant was recorded prior to the passage of California Civil Code section 1471, which established the framework for environmental covenants in California. Attorneys representing Fairchild and EPA have been negotiating this new covenant; however, it has not been finalized and recorded.

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: none
VII. LANDFILL COVERS ☐ Applicable ☒ N/A
VIII. VERTICAL BARRIER WALLS ☒ Applicable ☐ N/A

1.	**Settlement** ☐ Location shown on site map ☒ Settlement not evident Areal extent_____ Depth_____ Remarks_____ _____
2.	**Performance Monitoring** Type of monitoring_____ ☐ Performance not monitored Frequency_____ ☐ Evidence of breaching Head differential_____ Remarks_____ _____
	IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines	☒ Applicable ☐ N/A
1.	**Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☒ N/A Remarks: Groundwater extraction was suspended in 1998, and no remediation has been performed at the Site since that time.
2.	**Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance ☒ N/A 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 ☒ Air stripping ☐ Carbon adsorbers ☐ Filters_____

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

☐ Others_____

☐ Good condition ☐ Needs Maintenance

☐ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☐ Equipment properly identified

☐ Quantity of groundwater treated annually_____

☐ Quantity of surface water treated annually_____

Remarks: Groundwater extraction was suspended in 1998, and no remediation has been performed at the Site since that time.

_____

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

☒N/A ☐ Good condition ☐ Needs Maintenance

Remarks

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

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

Remarks

4. **Discharge Structure and Appurtenances**

☒ N/A ☐ Good condition ☐ Needs Maintenance

Remarks

5. **Treatment Building(s)**

☒ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair

☐ Chemicals and equipment properly stored

Remarks

6.	**Monitoring Wells** (pump and treatment remedy) ☒Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒Good condition ☒ All required wells located ☐ Needs Maintenance ☐ N/A Remarks: Many are sampled annually, in good condition. Most have been located.
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
X. OTHER REMEDIES	
	If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.
XI. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). The remedy at this site is designed to contain the plume with a vertical barrier wall. There are no aspects of the current remedy that are visible. Wells for monitoring are accessible, and the remaining extraction system is no longer in use. There are no access restrictions- the site is currently a mall with stores and restaurants. No groundwater drinking wells were seen at the site.
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. No issues were observed related to the implementation of the remedy. It was mentioned in the interview that some wells had been paved over, but that this did not affect the remedy or protectiveness

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. It was mentioned in the interview that some wells had been paved over, but this does not affect the remedy or protectiveness.
11.1.1.	D. Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. No opportunities for optimization were observed during the site visit. In the interviews, the contractor mentioned the potential for switching from micropurge sampling methods to passive diffusion bags or hydrasleeves.

Appendix E: Photographs from Site Inspection Visit

[This page is intentionally blank]

Photographs from Site Inspection Visit

Photo 1. Commercial building, taken from source zone looking northeast.

Photo 2. Monitoring well RW-23(A) located near the source zone.

Photo 3. Off-site monitoring well RW-25(B).

Photo 4. Air stripper, no longer in use.

Photo 5. Monitoring well 128B, outside well of slurry wall well pair 128(B)/WCC-01(B).

Photo 6. Monitoring well WCC-01(B), inside well of slurry wall well pair 128(B)/WCC-01(B).

Appendix F: Data Summary

[This page is intentionally blank]

Data Summary

Table F1. Concentrations of Detected VOCs Inside Slurry Wall, 2009-2103

Sample Location	Date	1,1,1-TCA	1,1-DCA	1,1-DCE	1,2-DCA	cis-1,2-DCE	Freon 113	Total Xylene	PCE	TCE	Vinyl Chloride	1,4-Dioxane
Cleanup Level		200	5[1]	6	0.5[1]	6[1]	NE	1,750	5	5[1]	0.5[1]	NA
112(A)	2/3/2011	5.4	<0.5	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	6.4
115(A)	2/3/2011	69	1	**10**	<0.5	<0.5	<2	<1	<0.5	<0.5	<0.5	77
116(B)	9/10/2009	8.8	<0.5	1	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	--
116(B)	9/9/2010	6.1	<0.5	1.6	<0.5	<0.5	<2	<1	<0.5	<0.5	<0.5	--
116(B)	9/14/2011	19	<0.5	2.5	<0.5	<0.5	<2	<1	<0.5	<0.5	<0.5	--
116(B)	9/12/2012	5.8	<0.5	0.8	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	--
116(B)	9/5/2013	22	<0.5	4.2	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	--
119(B)	9/9/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<2	--	<0.5	<0.5	<0.5	--
119(B)	9/9/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<1	<0.5	<0.5	<0.5	--
119(B)	9/13/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<1	<0.5	<0.5	<0.5	--
119(B)	9/13/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	--
119(B)	9/4/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	--
122(B)	9/9/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<2	--	<0.5	<0.5	<0.5	--
122(B)	9/9/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<1	<0.5	<0.5	<0.5	--
122(B)	9/13/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<1	<0.5	<0.5	<0.5	--
122(B)	9/12/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	--
122(B)	9/5/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	--
131(B)	9/10/2009	8.1	<0.5	3.7	<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	--
131(B)	9/9/2010	9.1	0.5	**9.2**	<0.5	<0.5	<2	<1	<0.5	<0.5	<0.5	--
131(B)	9/14/2011	7	<0.5	**7.1**	<0.5	<0.5	<2	<1	<0.5	<0.5	<0.5	--
131(B)	9/12/2012	8.1	<0.5	5.4	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	--
131(B)	9/5/2013	5.9	1.3	**26**	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	--
145(B)	9/9/2009	16	0.6	3.6	<0.5	<0.5	<2	--	<0.5	<0.5	<0.5	--

Sample Location	Date	1,1,1-TCA	1,1-DCA	1,1-DCE	1,2-DCA	cis-1,2-DCE	Freon 113	Total Xylene	PCE	TCE	Vinyl Chloride	1,4-Dioxane
Cleanup Level		200	5[1]	6	0.5[1]	6[1]	NE	1,750	5	5[1]	0.5[1]	NA
145(B)	9/9/2010	19	1.2	<0.5	<0.5	<0.5	<2	<1	<0.5	<0.5	<0.5	--
145(B)	9/13/2011	14	<0.5	2.7	<0.5	<0.5	<2	<1	<0.5	<0.5	<0.5	--
145(B)	9/13/2012	11	0.62	4.9	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	--
145(B)	9/5/2013	9.4	<0.5	5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	--
146(B)	9/9/2009	11	0.6	1.9	<0.5	<0.5	<2	--	<0.5	<0.5	<0.5	--
146(B)	9/10/2010	13	0.5	2.5	<0.5	<0.5	<2	<1	<0.5	<0.5	<0.5	--
146(B)	9/14/2011	9.3	0.6	1.6	<0.5	<0.5	<2	<1	<0.5	<0.5	<0.5	--
146(B)	9/13/2012	5.9	<0.5	1.3	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	--
146(B)	9/5/2013	5.2	<0.5	1.4	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	--
AE-1(B)	9/8/2009	160	**120**	**2000**	<20	<20	<80	--	<20	<20	<20	--
AE-1(B)	9/10/2010	200	**170**	**2600**	**20**	<13	<50	<25	<13	<13	<13	--
AE-1(B)	2/3/2011	170	**150**	**2400**	**13**	<13	<50	<25	<13	<13	<13	180
AE-1(B)	9/14/2011	100	**180**	**1700**	**12**	<3.6	<14	<7.1	<3.6	<3.6	<3.6	--
AE-1(B)	9/13/2012	47	**84**	**2600**	**9.4**	1.2	6	80	**12**	1.4	**1.4**	--
AE-1(B)	9/3/2013	7.5	**12**	**150**	**0.62**	<0.5	<0.5	<1	1.6	<0.5	<0.5	--
AE-2(B)	9/9/2009	130	**120**	**490**	<3.6	<3.6	<14	--	<3.6	<3.6	<3.6	--
AE-2(B)	9/10/2010	120	**120**	**630**	<3.6	<3.6	<14	<7.1	5.2	<3.6	<3.6	--
AE-2(B)	2/3/2011	150	**120**	**990**	<10	<10	<40	<20	<10	<10	<10	56
AE-2(B)	9/14/2011	180	**160**	**440**	**3.4**	<2	<8	<4	<2.0	<2.0	<2.0	--
AE-2(B)	9/13/2012	45	**67**	**510**	**1.7**	0.52	4.7	<1	4.4	<0.5	<0.5	--
AE-2(B)	9/6/2013	3.4	4.4	**28**	<0.5	<0.5	<0.5	<1	0.88	<0.5	<0.5	--
RW-23(A)	9/9/2009	14	**6.9**	**25**	<0.5	<0.5	<2	--	1.6	<0.5	<0.5	--
RW-23(A)	9/10/2010	4.8	3.2	2.9	<0.5	<0.5	<2	<1	0.5	0.6	<0.5	--
RW-23(A)	2/3/2011	9	**8.1**	**19**	<0.5	<0.5	<2	<1	0.9	1.2	<0.5	<1.0
RW-23(A)	9/13/2011	6.4	**6.2**	4.8	<0.5	<0.5	<2	<1	<0.5	1.1	<0.5	--
RW-23(A)	9/13/2012	14	**6.2**	**20**	<0.5	<0.5	<0.5	<1	0.65	1.1	<0.5	--

Sample Location	Date	1,1,1-TCA	1,1-DCA	1,1-DCE	1,2-DCA	cis-1,2-DCE	Freon 113	Total Xylene	PCE	TCE	Vinyl Chloride	1,4-Dioxane
Cleanup Level		200	5[1]	6	0.5[1]	6[1]	NE	1,750	5	5[1]	0.5[1]	NA
RW-23(A)	9/5/2013	6.7	**5.5**	**9.7**	<0.5	<0.5	<0.5	<1	<0.5	1	<0.5	--
WCC-01(B)	9/9/2009	33	2.5	**8.1**	<0.5	<0.5	<2	--	<0.5	<0.5	<0.5	--
WCC-01(B)	9/10/2010	27	2.1	**7.1**	<0.5	<0.5	<2	<1	<0.5	<0.5	<0.5	--
WCC-01(B)	9/13/2011	40	2.6	**7.4**	<0.5	<0.5	<2	<1	<0.5	<0.5	<0.5	--
WCC-01(B)	9/13/2012	28	2.8	**9.3**	<0.5	<0.5	0.5	<1	<0.5	<0.5	<0.5	--
WCC-01(B)	9/5/2013	29	2.8	**11**	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	--
WCC-02(B)	9/10/2009	28	<0.5	1.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--
WCC-02(B)	9/9/2010	29	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	--
WCC-02(B)	9/14/2011	29	<0.5	1.4	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	--
WCC-02(B)	9/12/2012	27	<0.5	2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--
WCC-02(B)	9/5/2013	28	<0.5	3.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--
WCC-41(A)	9/8/2009	74	**21**	**120**	<0.7	<0.7	<2.9	<0.7	1.5	<0.7	<0.7	--
WCC-41(A)	9/22/2009	--	--	--	--	--	--	--	--	--	--	91
WCC-41(A)	9/10/2010	35	**17**	**84**	**0.6**	<0.5	<2	<1	1.9	<0.5	<0.5	78
WCC-41(A)	2/3/2011	36	**15**	**90**	**0.5**	<0.5	<2	<1	2	<0.5	<0.5	95
WCC-41(A)	9/14/2011	34	**20**	**100**	<1	<1	<4	<2	1.8	<1	<1	93
WCC-41(A)	9/13/2012	39	**23**	**84**	**0.71**	<0.5	<0.5	<1	0.95	<0.5	<0.5	110
WCC-41(A)	9/5/2013	41	**30**	**110**	**0.72**	<0.5	<0.5	<1	1.3	<0.5	<0.5	90

Notes:

[1] Contaminant not included as COC in ROD. Current California DHS MCL listed.

NA - Not Available

Shaded cell indicates constituent detected above Cleanup Level or MCL

Table F2. Concentrations of Detected VOCs Outside Slurry Wall, 2009-2013

Sample Location	Date	1,1,1-TCA	1,1-DCA	1,1-DCE	Iso-propanol	1,4-Dioxane	Hazard Index [2,3]
MCL/Cleanup Level		200	5[1]	6	NE	NE	0.25
75(B)	9/9/2009	0.6	<0.5	<0.5	--	--	0.09
75(B)	9/10/2010	0.7	<0.5	<0.5	--	--	0.09
75(B)	9/14/2011	0.9	<0.5	<0.5	--	--	0.09
75(B)	9/13/2012	0.79	<0.5	<0.5	<5	--	0.09
75(B)	9/6/2013	0.64	<0.5	<0.5	<100	--	0.09
82(A)	2/2/2011	<0.5	<0.5	<0.5	--	<0.97	0.09
105(B)	9/8/2009	<0.5	<0.5	<0.5	--	--	0.09
105(B)	9/10/2010	<0.5	<0.5	<0.5	--	--	0.09
105(B)	9/13/2011	<0.5	<0.5	<0.5	--	--	0.09
105(B)	9/12/2012	<0.5	<0.5	<0.5	<5	--	0.09
105(B)	9/5/2013	<0.5	<0.5	<0.5	<100	--	0.09
106(B)	9/9/2009	3.8	<0.5	<0.5	--	--	0.10
106(B)	9/9/2010	2.8	<0.5	<0.5	--	--	0.10
106(B)	9/12/2011	2.5	<0.5	<0.5	--	--	0.10
106(B)	9/12/2012	2.2	<0.5	<0.5	<5	--	0.09
106(B)	9/4/2013	2.1	<0.5	<0.5	<100	--	0.09
120(B)	9/9/2009	<0.5	<0.5	<0.5	--	--	0.09
120(B)	9/9/2010	<0.5	<0.5	<0.5	--	--	0.09
120(B)	9/12/2011	<0.5	<0.5	<0.5	--	--	0.09
120(B)	9/12/2012	<0.5	<0.5	<0.5	<5	--	0.09
120(B)	9/4/2013	<0.5	<0.5	<0.5	<100	--	0.09
126(B)	9/9/2009	<0.5	<0.5	<0.5	--	--	0.09
126(B)	9/8/2010	<0.5	<0.5	<0.5	--	--	0.09
126(B)	9/13/2011	<0.5	<0.5	<0.5	--	--	0.09
126(B)	9/12/2012	<0.5	<0.5	<0.5	<5	--	0.09
126(B)	9/3/2013	<0.5	<0.5	<0.5	<100	--	0.09
127(B)	9/10/2009	<0.5	<0.5	<0.5	--	--	0.09
127(B)	9/10/2010	<0.5	<0.5	<0.5	--	--	0.09
127(B)	9/12/2011	<0.5	<0.5	<0.5	--	--	0.09
127(B)	9/13/2012	<0.5	<0.5	<0.5	<5	--	0.09
127(B)	9/4/2013	<0.5	<0.5	<0.5	<100	--	0.09
128(B)	9/10/2009	1.6	<0.5	<0.5	--	--	0.09
128(B)	9/22/2009	--	--	--	--	<0.99	--
128(B)	9/10/2010	1.9	<0.5	0.6	--	<0.99	0.11
128(B)	9/12/2011	2.3	<0.5	<0.5	--	<0.98	0.09
128(B)	9/13/2012	1.1	<0.5	<0.5	<5	<1.0	0.09
128(B)	9/4/2013	1.5	<0.5	0.52	<100	<1.0	0.09

Sample Location	Date	1,1,1-TCA	1,1-DCA	1,1-DCE	Iso-propanol	1,4-Dioxane	Hazard Index [2,3]
MCL/Cleanup Level		200	5[1]	6	NE	NE	0.25
129(B)	9/9/2009	<0.5	<0.5	<0.5	--	--	0.09
129(B)	9/10/2010	<0.5	<0.5	<0.5	--	--	0.09
129(B)	9/12/2011	<0.5	<0.5	<0.5	--	--	0.09
129(B)	9/13/2012	<0.5	<0.5	<0.5	<5	--	0.09
129(B)	9/4/2013	<0.5	<0.5	<0.5	<100	--	0.09
135(B)	9/9/2009	3.1	<0.5	<0.5	--	--	0.10
135(B)	9/9/2010	2.3	<0.5	<0.5	--	--	0.09
135(B)	9/12/2011	1.9	<0.5	<0.5	--	--	0.09
135(B)	9/11/2012	2.4	<0.5	<0.5	<5	--	0.10
135(B)	9/3/2013	1.2	<0.5	<0.5	<100	--	0.09
F-6(A)	2/2/2011	<0.5	<0.5	<0.5	--	<0.97	0.09
GO-04(M)	8/25/2009	<0.5	<0.5	<0.5	--	--	0.09
GO-04(M)	8/16/2010	<0.5	<0.5	<0.5	--	--	0.09
GO-04(M)	8/18/2011	<0.5	<0.5	<0.5	--	--	0.09
GO-04(M)	8/28/2012	<0.5	<0.5	<0.5	9	--	0.09
GO-04(M)	11/6/2012	--	--	--	<5	--	--
GO-04(M)	9/4/2013	<0.5	<0.5	<0.5	<100	--	0.09
RW-13(B)	9/9/2009	<0.5	<0.5	<0.5	--	--	0.09
RW-13(B)	9/9/2010	<0.5	<0.5	<0.5	--	--	0.09
RW-13(B)	9/12/2011	<0.5	<0.5	<0.5	--	--	0.09
RW-13(B)	9/11/2012	<0.5	<0.5	<0.5	<5	--	0.09
RW-13(B)	9/4/2013	<0.5	<0.5	<0.5	<100	--	0.09
RW-19(B)	9/8/2009	5	<0.5	1.6	--	--	**0.29**
RW-19(B)	9/9/2010	4.1	<0.5	1.1	--	--	0.20
RW-19(B)	9/13/2011	3.4	<0.5	1	--	--	0.18
RW-19(B)	9/12/2012	<0.5	<0.5	<0.5	<5	--	0.09
RW-19(B)	9/4/2013	<0.5	<0.5	<0.5	<100	--	0.09
RW-20(B)	9/9/2009	2.7	<0.5	<0.5	--	--	0.10
RW-20(B)	9/9/2010	2.1	<0.5	<0.5	--	--	0.09
RW-20(B)	9/12/2011	1.4	<0.5	<0.5	--	--	0.09
RW-20(B)	9/11/2012	0.89	<0.5	<0.5	<5	--	0.09
RW-20(B)	9/4/2013	<0.5	<0.5	<0.5	<100	--	0.09
RW-25(B)	3/12/2009	<0.5	<0.5	<0.5	--	--	0.09
RW-25(B)	6/9/2009	16	1.3	**11**	--	--	**1.91**
RW-25(B)	9/9/2009	14	1.2	**11**	--	--	**1.90**
RW-25(B)	3/17/2010	13	1.4	**11**	--	--	**1.90**
RW-25(B)-65'	9/9/2010	<0.5	0.9	**3.1**	--	--	**0.52**
RW-25(B)-75'	9/9/2010	0.8	1.2	**4.3**	--	--	**0.72**

Sample Location	Date	1,1,1-TCA	1,1-DCA	1,1-DCE	Iso-propanol	1,4-Dioxane	Hazard Index [2,3]
MCL/Cleanup Level		200	5[1]	6	NE	NE	0.25
RW-25(B)-90'	9/9/2010	12	1	**9.1**	--	--	**1.58**
RW-25(B)	2/3/2011	1.2	1.4	**5.8**	--	<0.99	**0.97**
RW-25(B)	9/14/2011	11	1.2	**11**	--	--	**1.89**
RW-25(B)	9/13/2012	7.5	1.1	**7.1**	<5	--	**1.22**
RW-25(B)	9/4/2013	7.2	0.93	**6**	<100	--	**1.04**
RW-27(B)	9/9/2009	5.3	<0.5	0.6	--	--	0.13
RW-27(B)	9/9/2010	<0.5	<0.5	<0.5	--	--	0.09
RW-27(B)	9/13/2011	<0.5	<0.5	<0.5	--	--	0.09
RW-27(B)	9/11/2012	<0.5	<0.5	<0.5	<5	--	0.09
RW-27(B)	9/4/2013	<0.5	<0.5	<0.5	<100	--	0.09
WCC-04(A)	2/2/2011	<0.5	<0.5	<0.5	--	<0.96	0.09
WCC-06(C)	9/10/2009	<0.5	<0.5	<0.5	--	--	0.09
WCC-06(C)	9/10/2010	<0.5	<0.5	<0.5	--	--	0.09
WCC-06(C)	9/14/2011	<0.5	<0.5	<0.5	--	--	0.09
WCC-06(C)	9/12/2012	<0.5	<0.5	<0.5	<5	--	0.09
WCC-06(C)	9/3/2013	<0.5	<0.5	<0.5	<100	--	0.09
WCC-26(B)	9/9/2009	<0.5	<0.5	<0.5	--	--	0.09
WCC-26(B)	9/9/2010	<0.5	<0.5	<0.5	--	--	0.09
WCC-26(B)	9/13/2011	<0.5	<0.5	<0.5	--	--	0.09
WCC-26(B)	9/11/2012	<0.5	<0.5	<0.5	<5	--	0.09
WCC-26(B)	9/4/2013	<0.5	<0.5	<0.5	<100	--	0.09
WCC-42(B)	9/9/2009	<0.5	<0.5	<0.5	--	--	0.09
WCC-42(B)	9/9/2010	<0.5	<0.5	<0.5	--	--	0.09
WCC-42(B)	9/12/2011	<0.5	<0.5	<0.5	--	--	0.09
WCC-42(B)	9/12/2012	<0.5	<0.5	<0.5	<5	--	0.09
WCC-42(B)	9/5/2013	<0.5	<0.5	<0.5	<100	--	0.09

Notes:

[1] Contaminant not included as COC in ROD. Current California DHS MCL listed.

[2] Hazard index = concentration of 1,1,1-TCA/MCL 1,1,1-TCA + concentration of 1,1-DCE/MCL 1,1-DCE

[3] Reporting limit used for Hazard Index calculation when constituent non-detect

Shaded cell indicates constituent detected above MCL or Cleanup Level