

**FOURTH FIVE-YEAR REVIEW REPORT FOR  
MONOLITHIC MEMORIES SUPERFUND SITE (Subunit 2)  
SANTA CLARA COUNTY, CALIFORNIA**



PREPARED BY Army Corps of Engineers Seattle District

Approved by:

Date:

A handwritten signature in black ink, appearing to read "Stephen Hill".

9/24/14

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

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Date:

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9/24/14

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

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# Executive Summary

This is the fourth Five-Year Review (FYR) of the Monolithic Memories, Inc. Superfund Site (MMI or Advanced Micro Devices-1165/1175 Arques Site), a former semiconductor manufacturing facility, located in Sunnyvale, Santa Clara County, California. The purpose of this FYR is to review information 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 30, 2009.

Remediation of the MMI Site has been combined with another National Priorities List (NPL) site, National Semiconductor Corporation (NSC), because both sites contributed to the same groundwater contamination. The remedy for groundwater contamination at the MMI Site has included soil excavation, groundwater extraction and treatment (GWET), soil vapor extraction and treatment (SVET), groundwater monitoring, and institutional controls. This FYR covers remedial activities conducted between October 2009 and March 2014.

On September 11, 1991, EPA issued a joint Record of Decision (ROD) for the commingled plume of groundwater contamination from both the NSC and MMI Sites (together, Operable Unit 1 or OU1). OU1 has been divided into three subunits: Subunit 1- the former NSC campus, the down-gradient area to East Arques Avenue and the adjacent former United Technologies Corporation (UTC) facility at 1050 East Arques Avenue; Subunit 2 of OU1 - the MMI Site, which includes two properties: 1165/1175 East Arques Avenue (former Buildings 1 and 2) and 1160 Kern Avenue (Building 3); and Subunit 3 – the commingled solvent plume down-gradient of the NSC, UTC, and MMI sites and that lies entirely within the City of Sunnyvale.

The selected final remedy for the NSC and MMI sites included the following elements: groundwater extraction; treatment of extracted groundwater by air stripping or ozone oxidation and discharge of treated water under NPDES permit; soil vapor extraction or excavation; and a deed restriction prohibiting the use of shallow groundwater for drinking water.

At the MMI Site (Subunit 2 of OU1), all remedies described above have been implemented and the responsibility for groundwater monitoring has been transferred to the NSC Site. Groundwater treatment and monitoring continues for Subunit 2 of OU1 but within the overall groundwater extraction program for OU1 for the NSC Site, as of 2002. Texas Instruments, Inc. (TI) acquired the NSC Site through a merger with NSC in September 2011. Through this merger, TI assumed responsibility for the NSC Site and groundwater monitoring and treatment at the MMI Site.

Off-site sources of trichloroethene (TCE) and cis-1,2-dichloroethene (cis-1,2-DCE), including from the NSC Site, continue to impact the MMI Site, and in general concentrations of TCE and cis-1,2-DCE detected in MMI Site monitoring wells are comparable to concentrations in wells located upgradient of the MMI Site. Concentrations measured in groundwater at the MMI Site in October 2013 continue to remain above the cleanup standards (up to 220 µg/L for TCE vs 5 µg/L and up to 370 µg/L for cis-1,2-DCE vs 6 µg/L). However MMI-related chemicals (PCE, 1,1-dichloroethane or 1,1-DCA, 1,2-dichlorobenzene or 1,2-DCB, and chlorobenzene) are below or approaching cleanup goals in groundwater beneath the site, due to the effectiveness of the soil and groundwater remediation programs previously

conducted. No further on-site groundwater extraction for remediation or containment of groundwater affected by MMI Site chemicals is currently being conducted.

In July of 2005, during demolition of Buildings 1 and 2 on East Arques Avenue, a transformer was damaged on the MMI Site and 250 gallons of tetrachloroethylene or perchloroethene (PCE) were spilled onto the soil. By March of 2011, PCE concentrations in groundwater relating to the 2005 transformer spill had been reduced to well below the Regional Water Quality Control Board (RWQCB) approved Remedial Action Objectives (RAOs) cleanup levels and generally below the previously existing volatile organic chemicals (VOC) concentrations. However, PCE groundwater concentrations remain elevated above the cleanup standard of 5 µg/L as specified in the ROD in certain wells (including up to 34 µg/L measured during a 2013 sampling event in a well historically shown to be impacted by PCE from the 2005 release).

In April 2012, the RWQCB approved a No Further Action Workplan and Addendum for the 2005 release, which approved the cessation of active remediation on-site but required some continued groundwater monitoring at certain wells to ensure that rebound does not occur. A subsequent monitoring event in October 2013 showed PCE breakdown products elevated in some locations, indicative of continued degradation of PCE into innocuous end products such as ethane and ethane. These two compounds, together with vinyl chloride, were the only PCE and TCE breakdown products detected at concentrations greater than those in the upgradient area (for vinyl chloride, up to a maximum of 130 micrograms per liter or µg/L, compared to the cleanup standard of 0.5 µg/L). Additional monitoring is appropriate to show that RAOs are achieved and that rebound does not occur.

Regarding vapor intrusion (VI), vapor sampling at a daycare facility (located off-site at 1155 East Arques Avenue, adjacent to the western property boundary) indicate no VI exposure currently exists at that facility from the 2005 PCE spill. In May 2013, Advanced Micro Devices (AMD) conducted a preferential pathway investigation at 1160 Kern Ave (Building 3) to evaluate additional measures to reduce VI in a women's restroom in the on-site building. Ventilation enhancements and certain other mitigation measures were completed, to address exceedances of the long-term commercial screening level of 3 µg/m<sup>3</sup> of up to 27 micrograms per cubic meter (µg/m<sup>3</sup>; pathway sample collected during a ventilation-off sampling event) and 5.2 µg/m<sup>3</sup> (ventilation-off breathing zone sample collected from the same restroom following the initial ventilation improvements, but prior to additional mitigation work).

Following some additional mitigation activities, indoor air VI measurements decreased to below commercial standards, with the exception of a ventilation-on breathing zone exceedance in the women's bathroom referenced above (3.5 µg/m<sup>3</sup>). Additional preferential pathway evaluations are underway with the aim of identifying additional mitigation measures to reduce even further the VI-related indoor air screening level exceedances measured.

The remedy at the MMI Site is currently protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. Institutional Controls restrict the use of groundwater as a drinking water source. In order to be protective in the long-term, the preferential pathway investigation, mitigation and indoor air monitoring at 1160 Kern Avenue (Building 3) should be continued and an evaluation of the need for restarting the pump and treat system or a determination of an alternate remedy needs to be completed.

## Five-Year Review Summary Form

SITE IDENTIFICATION		
<b>Site Name:</b> Monolithic Memories (Advanced Micro Devices-Arques)		
<b>EPA ID:</b> CAD049236201		
<b>Region:</b> 9	<b>State:</b> CA	<b>City/County:</b> Sunnyvale, Santa Clara
SITE STATUS		
<b>NPL Status:</b> Final		
<b>Multiple OUs?</b> No	<b>Has the site achieved construction completion?</b> Yes	
REVIEW STATUS		
<b>Lead agency:</b> EPA and State of California <b>If "Other Federal Agency" was selected above, enter Agency name:</b> <a href="#">Click here to enter text.</a>		
<b>Author name (Federal or State Project Manager):</b> Melanie Morash and Max Shahbazian		
<b>Author affiliation:</b> U.S. EPA and State of California RWQCB		
<b>Review period:</b> October 1, 2013 – March 30, 2014		
<b>Date of site inspection:</b> October 24, 2013		
<b>Type of review:</b> Statutory		
<b>Review number:</b> 4		
<b>Triggering action date:</b> September 30, 2009		
<b>Due date (five years after triggering action date):</b> September 30, 2014		

## Five-Year Review Summary Form (continued)

Issues/Recommendations				
<b>OU(s) without Issues/Recommendations Identified in the Five-Year Review:</b>				
None				
<b>Issues and Recommendations Identified in the Five-Year Review:</b>				
<b>OU(s):</b> OU 1 Subunit 2	<b>Issue Category: Monitoring</b>			
	<b>Issue:</b> Air monitoring at Building 3 (1160 Kern Ave) shows exceedances (3.5 µg/m <sup>3</sup> ) of commercial/industrial Regional Screening Level (RSL) of 3.0 µg/m <sup>3</sup> .			
	<b>Recommendation:</b> Continue preferential pathway investigation, mitigation and indoor air monitoring at 1160 Kern Ave to ensure compliance with RSLs.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	PRP	RWQCB	06/2015
Issues/Recommendations				
<b>OU(s) without Issues/Recommendations Identified in the Five-Year Review:</b>				
None				
<b>Issues and Recommendations Identified in the Five-Year Review:</b>				
<b>OU(s):</b> OU 1 Subunit 2	<b>Issue Category: Monitoring</b>			
	<b>Issue:</b> The pump and treat system selected in the ROD was shut down in 2005.			
	<b>Recommendation:</b> An evaluation of the need for restarting the pump and treat system or a determination of an alternate remedy needs to be done. This should also be documented in a decision document.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	EPA	RWQCB	09/2019
Protectiveness Statement(s)				
<i>Operable Unit:</i> OU1 Subunit 2	<i>Protectiveness Determination:</i> Short-term Protective	<i>Addendum Due Date (if applicable):</i> <a href="#">Click here to enter date.</a>		
<i>Protectiveness Statement:</i> The remedy at the MMI Site is currently protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. Institutional Controls restrict the use of groundwater as a drinking water source. In order to be protective in the long-term, the preferential pathway investigation, mitigation and indoor air monitoring at 1160 Kern Avenue (Building 3) should be continued and an evaluation of the need for restarting the pump and treat system or a determination of an alternate remedy needs to be completed.				

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## List of Abbreviations

1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
AL	Action Level
AMD	Advanced Micro Devices
ARAR	Applicable or Relevant and Appropriate Requirement
BAAQMD	Bay Area Air Quality Management District
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cis-1,2-DCE	cis-1,2-dichloroethene
EPA	Environmental Protection Agency
ESL	Environmental Screening Level
FYR	Five-Year Review
GWET	Groundwater Extraction and Treatment
HRC	Hydrogen Release Compound
ICS	Institutional Controls
MMI	Monolithic Memories Inc.
MPE	Multi-phase Extraction Wells
NCP	National Contingency Plan
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
NSC	National Semiconductor Corporation
O&M	Operation and Maintenance
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PCE	Tetrachloroethylene
PRP	Potentially Responsible Party
RP	Responsible Party
RAO	Remedial Action Objectives
RAP	Remedial Action Plan
RAFT	Resource Area for Teaching
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
RWQCB	California Regional Water Quality Control Board – San Francisco Region
SCR	Site Cleanup Requirements
SVE	Soil Vapor Extraction
TI	Texas Instruments Incorporated
TCE	Trichloroethylene
trans-1,2-DCE	trans-1,2-dichloroethene
TWC	TWC Storage LLC
UTC	United Technologies Corporation
VOC	Volatile Organic Chemicals

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# Fourth Five-Year Review Report

## for

### Monolithic Memories Superfund Site

## 1. Introduction

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

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

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

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

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

This is the fourth FYR for the Monolithic Memories, Inc. Superfund Site (MMI Site or Advanced Micro Devices-1165/1175 Arques Site). The triggering action for this statutory review is the previous FYR dated September 2009. The 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. The MMI Site is Subunit 2 of Operable Unit 1 (OU 1), as identified in a September 11, 1991 Record of Decision (ROD) that also includes the National Semiconductor Corporation (NSC) Superfund Site (NSC Site). Other subunits are not addressed in this FYR.

The U.S. Army Corps of Engineers (USACE), conducted the FYR and prepared this report regarding the remedy implemented at the Monolithic Memories Superfund Site in the City of Sunnyvale, Santa Clara County, California. The California Regional Water Quality Control Board (RWQCB), San Francisco Bay Region, is the lead agency for developing and implementing the remedy for the MMI Site.

As defined in the combined ROD, the MMI Site and the NSC Site to the south, consist of one operable unit (OU 1) which addresses remediation of contaminated soil and groundwater. OU 1 consists of three subunits (see Figure 1). Subunit 1 includes the 60-acre former NSC facility and the 10-acre United Technology Corporation (UTC) facility. Subunit 2 encompasses the 20-acre former MMI facility, or the Site. Subunit 3 consists of the areas downgradient from Subunits 1 and 2 and extends to the leading edge of the contaminant plume. A final remedy was selected for OU 1 that encompassed groundwater and soil cleanup elements. This FYR addresses Subunit 2 of OU1 only; information on the protectiveness and status of the remedy at Subunits 1 and 3, and overall OU 1 can be found in the fourth FYR for NSC (September 2013; EPA ID CAD041472986).

## 2. Site Chronology

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

**Table 1. Chronology of Site Events**

Event	Date
Monolithic Memories, Inc. (MMI) begins semiconductor manufacturing operations at 1165 (Building 1)/1175 (Building 2) East Arques Avenue and 1160 Kern Avenue (Building 3) complex	1970
Initial investigations and removal of leaking USTs and associated piping; soil and groundwater contamination discovered at the Site	1982
MMI begins groundwater extraction from A-zone aquifer	1986
San Francisco Bay Regional Water Quality Control Board (RWQCB) issues Waste Discharge Requirements Order WDR 86-64 requiring delineation of volatile organic chemical (VOC) plume	August 1986
Advanced Micro Devices (AMD) acquires MMI and assumes Site cleanup responsibility	1987
The MMI and adjacent National Semiconductor Corporation (NSC) Sites added to the National Priorities List (NPL)	July 1987
Groundwater extraction begins from the B-zone aquifer	1988
RWQCB adopts Site Cleanup Requirements	April 1989
AMD ceases its industrial operations	1989
AMD completes Baseline Public Health Evaluation for Site	April 1991
RWQCB and EPA approve Final RI/FS work plans for MMI and NSC Sites	September 1991
RWQCB adopted Orders No. 91-137, 91-139, and 91-140, the Final Site Cleanup Requirements for Subunits 1, 2, and 3 of Operable Unit 1	September 1991
EPA issues ROD for MMI and NSC Sites	September 1991
AMD installs two A-zone extraction wells (E42A and E43A) and performs soil investigation	1992
AMD installs and operates soil vapor extraction (SVE) system	1993
AMD ceases SVE operations upon achieving soil cleanup standards	1997
The first Five-Year Review Report is signed	September 1999

NSC takes over operations of the Operable Unit 1 groundwater extraction, treatment and monitoring program	January 2002
The second Five-Year Review Report is signed	Sept 2004
AMD records an environmental restriction covenant for the 1165 East Arques Avenue property (Building 1). TWC Storage LLC (TWC) purchases the property.	April 2005
TWC damages an electrical transformer in the northwest corner of Building 1 during building demolition activities and 250 gallons of tetrachloroethylene or perchloroethene (PCE) leak into MMI Site soils and shallow groundwater	July 2005
TWC removes approximately 2,000 cubic yards (3,100 tons) of PCE-impacted soil within two excavation areas in the northwest corner of the property. TWC places hydrogen release compound (HRC) in the bottom of each excavation prior to backfilling to accelerate the bioremediation (breakdown) of residual PCE in soil and shallow groundwater	October 2005
TWC conducts soil and groundwater sampling in area of PCE spill	November 2005
NSC conducts soil gas and indoor air sampling at 1155 E. Arques Ave. (daycare center)	September-October 2005
TWC conducts its second round biannual indoor air sampling at the 1155 E. Arques daycare center.	December 2005
TWC installs seven SVE wells in the northwest corner of Building 1 and conducts SVE feasibility test	February 2006
TWC conducts first of two in-situ chemical oxidation injection events using RegenOx™	February 2006
AMD removes below-surface grade wastewater conveyance lines and overburden from 1160 Kern property (Building 3)	March 2006
TWC conducts second of two in-situ chemical oxidation injection events using RegenOx™	March 2006
TWC installs four soil-gas probes on 1155 E. Arques Ave. property for yearly concurrent indoor air and soil-gas monitoring	March 2006
AMD conducts soil excavation activities in Areas 1 and 2 (historical), Area 3 (discovered in March 2005), Area 4 (discovered in July 2005), and 1160 Kern (Building 3) Areas 1 and 2 (identified in March 2006)	November 2006
AMD conducts two soil sampling programs to establish the extent of Area 2	November-December 2006
TWC installs groundwater extraction and treatment (GWET) system and begins groundwater extraction from well MM17A to capture and treat contaminated groundwater related to the 2005 PCE spill.	July 2007
TWC installs four groundwater monitoring wells and nine multi-phase extraction (MPE) wells in the area of the 2005 PCE spill.	September 2007
TWC installs an MPE system and combines it with the GWET system. The combined treatment systems begin operation.	January 2008
TWC records a new environmental restriction covenant for the 1165 East Arques Avenue (former Building 1) property.	July 2008
AMD completes soil excavation and backfill of contaminated soil in Area 2.	September 2008
Combined MPE/GWET system ceases operation.	November 2008
TWC injects 10,000 gallons of 3DMe™ HRC to remediate PCE-impacted soil and shallow groundwater in the PCE spill area.	June 2009
The third Five-Year Review Report is signed.	September 2009
TWC injects approximately 7,000 gallons of 3DMe™ HRC to remediate PCE-impacted groundwater in the PCE spill area.	December 2010
AMD submits workplan to RWQCB and EPA for evaluation of potential vapor intrusion (VI) at 1160 Kern Ave (Building 3).	July 2011

Based on ventilation-off air sampling results, RWQCB requests that AMD undertake mitigation measures for VI from the floor drains in the women's restroom at 1160 Kern Ave (Building 3) and perform post-mitigation confirmation sampling.	August 2011
AMD conducts VI mitigation measures in restroom floor drains and conducts a confirmatory ventilation-off indoor air sampling event.	December 2011
TWC submits a No Further Action Workplan for the 2005 release.	January 2012
TWC submits an Addendum to the No Further Action Workplan for the 2005 release including groundwater monitoring schedule.	March 2012
RWQCB approves No Further Action Workplan and Addendum for the 2005 release, requiring some continued groundwater monitoring at 3 wells.	April 2012
AMD conducts additional indoor air sampling at 1160 Kern Ave (Building 3)	July 2012
TWC submits Groundwater Monitoring Report documenting completion of the No Further Action Workplan and Addendum.	March 2013
TWC records an amended environmental restriction covenant for the 1165 East Arques Avenue (former Building 1) property.	March 2013
TWC submits Well Destruction Request and Workplan for 1165/1175 E. Arques Ave. (former Buildings 1&2)	April 2013
AMD conducts preferential pathway investigation at 1160 Kern Ave (Building 3) to evaluate additional measures to reduce vapor intrusion in the women's restroom.	May 2013
RWQCB issues partial approval for Well Destruction Request and Workplan stipulating that wells MW-3, EX-1, and EX-2 should continue to monitor natural attenuation of residual VOCs in soil and groundwater.	June 2013
AMD conducts ventilation-on air monitoring at 1160 Kern Ave (Building 3) prior to the start of vapor intrusion mitigation efforts (building ventilation enhancements).	September 2013
AMD conducts vapor intrusion mitigation measures (floor sealing activities) at 1160 Kern Ave (Building 3).	January 2014
AMD conducts ventilation-on indoor air sampling at 1160 Kern Ave (Building 3) to determine effectiveness of mitigation measures.	February 2014

### 3. Background

#### 3.1. Physical Characteristics

The MMI Site includes the properties at 1165 and 1175 East Arques Avenue (Buildings 1 and 2, respectively, demolished in 2005) and at 1160 Kern Avenue (Building 3) within the City of Sunnyvale, Santa Clara County, California (Figure 1 and Figure 2). The site is located south of Highway 101 and lies to the north of another federal Superfund Site, the NSC Site in Santa Clara. A joint ROD for both sites (OU 1) was issued on September 11, 1991, for the commingled plume of groundwater contamination from both sites. The MMI Site is designated Subunit 2 of OU 1. Subunit 1 is the NSC Site, hydraulically up-gradient; and Subunit 3 is the rest of the commingled plume hydraulically down-gradient from both the MMI and NSC properties.

The MMI Site occupies approximately 20 acres northeast of the junction of the Central Expressway and the Lawrence Expressway and is located in the light industrial and commercial area (dominated by the

electronics industry) known as Silicon Valley. Most buildings in the vicinity are low-rise developments containing office space and research and development facilities. Residential areas are located within one mile of the Site.

Both the MMI and NSC properties are located in the Santa Clara Valley which is a gently sloping alluvial plain, flanked by the Diablo Range to the east-southeast and the Santa Cruz Mountains to the west-southwest. MMI is located toward the center of the valley, and is approximately 2.5 miles south of the former Leslie Salt Company salt ponds (former salt marshes of San Francisco Bay), approximately 1.6 miles west of San Tomas Aquino Creek, and approximately 0.8 miles north of the Cal Train commuter tracks. Adjacent properties include the First Korean Christian Church, the KinderCare childcare center, Grace Adult Health Care, and Grainger Industrial Supply. The site is relatively flat and was in agricultural usage from at least 1948 through 1969.

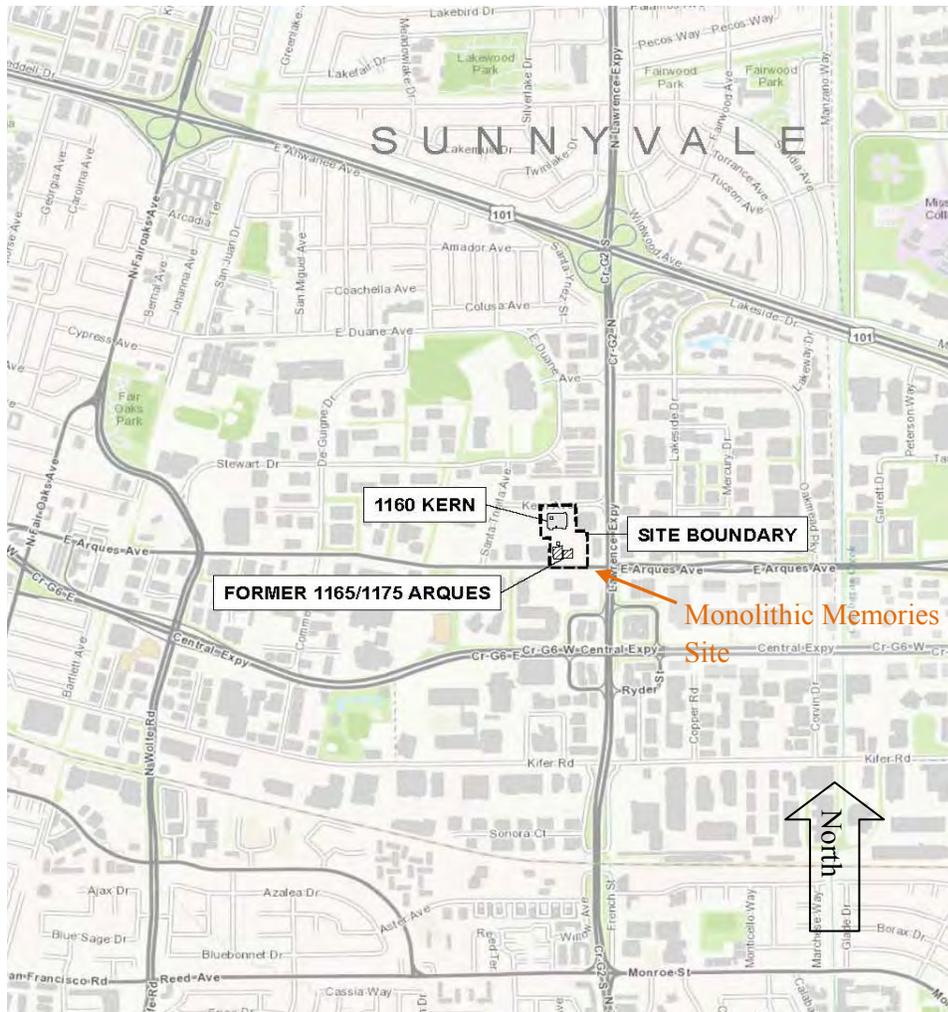


Figure 1. Location Map for the Monolithic Memories Superfund Site

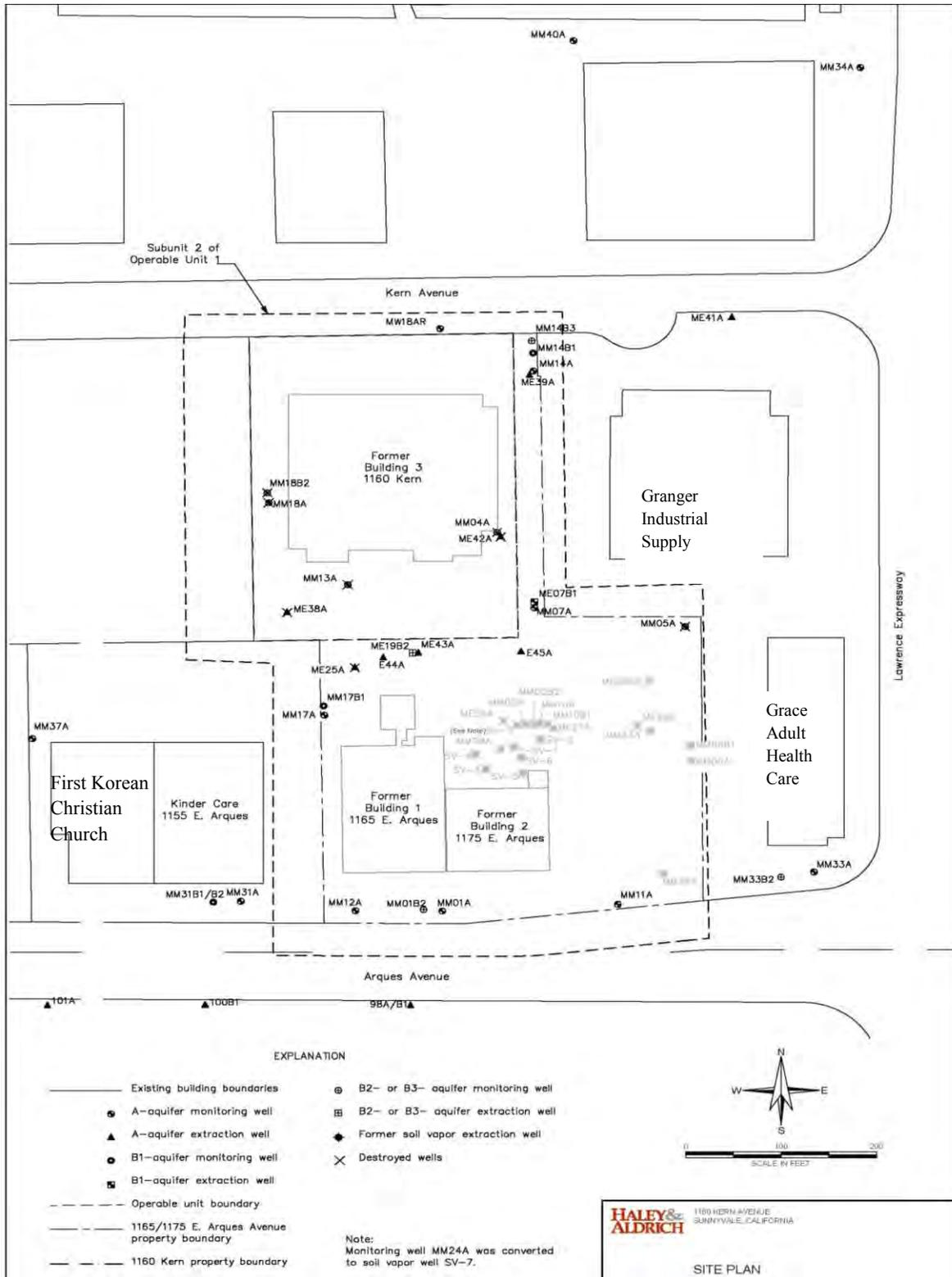


Figure 2. Detailed Map of the Monolithic Memories Superfund Site Subunit 2

## 3.2. Hydrogeology

### 3.2.1. Regional

The MMI Site is located in the Santa Clara Valley which extends southeast of San Francisco Bay and is bounded by the Diablo Range on the northeast, and by the Santa Cruz and Gabilan Ranges on the southwest. The Santa Clara Valley is a fault-bounded structural basin filled with marine and alluvial sediments from the adjacent mountain ranges with alternating layers of coarse and fine deposits in a heterogeneous sequence of interbedded sands, gravels, silts and clays. These deposits are up to 1,500 feet thick. At the base of the adjacent mountains, gently sloping alluvial fans of the basin tributaries laterally merge to form an alluvial apron extending into the interior of the basin.

The Santa Clara Valley groundwater basin is divided into two broad areas: (1) the recharge zone or forebay, and (2) the confined area, where the study area is located. The forebay occurs along the elevated edges of the basin where the basin receives its principal recharge. The confined area is located in the flatter interior portion of the basin and is stratified or divided in individual beds separated by significant aquitards. The confined area is divided into the upper and lower aquifer zones. The division is formed by an extensive regional aquitard that occurs at depths ranging from about 100 feet, near the confined area's southern boundary, to 150 to 250 feet in the center of the confined area and beneath San Francisco Bay. Thickness of this regional aquitard varies from about 20 feet to over 100 feet.

### 3.2.2. Local

Stratigraphy in the local area is characterized by interbedded and interfingering sands, silts, and clays. These soils were deposited in complex patterns by fluvial alluvial systems draining the uplands on the east and west of the valley; sediments were deposited as the various streams flowed northward towards San Francisco Bay. The nomenclature applied to the water-bearing zones in the study area is representative of the hydrogeology within the Santa Clara Groundwater Basin. A number of shallow water-bearing zones are separated from deeper zones by the thick persistent regional aquitard.

The shallow zones may be subdivided into a variety of zones depending upon depth, lithology, and lateral persistence. These zones are frequently labeled as A and B aquifer zones (A and B aquifers). The deeper aquifer is commonly referred to as the C aquifer and the clay layer separating the upper and lower water-bearing aquifers is commonly referred to as the B-C aquitard. Within the study area the shallowest water-bearing aquifer has been identified as the A aquifer. The next deeper water-bearing aquifer within the study area has been identified as the B aquifer and has been subdivided into three water-bearing aquifers, B1 through B3, based on the depths at which major sand units are encountered. The A aquifer occurs between five and 25 feet below ground surface (bgs). The B1 aquifer is encountered between 30 and 45 feet bgs, the B2 aquifer between 45 and 70 bgs, and the B3 aquifer between 70 and 90 feet bgs. The A aquifer and B aquifer is separated by the A/B aquitard. The groundwater gradient in all identified aquifer zones is in a north-northeast direction.

### 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. The MMI Site is located in a light industrial and commercial land-use area having residential neighborhoods within one mile of the Site. This is similar to the land use pattern around the MMI Site identified in the 1991 ROD. The City of Sunnyvale's 2011 General Plan delineates a potential residential growth area within 0.5 miles north of the Site immediately west of Lawrence Expressway. Sunnyvale has a population of approximately 146,000 residents and is part of the San Francisco Bay Metropolitan Region, which has a total population of approximately 6.7 million.

In 1970, two buildings, Building 1, at 1165 East Arques Avenue and Building 2, at 1175 East Arques Avenue, were constructed and used for semiconductor fabrication until 1989. The building located at 1160 Kern Avenue (Building 3) was leased by MMI for office space, product testing and handling, and administration. Chemicals used in semiconductor manufacturing included organic solvent mixtures, acids, caustics, and other chemicals. Hazardous wastes, generated as part of fabrication activities, were stored and treated in underground storage tanks (USTs). The USTs leaked and caused groundwater contamination. Initial investigations in 1982 found leaking USTs and associated piping; soil and groundwater contamination was subsequently discovered at the Site and the leaking USTs were removed.

MMI occupied the Site from 1970 until Advanced Micro Devices (AMD) acquired the property from MMI in 1987. In April 2005, AMD donated the 1165/1175 E. Arques Avenue property (former Buildings 1 & 2) to a local charity, which immediately sold the property to TWC Storage, LLC (TWC). Building 3 (1160 Kern) is currently owned by *Resource Area for Teaching* (RAFT), a non-profit organization for teachers, which operates a warehouse there. The RWQCB approved a Site Management Plan in September 2013 for 1165 East Arques Avenue (former Building 1) where a fitness center is being constructed. A childcare facility is located just west of the property boundary (Figure 2).

Currently, the public water supply wells closest to the Site consist of a stand-by City well located approximately 1.5 miles west of the site and two California Water wells some 2.5 miles to the southwest.

### 3.4. *History of Contamination*

MMI manufactured integrated circuits on this 20-acre site from 1970 until 1987 when AMD acquired the property. Manufacturing continued under AMD until 1989. The facility consisted of three buildings that were used for production, assembly, storage, offices, and laboratories.

MMI (subsequently AMD) initiated subsurface investigations at their facility in 1982 because of suspected leakage from several underground chemical solvent storage tanks and chemical handling areas used for onsite storage and/or treatment of waste solvents (Buildings 1 and 2). Contamination of soil and groundwater was found to have originated from an on-site waste stripper tank, an acid neutralization system and wastewater collection system, and a waste solvent reclamation tank. The MMI Site and the up-gradient NSC Site were jointly listed on the National Priorities List (NPL) in July 22, 1987, after contamination of soil and groundwater was discovered at both sites.

The most significant contamination was located just north of Building 2 (1175 East Arques Avenue). Additional remedial investigations between 1984 and 1991 confirmed the sources and extent of contamination. The main contaminants of concern identified during investigations include: trichloroethylene (TCE), tetrachloroethylene or perchloroethene (PCE), chlorobenzene, 1,2-dichlorobenzene (1,2-DCB), 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), 1,2-cis-dichloroethene (cis-1,2-DCE), 1,2-trans-dichloroethene (trans-1,2,-DCE), 1,1,1-trichloroethane (1,1,1-TCA), ethylbenzene, xylenes, and polynuclear aromatic hydrocarbons (PAHs), as the indicator chemicals for releases associated with former MMI operations. Existing contamination from the NSC Superfund Site immediately to the south has resulted in a commingled plume of groundwater contamination from both sites.

On July 15, 2005, during demolition of Buildings 1 and 2, a transformer located on a pad in the northwest corner of the 1165 Arques building (former Building 1) was damaged by contractors retained by TWC Storage, LLC (TWC). Approximately 250 gallons of PCE were spilled onto the ground and subsequently migrated into underlying soils and groundwater. Remedial activities including soil excavation and dual-phase extraction have been conducted at the MMI Site to address the release of PCE. PCE-impacted soil and shallow groundwater from the release of PCE from the electrical transformer have been remediated to the extent feasible by TWC.

NSC and AMD reached a settlement concerning the groundwater cleanup in OU1. Beginning on January 31, 2002, NSC took the lead on groundwater remediation in all of OU1 (including Subunits 1, 2, and 3). Remedial systems operation, monitoring, and reporting in OU1 were integrated, with the required National Pollution Discharge Elimination System (NPDES) permits obtained by NSC. The common objective of both parties consisted of optimizing the cleanup without regard to property boundaries, allowing a reconfiguration of the remedial systems to eliminate redundant pumping.

Texas Instruments, Inc. (TI) acquired the NSC Site through a merger with NSC in September 2011. Through this merger, TI assumed responsibility for the NSC Site and groundwater monitoring and treatment at the MMI Site. AMD retained certain specific responsibilities, including any soil remediation required in Subunit 2 of OU1 and any environmental studies or remediation required in connection with redevelopment activities in Subunit 2 of OU1.

### ***3.5. Initial Response***

Soils containing elevated concentrations of volatile organic chemicals (VOCs) were removed by MMI, along with sumps and tanks, between 1982 and 1984. Groundwater remediation for the shallow water-yielding interval (A aquifer) began in 1986 with an on-site groundwater extraction and treatment (GWET) system as the interim remedial measure. The system was expanded to the deeper B aquifer in 1988 and was discontinued in 2005.

The company removed two subsurface waste solvent tanks and two subsurface acid neutralization systems and the conveyance systems. In 1986, under the direction of the State, the company began extracting and treating the groundwater to contain the contaminant plume.

In July of 2005 a discharge of PCE occurred when a transformer was damaged during demolition activities. Initial response activities included removal of PCE liquid and PCE-impacted soil (~ 2,300 cubic yards) and demolition debris. These activities are estimated to have removed approximately 85 percent (210 gallons) of the spilled mass.

### 3.6. *Basis for Taking Action*

The presence of VOCs in soils and/or groundwater at the MMI and NSC sites provided the basis for taking action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). For the MMI Site, four of the Contaminants of Concern (COCs) were considered known (vinyl chloride) or probable (1,1-DCA, PCE, and TCE) human carcinogens. The NSC Site COCs included trichloroethene (TCE), 1,1,1-trichloroethane (TCA), cis-1,2-dichloroethene (cis-1,2-DCE), 1,1-dichloroethene, and Freon 113. The primary threat to human health identified in the ROD was posed by potential migration of contaminants in the upper aquifer zones down to the lower aquifer zones which serve as a source of public water supply.

## 4. Remedial Actions

### 4.1. *Remedy Selection*

A joint ROD for the NCS and MMI sites was signed on September 11, 1991. As described in the ROD:

*The objective of the selected remedy is to remove and permanently destroy the contaminants from both soils and groundwater or to significantly reduce the toxicity, mobility or volume of hazardous substances in both media. Contaminated groundwater at the site represents the primary risk at the site, and the remedy is intended to return groundwater to its beneficial uses within a reasonable period of time. Soil contamination at the site represents a continuing source of groundwater contamination and represents the principal threat at the site. This principal threat will be addressed by the remedy. These response actions will greatly reduce the possibility of contamination of current and potential water supplies.*

The selected final remedy for OU 1 as described in the 1991 ROD included the following elements:

- Groundwater extraction, to control further migration of Site chemicals in the contaminated aquifers and reduce chemical concentrations until cleanup standards have been achieved.
- Treatment of extracted groundwater with air stripping or ozone oxidation under Bay Area Air Quality Management District (BAAQMD) permit or pursuant to Office of Solid Waste and Emergency Response (OSWER) Directive 9355.0-28.21. Approximately 160 gallons per minute (gpm) would be treated by air stripping and approximately 80 gpm would be treated with ozone oxidation.
- Discharge of extracted and treated groundwater to storm sewers and eventually to Calabasas Creek under a National Pollutant Discharge Elimination System (NPDES) permit.
- Soil Vapor Extraction (SVE) where vadose and shallow soils present a potential continuing source of contamination to groundwater or a health risk due to direct contact.

- Removal of shallow soils at the MMI Site which are contaminated with semi-volatile organic compounds (SVOCs) if insufficiently responsive to SVE.
- SVE conducted pursuant to a BAAQMD permit.
- Institutional Controls prohibiting the use of the A and B aquifer groundwater and for controlling activities that could endanger the public health or the environment.

The ROD indicated that to implement this final remedy for OU 1, the operating extraction system would be expanded, and an ozone oxidation treatment system would be added to the current air stripper treatment systems.

The ROD set groundwater cleanup standards at California proposed or adopted Maximum Contaminant Levels (MCLs), EPA MCLs, California Action Levels, or levels based on a risk assessment (Table 2).

**Table 2. Chemicals of Concern and Cleanup Standard**

Chemical Name	Groundwater	Soil	Cleanup Standard
Chlorobenzene	x		30 ug/L
1,1-DCA	x		5 ug/L
1,2-DCB	x		60 ug/L
1,1-DCE	x		6 ug/L
Trans-1,2-DCE	x		10 ug/L
Cis-1,2-DCE	x		6 ug/L
Ethylbenzene	x		68 ug/L
Freon 113	x		1,200 ug/L
PCE	x		5 ug/L
TCA	x		200 ug/L
TCE	x		5 ug/L
Vinyl Chloride	x		0.5 ug/L
Xylenes	x		175 ug/L
Total VOCs		x	1 ppm
PAHs		x	10 ppm

## 4.2. Remedy Implementation

### 4.2.1. MMI Site Remedy Implementation under the ROD

#### Soil Remediation

AMD installed and operated a soil vapor extraction (SVE) system north of Building 2 in 1993 to treat vadose-zone soil contamination. The system operated until 1996 when AMD demonstrated to the San

Francisco Bay Regional Water Quality Control Board (RWQCB) that soil cleanup standards had been achieved. The SVE system was removed in 2000 and seven SVE wells were decommissioned in 2005.

Redevelopment of the MMI property and demolition of Buildings 1 and 2 by TWC in 2006 and 2007 allowed access to and removal of approximately 160 cubic yards of soils contaminated with VOCs and SVOCs. In 2006, in connection with the termination of its lease on Building 3, AMD discovered two areas where PCE was detected at concentrations above RWQCB environmental screening levels (ESLs) and identified for soil removal. Excavation, confirmation sampling, and backfilling of these areas were completed in November 2006. Approximately 90 and 13 cubic yards of soil from areas at Buildings 1 and 2, respectively, were removed and disposed at Waste Management's Kettleman City facility in Kettleman City, California.

#### Groundwater Remediation

AMD operated the on-site GWET system until January 2002 when NSC assumed the lead for groundwater remediation of the entire commingled plume in OU 1. NSC operated the GWET system until 2005, at which time the system was decommissioned to accommodate property redevelopment (demolition of Buildings 1 and 2). To replace the two on-site extraction wells (ME26A and ME38A) destroyed as a result of the redevelopment activities, two new extraction wells (E44A and E45A) were installed by AMD in May 2005. These new extraction wells were never used because the PCE spill occurred immediately following their installation.

#### 4.2.2. 2005 PCE Spill Remediation

A Remedial Action Plan (RAP) was approved by RWQCB on April 25, 2007, separate from the ROD, to address the resulting MMI Site PCE soil and groundwater contamination. The remediation goal stated in the RAP was to restore the MMI Site to its approximate historic conditions prior to the PCE release from the damaged transformer.

#### Soil

TWC conducted soil excavation and cleanup activities beginning in 2005 in connection with the PCE spill from a transformer damaged during demolition of Building 1. These activities included removing approximately 2,300 cubic yards of contaminated soil, and the application of 2,430 pounds of Hydrogen Release Compound (HRC) prior to backfilling the excavation.

The soil cleanup standard for soil selected in the RAP was the RWQCB ESL, which was 240 µg/kg at that time. In November 2007 the ESL, and consequently the soil cleanup standard, was changed to 700 µg/kg.

Nine multi-phase extraction (MPE) wells were installed in September 2007 to remediate PCE soil and groundwater contamination related to the 2005 spill. The system was shut down on November 10, 2008 with RWQCB approval because PCE mass removal had reached an asymptotic condition. Concentrations in soil have decreased and no soil concentrations exceeding soil cleanup goals are known to remain at the

MMI Site. A No Further Action Work Plan requiring additional groundwater monitoring was approved by the RWQCB for the 2005 PCE release in April 2012, and the results were presented in the 2013 No Further Action Work Plan and Addendum.

#### Groundwater

MPE wells were proposed in the RAP as the remedial technology to further remediate PCE-affected soil and groundwater beneath the MMI Site and vicinity. A groundwater cleanup standard of 40 µg/L was initially selected based on the historical average PCE concentration in groundwater at the MMI Site prior to the PCE release.

In February and March 2006, TWC conducted two in-situ chemical oxidation injection events using RegenOx™. In June 2007, TWC installed an interim GWET system at the MMI Site to extract and treat PCE-impacted groundwater using an existing monitoring well MM17A. In September 2007, TWC installed nine MPE wells (EX-1, EX-2, and EX-4 through EX-10) and four groundwater-monitoring wells (MW-1 through MW-4). The wells were screened in the shallow water-bearing zone (A aquifer) to total depths ranging from 15.5 to 18 feet below ground surface (bgs). The MPE system, which incorporated the interim GWET system, began operation on January 7, 2008. It was subsequently shut down in November 2008 with RWQCB approval as PCE removal rates had reached asymptotic conditions.

### 4.3. Operation and Maintenance (O&M)

Since there is currently no groundwater extraction at the MMI Site, there is no operation and maintenance. The few wells in the vicinity are the responsibility of the NSC Site. The only costs at the MMI Site are related to as-needed services, which can vary greatly from year to year based on requests from the RWQCB and EPA. As an average based on the last few years, costs are estimated at approximately \$50K/year for studies and remediation associated with vapor intrusion at 1160 Kern Ave (Building 3).

**Table 3. Annual O&M Costs**

<b>Date Range</b>	<b>Total Cost</b>
1996 to 2004	\$1,034
2004 to 2005	\$120
2005 to 2009	\$2,753
2009 to 2012	Estimated \$50,000 per year average
2013 to 2014	>\$100,000 due to VI sampling

## 5. Progress since the Last Five-Year Review

### 5.1. Previous Five-Year Review Protectiveness Statement and Issues

The protectiveness statement from the third FYR for the MMI Site stated the following:

*“A protectiveness determination of the remedy at Monolithic Memories, Inc. (Advanced Micro Devices - Arques) cannot be made at this time until further information is obtained concerning*

*the potential for vapor intrusion. Further information will be obtained from collecting and analyzing soil gas and possibly indoor air samples at 1160 Kern Avenue (Building 3) building and the need for a further restrictive covenant at that property will be assessed. The historical data from biannual vapor sampling data from the 1155 East Arques Avenue location (KinderCare) will be analyzed to verify protectiveness. It is expected that these actions will take approximately one year to complete.*

*Although the historical groundwater plume has been reduced and contained, current information indicates that the selective remedy may not be able to restore the groundwater to its beneficial use as a potential drinking water supply. The recent PCE spill has increased concentrations on property and has not been fully assessed. Currently, the institutional controls are preventing exposure to, and the ingestion of contaminated groundwater. The feasibility of alternative remedies or improvements to the existing system needs to be evaluated to insure the long term remedial objectives are achieved.”*

The 2009 FYR included three issues and recommendations.

**Issue 1.** *Mass removal efficiency of the GWET system has declined over time and the system was shut down in 2005.*

Recommendation: An evaluation of alternatives for achieving groundwater cleanup standards needs to be completed. The ROD and final Site Completion Report (SCR) will need to be amended to reflect the change in remedy.

Action Taken: RWQCB approved using bioremediation as an alternative for achieving groundwater cleanup standards which started in 2009. By March 2011 concentrations had decreased to below or near RWQCB criteria so no further movement toward a ROD amendment has been made. A ROD amendment has not been drafted.

**Issue 2.** *The impact of a 2005 spill of PCE has not been fully assessed.*

Recommendation: An investigation should be completed to assess the impact of the 2005 PCE spill and the possible need for further action. Additionally, the ROD and final SCR will need to be amended to incorporate the implementation of remedial treatments and treatment systems related to the 2005 PCE spill.

Action Taken: An investigation of the 2005 spill impacts found that PCE concentrations in groundwater relating to the 2005 transformer spill had been reduced to below the RWQCB-approved cleanup levels and generally below the previously existing VOC concentrations by March 2011. Subsequent monitoring has not revealed any significant rebound, and elevated levels of PCE breakdown products in many locations indicate the continued degradation of PCE into innocuous end products such as ethane and ethane.

**Issue 3.** The vapor intrusion pathway at the Site has not been assessed at 1160 Kern Avenue (Building 3), a property which is not covered by a restricted covenant. Additionally, further evaluation needs to be completed of the historic VOC concentrations in the bi-annual indoor air sampling program at 1155 East Arques Avenue (KinderCare).

Recommendation: Soil gas and possibly indoor air samples should be collected at 1160 Kern Avenue (Building 3) to further assess the potential for a vapor intrusion pathway. The necessity of a further restrictive covenant for that property will be determined after the vapor intrusion assessment is completed. A statistical analysis of the historic indoor air data from KinderCare needs to be completed to verify that the clean-up activities from the 2005 PCE spill is protective of the KinderCare facility.

Action Taken: On December 3, 2013, EPA required the RWQCB to conduct vapor intrusion evaluations at the RWQCB-lead National Priorities List (NPL) or Superfund sites in the South San Francisco Bay Area (South Bay Sites) where trichloroethene (TCE) or tetrachloroethene (PCE) are contaminants of potential concern (which includes the MMI Site). The letter further states that "data gaps must be filled to fully evaluate the potential for vapor intrusion into buildings overlying the South Bay Sites contamination."

Continued sampling at the 1155 East Arques Avenue property (KinderCare) through June 2012 showed gradual decreases in indoor air VOC levels, with the last two sampling events showing no PCE or breakdown products detected above the laboratory reporting limit in indoor air samples. TWC concluded that VOCs in the subsurface, including soil vapor, do not currently cause an unacceptable risk to indoor air quality at the KinderCare building.

Indoor air sampling and mitigation activities have taken place at the 1160 Kern Avenue building (Building 3) to address exceedances of the long-term commercial screening level for TCE. AMD continues to conduct a preferential pathway investigation with the aim of identifying additional mitigation measures to reduce even further the VI-related indoor air screening level exceedances measured.

## ***5.2. Work Completed at the Site during this Five Year Review Period***

### **Groundwater**

In June 2009 and December 2010, approximately 930 and 1,910 pounds (lbs) of 3DMe™ were injected into the subsurface, respectively, as implementation of the Enhanced Reductive Dechlorination (ERD) technology approved by RWQCB to remediate residual PCE-affected groundwater associated with the 2005 PCE Spill (not associated with the ROD).

By March of 2011, PCE concentrations in groundwater relating to the transformer spill had been reduced to well below the RWQCB-approved remedial action objective cleanup levels and generally below the previously existing VOC concentrations. Concentrations of degradation products such as TCE and cis-1,2-DCE had been reduced to their approximate conditions existing prior to the 2005 PCE spill.

Subsequent monitoring has not revealed any significant rebound. However, PCE groundwater concentrations remain elevated above the cleanup standard of 5 µg/L as specified in the ROD in certain wells (including up to 34 µg/L measured during a 2013 sampling event in a well historically shown to be impacted by PCE from the 2005 release).

A total of 17 wells were properly destroyed following approval of ARCADIS' April 12, 2013 "Request for Well Destruction and Work Plan" in a letter dated June 20, 2013 from the RWQCB. The wells were destroyed on July 20, 2013 and include seven MPE wells EX-4 to EX-10; three groundwater monitoring wells MW-1, MW-2, MW-4; and seven soil-vapor extraction wells SV-01 to SV-07.

### Indoor Air

Thirteen rounds of indoor air and concurrent soil vapor sampling were conducted by TWC at the 1155 East Arques Avenue property (KinderCare) through June 2012. During the last two sampling events (in which the heating, ventilation, and air conditioning [HVAC] system was off for the first event and on for the second), no PCE or breakdown products were detected above the laboratory reporting limit in indoor air samples. TWC concluded that VOCs in the subsurface, including soil vapor, do not currently cause an unacceptable risk to indoor air quality at the KinderCare building.

In July 2011, a work plan was submitted to the RWQCB and EPA for evaluation of potential vapor intrusion at 1160 Kern (Building 3, historic contamination) in response to the recommendations and follow-up actions outlined by EPA in their Third FYR of the MMI Site. Indoor air sampling was conducted in August 2011, December 2011, and July 2012 with the HVAC system off, and in September 2013 and February 2014 with the HVAC system operating as usual, with certain screening level exceedances detected.

Ventilation enhancements and certain other mitigation measures were completed, to address exceedances in a women's restroom of up to 27 micrograms per cubic meter (µg/m<sup>3</sup>; pathway sample collected during a ventilation-off sampling event) and 5.2 µg/m<sup>3</sup> (ventilation-off breathing zone sample collected from the same restroom following the initial ventilation improvements, but prior to additional mitigation work). The long-term commercial screening level for TCE is 2.1 µg/m<sup>3</sup> which corresponds to an excess cancer risk of 10<sup>-6</sup>.

Following some additional mitigation activities (sealing of cracks and other surface imperfections, improvements to drains, additional ventilation enhancements), indoor air VI measurements decreased to below commercial standards, with the exception of a ventilation-on breathing zone exceedance in the women's bathroom referenced above (3.5 µg/m<sup>3</sup>). AMD continues to conduct a preferential pathway investigation with the aim of identifying additional mitigation measures to reduce even further the VI-related indoor air screening level exceedances measured.

## 6. Five-Year Review Process

### 6.1. *Administrative Components*

EPA Region 9 initiated the FYR in October 2013 and scheduled its completion for September 2014. The review team was led by Max Shahbazian of the San Francisco Bay RWQCB, Project Manager for the MMI Site, and Melanie Morash of the EPA, Remedial Project Manager (RPM) for the MMI Site, and written by Jose Valdes, Ellen Engberg and Deborah Johnston of the Corps of Engineers, Seattle District. In September 2013, EPA and the RWQCB held a scoping call with the review team to discuss the MMI 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 May 30, 2014, a public notice was published in the *Sunnyvale Sun* announcing the commencement of the Five-Year Review process for the MMI Site, providing EPA's and the State's contact information, and inviting community participation. The press notice is available in Appendix B. No one contacted EPA as a result of this advertisement.

### 6.3. *Document Review*

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

#### ARARs Review

Section 121 (d)(2)(A) of CERCLA specifies that Superfund 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, RA, location, or other circumstance at a CERCLA site.

Chemical-specific ARARs identified in the selected remedy within the ROD for groundwater and considered for this FYR for continued groundwater treatment and monitoring are listed in Table 4. California primary drinking water standards are generally more stringent than federal standards. None of the ARAR changes occurred during the last five years.

**Table 4. Summary of Groundwater ARAR Changes**

Contaminants of Concern	1991 ROD ARARs (ug/L)			Current Regulations (ug/L)		ARARs Changed?
	Federal MCL	State MCL	Site Cleanup	Federal MCL	State MCL	
Chlorobenzene	100	30	30	100	30	No
1,2-Dichlorobenzene	600	N/A	60	600	600	State adopted federal MCL
1,1-Dichloroethane	N/A	5	5	N/A	5	No
1,1-Dichloroethene	7	6	6	7	6	No
cis-1,2- Dichloroethene	70	6	6	70	6	No
trans-1,2- Dichloroethene	100 <sup>1</sup>	10	10	100	10	No
Ethylbenzene	700	680	68	700	300	More restrictive
Freon 113	N/A	1,200	1,200	N/A	1,200	No
Tetrachloroethylene	5	5	5	5	5	No
Trichloroethylene	5	5	5	5	5	No
Vinyl Chloride	2	0.5	0.5	2	0.5	No
Xylene (total)	10,000	1,750	175	10,000	1,750	No
1,1,1-Trichloroethane	200 <sup>1</sup>	200 <sup>1</sup>	200	200	200	No

<sup>1</sup> This value was missing from Table 6 in ROD but was established at the time the ROD was issued.

ARARs identified in 1991 ROD that are no longer pertinent today now that the response action has transitioned from construction to long-term OM&M phase work, are not included in Table 5. There have been no revisions to laws and regulations that affect the protectiveness of the remedy in the last five years.

**Table 5. Applicable or Relevant and Appropriate Requirements Evaluation**

<b>Requirement</b>	<b>Citation</b>	<b>Document</b>	<b>Description</b>	<b>Effect on Protectiveness</b>	<b>Comments</b>
Federal Drinking Water Standards	Federal SDWA <sup>1</sup> Section 1412, 42 USC §300f-1 and 40 CFR Part 141.11-141.6 National Primary Drinking Water Regulations	1991 ROD	Standards have been adopted as enforceable standards for public drinking water systems.	There have been no changes to the federal MCLs since the last FYR. Protectiveness is not affected.	The appropriate remedial goal for each indicator chemical in groundwater is the MCLG (if not equal to zero), the federal MCL, or the State MCL, whichever is most stringent.
State Drinking Water Quality	SWRCB Resolution 68-16 Statement of Policy With Respect to Maintaining High Quality of Waters in California	1991 ROD	The policy requires maintenance of existing water quality.	Revisions do not affect protectiveness.	For Operable Unit 1 at the AMD-Arques and NSC sites, the affected aquifers have been classified as potential sources of drinking water (applies to Subunit 2 of OU1). Resolution 68-16 would require control of the plume to prevent further degradation of uncontaminated areas in the aquifer, and cleanup to drinking water standards before remediation could be considered complete.

Human Health Risk Assessment Review

Two Baseline Public Health Evaluations were conducted for Operable Unit 1. One of them addressed Subunits 1 and 3, and the other addressed Subunit 2 (April 1991). Both of these BPHEs have undergone EPA review and approval.

Risks were characterized in each of the Heath Evaluations for pathways involving soil, groundwater, and air. As described in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the EPA acceptable cancer risk range is  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$  for exposure to known or suspected carcinogens at concentration levels that represent an excess upper bound lifetime cancer risk to an individual. For noncarcinogenic effects, the Hazard Quotient (HQ) provides a useful reference point for gauging the

potential significance of multiple contaminant exposures within a single medium or across media. EPA considers an HQ of 1.0 or less to be acceptable.

A risk assessment was completed as part of the ROD. The risk assessment identified the exposure pathways at Subunit 2 as domestic use of groundwater including ingestion, inhalation, and dermal exposure. The ROD risk assessment identified the following contaminants of concern: vinyl chloride, 1,1-DCA, PCE, TCE, 1,1-DCE, 1,2-DCE, 1,1,1-TCA, Freon 113, 1,2-dichlorobenzene, xylenes, ethylbenzene, and chlorobenzene. The BPHE did not identify any current potential for completed exposure pathways in Subunit 2. For the hypothetical future exposure scenarios, it was assumed that the AMD facility would be developed for residential use and that the groundwater in the A and B aquifers would be used for domestic purposes. According to the BPHE, potential future exposure routes at the AMD facility may include ingestion of groundwater containing the chemicals of concern, inhalation of VOC vapors from groundwater during showering or other domestic uses, and inhalation of VOC vapors volatilizing from the groundwater. However, domestic use is a hypothetical case since shallow groundwater in the A and B aquifers is not currently used for water-supply purposes and local ordinances currently prohibit such practice.

The risk assessment was reviewed to identify any changes in exposure or toxicity that would impact protectiveness. The current groundwater extraction systems continue to demonstrate stable and adequate capture areas for containment of groundwater impacts at the MMI Site. Deed restrictions prohibit the use of the A- and B-aquifers as a source of drinking water until groundwater cleanup standards have been achieved and therefore, the groundwater exposure pathway is not complete.

**Table 6. Comparison of ROD cleanup levels to May 2013 EPA Regional Screening Levels**

Contaminant of Concern	ROD Cleanup Level (ug/L)	Tapwater multipathway Cancer RSL (ug/L)	Tapwater multipathway Non-cancer RSL (ug/L)	RSL < ROD Cleanup Level?
chlorobenzene	30		<b>7.2</b>	Yes
1,2-DCB	600	--	<b>280</b>	Yes
1,1-DCA	5	<b>2.4</b>	2900	Yes
1,1-DCE	6	--	260	No
Cis-1,2-DCE <sup>1</sup>	6	--	28	No
Trans-1,2-DCE	10	--	86	No
Ethylbenzene	68	<b>1.3</b>	700	Yes
FREON 113	1200	--	53000	No
TCE	5	<b>0.44</b>	<b>2.6</b>	Yes
PCE	5	9.7	35	No
1,1,1-TCA	200	--	7500	No
Xylenes	175-	--	190	No
Vinyl chloride	0.5	<b>0.015</b>	36	Yes

RSL values shown in bold type are lower than the ROD cleanup levels.

As shown in Table 6, the RSLs are below the ROD cleanup levels for five COCs: chlorobenzene, 1,2-DCB; 1,1-DCA; TCE, and vinyl chloride, indicating that the cleanup level may not be protective. EPA

uses an excess cancer risk range between  $10^{-4}$  and  $10^{-6}$  for assessing potential exposures. Three COCs (1,1-DCA, TCE, and vinyl chloride) have cancer RSLs below ROD cleanup levels; however, all three cleanup levels are within EPA's protective excess cancer risk range of  $10^{-4}$  to  $10^{-6}$ .

Three COCs (chlorobenzene, 1,2-DCB and TCE) have cleanup levels that are higher than the non-cancer RSL. Any concentration below the non-cancer RSL indicates that no adverse health effect from exposure is expected. Concentrations significantly above the non-cancer RSL may indicate an increased potential of non-cancer effects.

Toxicity values for TCE were most recently revised in EPA's Integrated Risk Information System (IRIS) in September 2011. EPA's 2011 Toxicological Review for TCE developed safe levels that include at least a 10-fold margin of safety for health effects other than cancer. The tapwater non-cancer screening level developed for TCE is 2.6 ug/L. EPA considers the TCE MCL of 5 ug/L protective for non-cancer effects.

### 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.

Currently, only Building 3 remains on the property. The previous Five Year Review made the determination that the vapor intrusion pathway at 1160 Kern (Building 3) needed additional assessment. This building primarily functions as a warehouse with a weekly employ of four or five employees who sort materials and otherwise operate the warehouse.

Beginning in 2011 workplans and associated reports were submitted by AMEC and Haley and Aldrich, on behalf of AMD, to the RWQCB for investigating vapor intrusion at Building 3. Preferential pathways were evaluated and indoor air sampling was conducted in August 2011, along with two outdoor samples. Samples were analyzed for VOCs associated with groundwater at the MMI Site. Some of the indoor air results exceeded the California regional screening level of  $2.1 \mu\text{g}/\text{m}^3$  for PCE in indoor air concentrations but the cumulative cancer risk was below  $1 \times 10^{-5}$ . Concentrations of total VOCs up to 43 parts per billion by volume were measured at the top of the floor drains in the warehouse women's restroom during the pre-investigation screening, and pathway samples collected from near the floor drain yielded TCE up to  $27 \mu\text{g}/\text{m}^3$ . Therefore, the warehouse women's restroom was determined to be a preferential pathway based on concentrations of PCE and TCE that were higher in that location than in other areas of the building, and the RWQCB requested that mitigation efforts occur there.

Inserts were installed in the drains of all four restrooms in the building to block potential vapor intrusion, and confirmation, ventilation-off sampling indicated that pathway sample concentrations had been lowered to  $7.6 \mu\text{g}/\text{m}^3$ , however a subsequent set of pathway samples collected in July 2012 showed an increase in TCE in the warehouse women's restroom to  $15 \mu\text{g}/\text{m}^3$  as well as elevated TCE in a pathway sample collected from another women's restroom (the restroom off the lobby) of  $4.2 \mu\text{g}/\text{m}^3$ .

The RWQCB requested that AMD undertake additional mitigation measures to further reduce TCE concentration in the affected restroom. The following measures were taken:

- seal all cracks, including in walls and corners of all restrooms;
- improve the functioning of the drain plugs and drains in all restrooms;
- eliminate the negative pressure in the restrooms by installing a vent in the ceiling and a slotted vent in the restroom doors (the vents were installed in October, 2013); and
- setting minimum outside air on the rooftop air intake vents.

Subsequent breathing zone indoor air sampling (ventilation-on) in the warehouse women's restroom in September 2013 yielded TCE concentrations women's restroom of  $5.2 \mu\text{g}/\text{m}^3$ , above the commercial, long-term RSL of  $3.0 \mu\text{g}/\text{m}^3$ .

EPA issued a letter to the RWCQB on Dec. 3, 2013 with supplemental vapor intrusion investigation guidelines and interim TCE short-term response action levels, which was subsequently conveyed to AMD by the RWQCB.

AMD then continued its investigation and mitigation work in Building 3. Retro-Coat™ Vapor Intrusion Coating System was applied to the floors in the restrooms to mitigate the migration of COCs from the sub-slab to indoor air in January 2014. The TrapGuard® drain inserts, which were installed in each of the drains in the warehouse and lobby restrooms in December 2011 were also replaced with rubber Dranjer™ D-R2 drain inserts. These inserts are designed to permit the unrestricted flow of water into floor drains while preventing gas from entering the building.

Subsequent breathing zone indoor air sampling (ventilation-on) in the warehouse women's restroom yielded TCE concentrations of  $3.5 \mu\text{g}/\text{m}^3$ , still above the commercial, long-term RSL of  $3.0 \mu\text{g}/\text{m}^3$  which corresponds to an excess cancer risk of  $10^{-6}$ . EPA's acceptable risk range for TCE under commercial/industrial scenarios is  $3 \mu\text{g}/\text{m}^3$  to  $8 \mu\text{g}/\text{m}^3$  (EPA's non-cancer risk screening level). All other sampled locations had concentrations below the RSLs. Currently, additional preferential pathway evaluations are underway with the aim of identifying additional mitigation measures to reduce even further the VI-related indoor air screening level exceedances measured.

#### Vapor Intrusion Due to the 2005 PCE Spill

Immediately next door to the 1165/1175 Arques (former Buildings 1 & 2) property is the KinderCare site, a childcare facility, located at 1155 East Arques Avenue. After the PCE spill in 2005, soil gas samples were collected at the KinderCare site. The soil gas sampling found that some COCs were present in soil gas above the RWQCB ESLs for shallow soil gas indicating the need for additional investigation.

Indoor and outdoor air sampling was subsequently conducted at the KinderCare site on October 23, 2005, December 17, 2005, and March 18, 2006, to evaluate whether contaminants detected in soil gas samples were present in the building. Freon 113 and PCE were detected in the indoor and outdoor air samples. The maximum PCE concentration in the indoor air was  $2.3 \mu\text{g}/\text{m}^3$ . The outdoor air samples collected at the same time showed ambient air concentrations of PCE that ranged from  $0.52 \mu\text{g}/\text{m}^3$  to  $1.3 \mu\text{g}/\text{m}^3$ . The PCE ESL for residential indoor air is  $0.41 \mu\text{g}/\text{m}^3$ . The concentrations of Freon 113 in indoor air samples were nearly the same as the concentrations detected in outdoor air samples and below the ESL for residential indoor air of  $146 \mu\text{g}/\text{m}^3$ .

Subsequently, the RWQCB approved the Indoor Air and Soil Gas Sampling Work Plan, which called for semiannual indoor air sampling at the KinderCare Site. An additional sampling round was conducted in December 2008. The indoor air, outdoor air, and soil gas results show PCE concentrations have declined significantly. All indoor air samples collected in December 2008 were below the ESLs, except one location that had a PCE concentration of 0.43 µg/L (ESL for PCE is 0.41 µg/l).

The “Report on Indoor Air and Soil Gas Sampling” found that subsequent indoor air samples collected on June 15, 2012, yielded no detections of the select VOCs and did not yield concentrations of chemicals at or above their respective residential-land-use ESLs. A No Further Action Plan was proposed and approved by RWQCB in June 2013. Based on the data collected to date, there is no current unacceptable vapor intrusion risk present to workers or children attending the KinderCare facility from the 2005 PCE spill.

### Ecological Review

An ecological risk assessment was not conducted at the time of the ROD. However, according to the ROD, the MMI Site did not constitute critical habitat for endangered species nor did it include or impact any wetlands. The ROD identified endangered species that use or are occasionally seen using the South San Francisco Bay. The conclusions in the ROD, indicating no ecological impacts or concerns related to the MMI Site, are still valid.

Currently, the MMI Site is flat, the southern portion of which is in the process of being redeveloped into a fitness center. The northern portion of the site contains a building that currently is used as a warehouse; the remainder of the lot is surrounded by asphalt parking and landscaped vegetation. Very little area is unpaved or contains exposed ground. Discharges to Calabasas Creek ended with the expiration of the NPDES permit. Wildlife usage would include those species typically found in an urban environment. It is believed that no exposure pathway exists for sensitive ecological receptors under current conditions. There have been no changes in usage of the area since the ROD or last FYR that would change the ecological assessment. In summary, the MMI Site is of low wildlife value, does not pose risks to ecological resources, and the remedy is protective of the environmental constituents present.

## **6.4. Data Review**

### Soil

#### *Historic Contamination*

Soil cleanup standards related to historic contamination at the Site were achieved by 1996 and soil monitoring ceased with RWQCB approval in 1997.

Redevelopment of the MMI property and demolition of Buildings 1 and 2 by TWC in 2006 and 2007 allowed access to and removal of approximately 160 cubic yards of soils contaminated with VOCs and SVOCs that remained from the previous soil cleanup (didn't extract soil under the building). In 2006, in connection with the termination of its lease on Building 3, AMD discovered two areas where PCE was detected at concentrations above RWQCB environmental screening levels (ESLs) and was identified for soil removal. Excavation, confirmation sampling, and backfilling of these areas was completed in

November 2006. Approximately 90 and 13 cubic yards of soil from areas at Buildings 1 and 2, respectively, were removed and disposed at Waste Management's Kettleman City facility in Kettleman City, California after the buildings were demolished.

### *2005 PCE Spill*

Soil samples collected at the MMI Site in September 2008 confirmed that PCE-affected soils had been successfully remediated to concentrations well below the corresponding ESL, which was the RWQCB-approved soil RAO. Therefore, no further action regarding PCE-affected soils at the MMI Site was required.

### Groundwater

#### *Historic Contamination (past MMI Operations)*

The historic contamination plume in OU-1 is a commingled plume of contamination from the NSC Site to the south (up-gradient) and contamination from the MMI Site. The MMI Site, or Subunit 2 of OU1, is monitored on an annual basis by TI for the NSC Site, in conjunction with monitoring related to Subunit 1 (the NSC Site) and Subunit 3 (the commingled plume to the north, or down-gradient, of both sites). Figure 3 shows the location of the monitoring wells within Subunit 2 wherein groundwater levels and/or water quality is monitored. A listing of wells with water quality information is shown in Table 7. The A, B1, or B2 designations in the well name identify the corresponding aquifer zone monitored.

Of the COCs for which data is available and cleanup standards were established, TCE, chlorobenzene, and total VOCs have shown exceedances in the monitored wells since 2009. TCE has exceeded the 5 µg/L cleanup standard in paired wells MM07A and ME07B1 (completed in the A and B1 aquifer zones, respectively) by one to two orders of magnitude through 2012. Chlorobenzene has exceeded the cleanup standard (30 µg/L) in well MM07A by one to two orders of magnitude through 2012 but has consistently been below detection limits in well ME07B1.

For the paired wells ME43A and ME19B2 (A and B2 aquifer zones, respectively), TCE concentrations have fallen below the cleanup standard in the A aquifer since 2010 but have remained one to two orders of magnitude above it in the B aquifer. Chlorobenzene concentrations in wells ME43A and MW18AR (both in the A aquifer) have decreased to below the cleanup standard since 2010 and have consistently remained below detection limits in well ME19B2.

The soil and groundwater remediation programs had been effective and no substantial sources for past MMI indicator compounds appear to be significantly affecting groundwater quality. MMI related chemicals are below or close to cleanup goals in groundwater beneath the MMI Site. This is evident by the low to non-detectable concentrations of PCE, 1,1-DCA, 1,2-DCB, and chlorobenzene in MMI Site monitoring wells. Where detected, concentrations have generally declined or remained stable over the review period, and are generally near or below the cleanup goals.

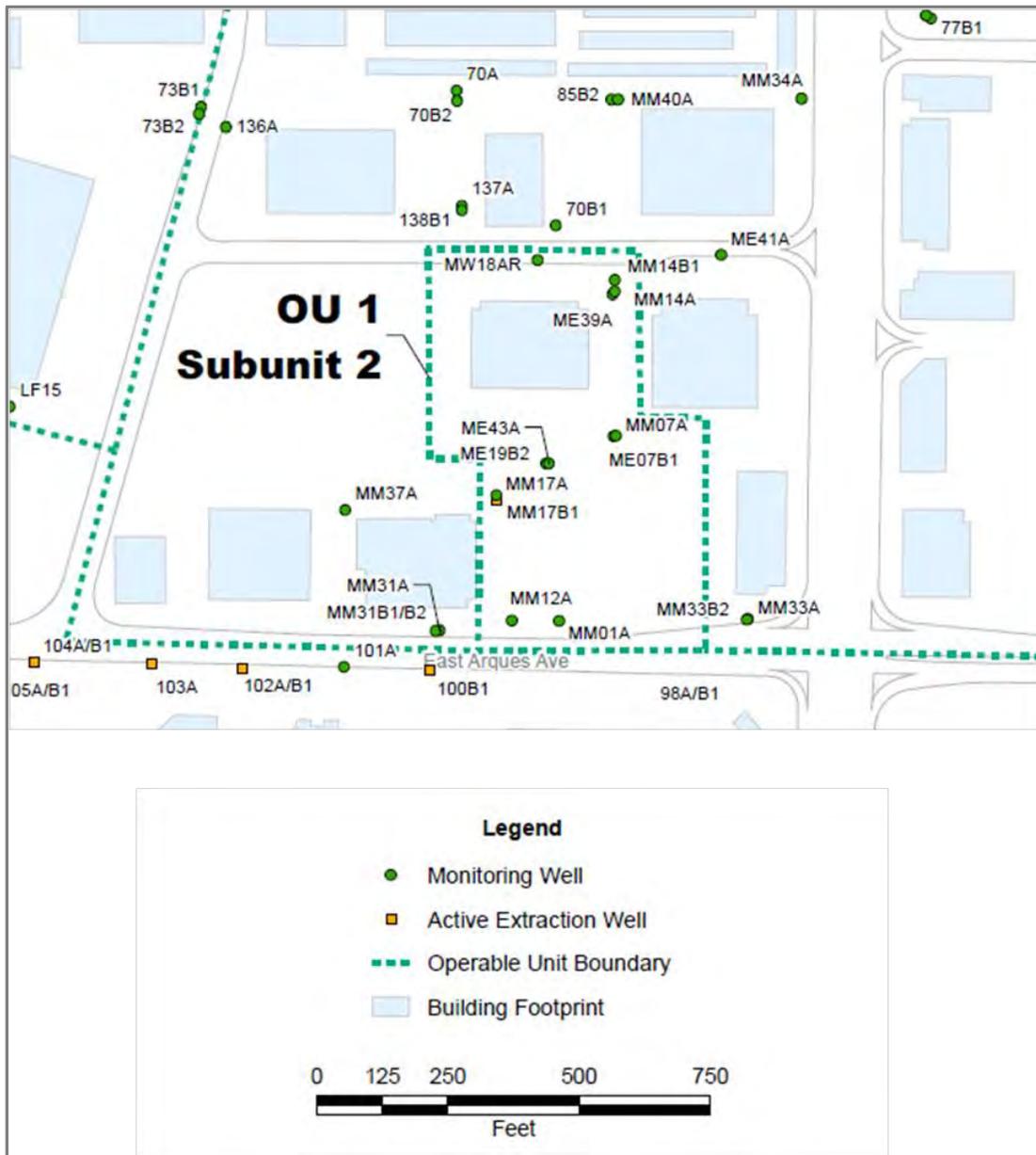


Figure 3. Location of OU-1 plume monitoring wells in Subunit 2.

**Table 7. Sampling results for OU-1 Subunit 2 Monitoring Wells**

Well ID	Sample Date	Trichloroethene µg/L	cis-1,2- Dichloroethene µg/L	1,1- Dichloroethene µg/L	1,1,1- Trichloroethane µg/L	Freon 113 µg/L	1,1- Dichloroethane µg/L	1,2- Dichlorobenzene µg/L	1,4- Dichlorobenzene µg/L	Chlorobenzene µg/L	Chloroform µg/L	Tetrachloroethene µg/L	trans-1,2- Dichloroethene µg/L	Vinyl Chloride µg/L	TOTAL VOCs µg/L
ME07B1	10/9/2008	50	16	< 0.5	< 0.5	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 1	< 0.5	< 0.5	< 0.5	
ME07B1	10/16/2009	38	15	< 0.5	< 0.5	< 2.0	< 0.5	< 0.5	< 0.5	< 0.5	< 1.0	< 0.5	< 0.5	< 0.5	
ME07B1	10/14/2010	45	15	< 0.5	< 0.5	< 2.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	
ME07B1	10/12/2011	40	15	< 0.50	< 0.50	0.7	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	55.7
ME07B1	10/11/2012	36	14	< 0.5	< 0.5	< 5.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	
ME19B2	10/10/2007	24	5.6	< 0.5	< 0.5	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 1	< 0.5	< 0.5	< 0.5	
ME19B2	10/8/2008	18	5	< 0.5	< 0.5	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 1	< 0.5	< 0.5	< 0.5	
ME19B2	10/8/2009*	5.7	2	< 0.5	< 0.5	< 2.0	< 0.5	< 0.5	< 0.5	< 0.5	< 1.0	< 0.5	< 0.5	< 0.5	
ME19B2	10/13/2010	4.5	2.4	< 0.5	< 0.5	< 2.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	
ME19B2	10/11/2011	2.4	0.92	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50		< 0.50	3.3
ME19B2	10/9/2012	1.9	0.9	< 0.5	< 0.5	< 5.0	< 0.5	0.6	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	
ME43A	10/10/2007	60	150	< 1	< 1	< 4	< 1	16	< 1	8.9	< 2	16	2.4	6.3	
ME43A	10/8/2008	36	91	< 0.5	< 0.5	< 2	< 0.5	5.2	< 0.5	3.3	< 1	8.6	1.6	3.2	
ME43A	10/16/2009	83	140	0.9	< 0.5	< 2.0	< 0.5	11	< 0.5	8.6	< 1.0	19	3	4.5	
ME43A	10/13/2010	44	160	< 1.0	< 1.0	< 4.0	< 1.0	7.8	< 1.0	4.8	< 1.0	8.7	4.6	2	
ME43A	10/11/2011	50	140	0.59	< 0.50	< 0.50	< 0.50	6.9	< 0.50	3.4	< 0.50	10	2.7	1.9	215.5
ME43A	10/9/2012	38	97	< 1.0	< 1.0	< 10	< 1.0	6.4	< 1.0	2.5	< 1.0	8.1	1.9	< 1.0	
MM07A	10/11/2007	91	470	< 3.6	< 3.6	< 14	13	< 3.6 UJ	< 3.6 UJ	65	< 7.1	9.2	4.1	11	
MM07A	10/7/2008	69	310	< 2	< 2	< 8	5.7	< 2	< 2	71	< 4	10 J+	2.6	5.4	
MM07A	10/14/2009	81	390	3.5	< 2.5	< 10	5.5	< 2.5	< 2.5	93	< 5.0	12	3.9	6	
MM07A	10/12/2010	52	280	< 2.5	< 2.5	< 10	3.7	< 2.5	< 2.5	72	< 2.5	9	4	6.5	
MM07A	10/11/2011	59	340	2	< 1.5	< 1.5	4.1	< 1.5	< 1.5	82	< 1.5	7.9	3	7.2	505.2
MM07A	10/11/2012	72	410	< 2.5	< 2.5	< 25	4.1	< 2.5	< 2.5	98	< 2.5	9.9	3.9	8	
MM14B1	10/11/2007	13	40	< 0.5	< 0.5	2.2	< 0.5	< 0.5	< 0.5	< 0.5	< 1	< 0.5	< 0.5	< 0.5	
MM14B1	10/8/2008	11	28	< 0.5	< 0.5	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 1	< 0.5	< 0.5	< 0.5	
MM14B1	10/14/2009	5.1	11	< 0.5	< 0.5	< 2.0	< 0.5	< 0.5	< 0.5	< 0.5	< 1.0	< 0.5	< 0.5	< 0.5	
MM14B1	10/12/2010	4.8	7.9	< 0.5	< 0.5	< 2.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	
MM14B1	10/11/2011	2.8	4.7	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	7.5
MM14B1	10/9/2012	2.3	2.7	< 0.5	< 0.5	< 5.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	
MW18AR	10/11/2007	200	130	< 2	< 2	< 8	3.7	36	< 2	46	< 4	21	4.6	< 2	
MW18AR	10/8/2008	230	110	< 2	< 2	< 8	3.4	34	< 2	34	< 4	28	3.5	< 2	
MW18AR	10/16/2009	190	120	< 1.3	< 1.3	< 5.0	3.9	28	1.5	28	< 2.5	22	3.2	< 1.3	
MW18AR	10/12/2010	160	98	< 1.3	< 1.3	< 5.0	3.4	22	< 1.3	24	< 1.3	19	2.6	< 1.3	
MW18AR	10/11/2011	150	99	< 0.50	< 0.50	0.83	2.7	22	1.1	23	< 0.50	18	7.8	< 0.50	324.4
MW18AR	10/9/2012	130	85	< 1.3	< 1.3	< 13	2.7	20	< 1.3	18	< 1.3	16	2.9	< 1.3	
*Reported as 2008 in 2009 report															

### *2005 PCE Spill*

Figure 4 shows the trends in concentrations of PCE and TCE in groundwater through 2014 related to the remediation of the 2005 PCE spill. These plots indicate that the RWQCB's cleanup standard of an average PCE concentration of 50 µg/L and a maximum concentration of 100 µg/L in wells EX-1, EX-2, EX-4, EX-5, EX-6, and MM17A has been achieved. The results of confirmatory sampling undertaken in August 2012 were consistent with this conclusion, and showed that only wells EX-2 (1.9 µg/L) and MM17A (66 µg/L) yielded detectable PCE concentrations. The average PCE concentration in the wells was 12 µg/L and the maximum PCE concentration measured was 66 µg/L in well MM17A.

During another confirmatory sampling event in February 2013, the PCE concentration was 2.1 µg/L in well EX-2 which had decreased significantly from 66 µg/L in August 2012. The average PCE concentration in these five wells was 3.9 µg/L during the groundwater monitoring event.

The highest concentration of PCE detected in groundwater samples collected during the 2013 sampling event was 34 g/L in the A-Zone well MM17A. As previously stated, this well has historically been shown to be impacted by PCE from 2005 PCE spill. Generally, the concentrations of PCE in other A Zone monitoring wells are near or below the cleanup goal of 5 µg/L. PCE was not detected in the most recent groundwater samples from B-Zone monitoring wells.

The maximum concentration of TCE and cis-1,2-DCE (constituents indicative of the regional plume) detected in samples collected during the 2013 monitoring event were 220 and 370 g/L from wells MM37A and MM07A, respectively. Well MM37A is an off-site well located on the adjacent property at 1155 East Arques Avenue, and well MM07A is located on the eastern edge of the MMI Site near the property boundary of 1160 Kern and 1165/1175 E. Arques. In general, concentrations of TCE and cis-1,2-DCE detected in MMI Site monitoring wells are comparable to concentrations in wells located south (upgradient) of the MMI Site (e.g., wells 98A/B1, 100B1, and 101A).

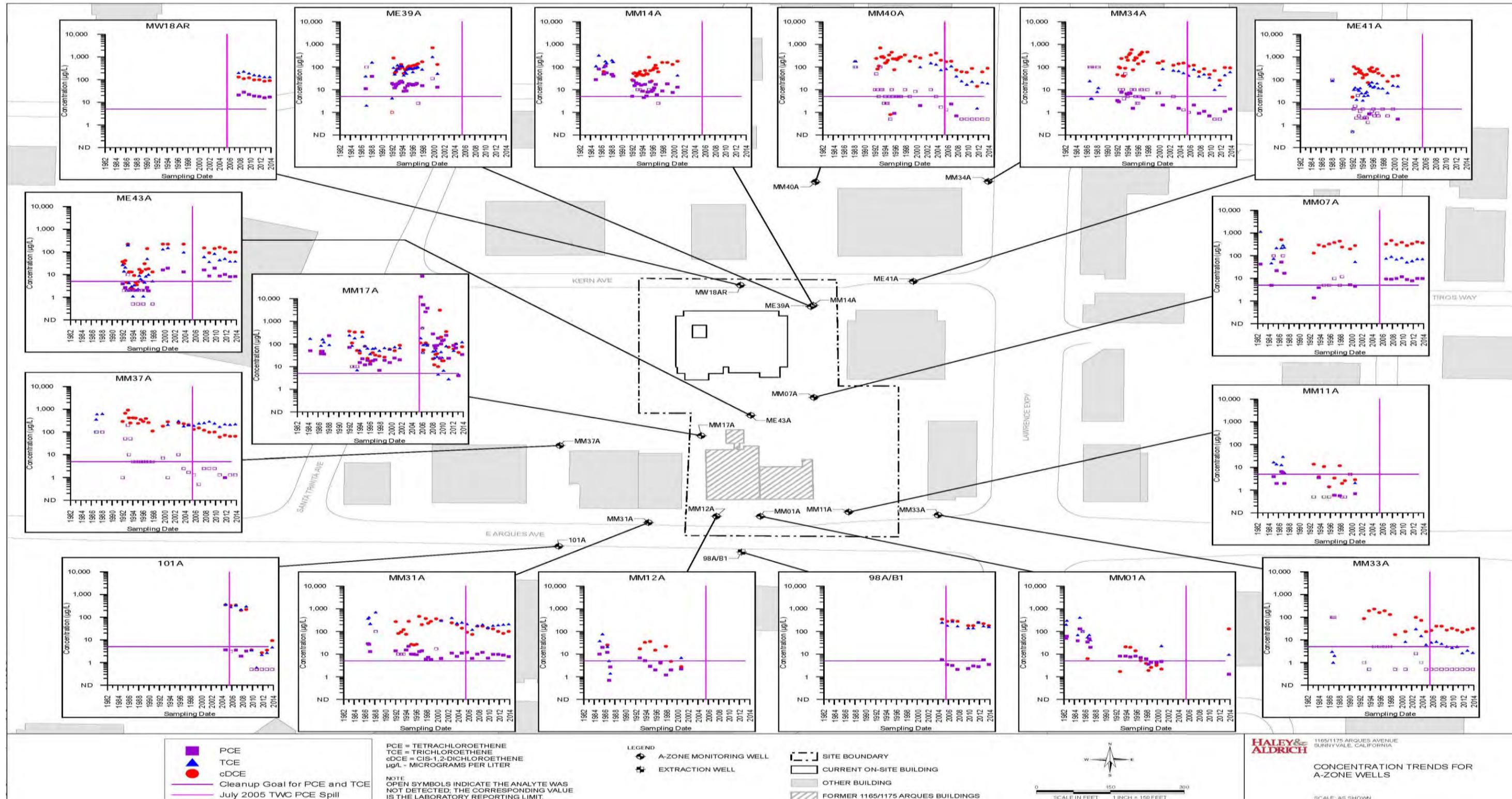


Figure 4. Dissolved PCE and TCE Concentration Trends in 2005 PCE Spill Monitoring Wells

**Table 8. Summary of Analytical Results for Shallow (A-Zone) Groundwater Samples at 1160 Kern Ave (Building 3)**

Well ID	Screen Interval (feet bgs)	Sampling Date	PCE	TCE	cDCE	tDCE	VC	1,1-DCE	1,1-DCA	1,2-DCB	1,1,1-TCA	Freon 113
98A/B1	11.5 - 26.5	10/12/2011	<b>2.82</b>	<b>250</b>	<b>250</b>	<b>1.9</b>	<b>4.4</b>	<b>3.7</b>	<b>7.2</b>	<b>1.0</b>	<b>9.6</b>	<b>25</b>
		10/9/2012	<b>5.6</b>	<b>170</b>	<b>220</b>	<b>2.6</b>	<1.33	<b>2.6</b>	<b>9.2</b>	<1.3	<b>6.4</b>	<b>22</b>
		10/16/2013	<b>3.5</b>	<b>160</b>	<b>180</b>	<b>1.9</b>	<1.3	<b>2.8</b>	<b>7.9</b>	<1.3	<b>6.8</b>	<b>24</b>
101A	23.5 -28.5	10/12/2011	<0.5	<b>2.2</b>	<b>2.7</b>	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		10/9/2012	<0.5	<b>2.7</b>	<b>3.5</b>	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0
		10/16/2013	<0.5	<b>4.7</b>	<b>9.3</b>	<0.5	<0.5	<0.5	<b>1.2</b>	<0.5	<0.5	<2.0
ME43A	9.5 - 26.5	10/11/2011	<b>10</b>	<b>50</b>	<b>140</b>	<b>2.7</b>	<b>1.9</b>	<b>0.59</b>	<0.5	<b>6.9</b>	<0.5	<0.5
		10/9/2012	<b>8.1</b>	<b>38</b>	<b>97</b>	<b>1.9</b>	<1.0	<1.0	<1.0	<b>6.4</b>	<1.0	<10
		10/15/2013	<b>8.3</b>	<b>38</b>	<b>98</b>	<b>1.9</b>	<b>0.8</b>	<0.5	<0.5	<b>6.5</b>	<0.5	<2.0
MM01A	11.5 - 31.5	10/15/2013	<b>1.3</b>	<b>9.5</b>	<b>130</b>	<b>2.3</b>	<1.0	<1.0	<b>2.6</b>	<1.0	<1.0	<4.0
MM07A	10 - 27	10/11/2011	<b>7.9</b>	<b>59</b>	<b>340</b>	<b>3</b>	<b>7.2</b>	<b>2.0</b>	<b>4.1</b>	<1.5	<1.5	<1.5
		10/11/2012	<b>9.9</b>	<b>72</b>	<b>410</b>	<b>3.9</b>	<b>8.0</b>	<2.5	<b>4.1</b>	<2.5	<2.5	<25
		10/16/2013	<b>9.9</b>	<b>71</b>	<b>370</b>	<b>3.8</b>	<b>8.2</b>	<2.5	<b>4.0</b>	<2.5	<2.5	<10
MM17A	8.5 - 18.5	3/15/2011	<b>23</b>	<b>2.8</b>	<b>72</b>	<b>0.68</b>	<b>2.3</b>	<0.5	<0.5	<0.5	<0.5	NA
		8/15/2012	<b>66</b>	<b>100</b>	<b>100</b>	<b>2.2</b>	<b>13</b>	<b>0.9</b>	<b>2.3</b>	<b>1.0</b>	<0.5	NA
		2/12/2013	<b>4.0</b>	<b>4.4</b>	<b>42</b>	<b>0.56</b>	<b>8.3</b>	<0.5	<0.5	<0.5	<0.5	NA
		10/17/2013	<b>34</b>	<b>120</b>	<b>75</b>	<b>1.8</b>	<b>2.2</b>	<1.0	<b>2.5</b>	<b>1.8</b>	<1.0	<4.0
MM31A	7 - 17	10/12/2011	<b>9.7</b>	<b>190</b>	<b>100</b>	<b>1.5</b>	<b>1.4</b>	<b>1.5</b>	<b>2.8</b>	<b>3.8</b>	<b>1.1</b>	<b>3.7</b>
		10/9/2012	<b>14</b>	<b>220</b>	<b>86</b>	<b>2.8</b>	<0.5	<b>1.8</b>	<b>2.8</b>	<b>4.7</b>	<b>1.2</b>	<17
		10/17/2013	<b>7.7</b>	<b>210</b>	<b>100</b>	<b>2.0</b>	<1.7	<1.7	<b>2.7</b>	<b>3.1</b>	<1.7	<6.7
MM33A	6.5 - 26.5	10/11/2011	<0.5	<b>2.6</b>	<b>22</b>	<b>1.2</b>	<b>1.4</b>	<0.5	<b>0.73</b>	<0.5	<0.5	<b>2.3</b>
		10/9/2012	<0.5	<b>3.4</b>	<b>28</b>	<0.5	<b>1.3</b>	<0.5	<b>0.7</b>	<0.5	<0.5	<b>5.1</b>
		10/17/2013	<0.5	<b>2.7</b>	<b>32</b>	<0.5	<b>1.4</b>	<0.5	<b>0.8</b>	<0.5	<0.5	<b>3.5</b>
MM34A	7 - 27	10/11/2011	<0.5	<b>16</b>	<b>26</b>	<0.5	<b>0.7</b>	<0.5	<b>0.9</b>	<0.5	<0.5	<0.5
		10/10/2012	<b>1.1</b>	<b>44</b>	<b>95</b>	<b>1.6</b>	<b>2.0</b>	<1.0	<b>3.5</b>	<1.0	<1.0	<10
		10/15/2013	<b>1.4</b>	<b>60</b>	<b>92</b>	<b>1.7</b>	<b>2.3</b>	<b>1.0</b>	<b>4</b>	<0.5	<0.5	<2.0
MM37A	14 - 34	10/11/2011	<b>1.0</b>	<b>220</b>	<b>72</b>	<b>1.6</b>	<0.5	<b>1.2</b>	<b>3.9</b>	<0.5	<b>1.1</b>	<b>2.8</b>
		10/9/2012	<1.3	<b>210</b>	<b>65</b>	<b>2.7</b>	<1.3	<1.3	<b>3.9</b>	<1.3	<1.3	<13
		10/17/2013	<1.3	<b>220</b>	<b>65</b>	<b>2.3</b>	<1.3	<1.3	<b>2.9</b>	<1.3	<1.3	<5.0
MM40A	7.5 - 22.5	10/11/2011	<0.5	<b>1.5</b>	<b>14</b>	<0.5	<b>2.4</b>	<b>1.1</b>	<b>0.51</b>	<0.5	<0.5	<0.5
		10/9/2012	<0.5	<b>21</b>	<b>61</b>	<b>0.9</b>	<b>6.7</b>	<b>6.3</b>	<b>2.6</b>	<0.5	<0.5	<b>6.2</b>
		10/15/2013	<0.5	<b>19</b>	<b>89</b>	<b>1.2</b>	<b>2.5</b>	<b>8.6</b>	<b>2</b>	<0.5	<0.5	<b>4.7</b>

Well ID	Screen Interval (feet bgs)	Sampling Date	PCE	TCE	cDCE	tDCE	VC	1,1-DCE	1,1-DCA	1,2-DCB	1,1,1-TCA	Freon 113
MW18AR	14.2 - 19.0	10/11/2011	<b>19</b>	<b>150</b>	<b>99</b>	<b>7.8</b>	<0.5	<0.5	<b>2.7</b>	<b>22</b>	<0.5	<b>0.83</b>
		10/9/2012	<b>16</b>	<b>130</b>	<b>85</b>	<b>2.9</b>	<1.3	<1.3	<b>2.7</b>	<b>20</b>	<1.3	<13
		10/16/2013	<b>17</b>	<b>130</b>	<b>90</b>	<b>2.3</b>	<1.0	<1.0	<b>2</b>	<b>17</b>	<1.0	<4.0
<b>Maximum Detected Concentration</b>			<b>66</b>	<b>250</b>	<b>410</b>	<b>7.8</b>	<b>13</b>	<b>8.6</b>	<b>9.2</b>	<b>22</b>	<b>9.6</b>	<b>25</b>
<b>RWQCB Commercial ESL <sup>5</sup></b>			<b>640</b>	<b>1,300</b>	<b>26,000</b>	<b>120,000</b>	<b>18</b>	<b>130,000</b>	<b>NA</b>	<b>1,600</b>	<b>NA</b>	<b>NA</b>
<b>U.S. EPA VISL <sup>6</sup></b>			<b>65</b>	<b>7.4</b>	<b>NA</b>	<b>1,600</b>	<b>2.5</b>	<b>820</b>	<b>33</b>	<b>11,000</b>	<b>31,000</b>	<b>6,100</b>

**Notes**

1. Groundwater samples were collected by Field Solutions, Inc., of San Jose, California, and analyzed by Curtis & Tompkins, Ltd., of Berkeley, California, for the USEPA Method 8010 list
2. Results in **bold** indicate the constituent was detected in the sample above the laboratory reporting limit.
3. "<" indicates constituent not detected above the laboratory reporting limit shown.
4. NA = not available
6. Groundwater Vapor Intrusion Screening Levels (VISLs) for commercial scenario

## Soil Gas/Indoor Air

Indoor air and soil gas sampling have been performed in and around the MMI Site at the request of RWQCB and EPA to assess air quality impacts related to the regional VOC plume (referred to as historic contamination in this report) and the 2005 PCE spill.

### *1165 East Arques Avenue, former Building 1 and 2*

Soil gas investigations were conducted in January 2013 in connection with the planned construction on-site of a fitness club (former locations of Buildings 1 and 2). During this investigation, soil gas samples were collected at 12 sampling locations at approximate depths of 5 and 8 feet (ft.) below ground surface (bgs). TCE and PCE were detected in all 24 samples collected. TCE concentrations ranged between 29 and 4,500 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) and PCE concentrations ranged between 160 and 4,900  $\mu\text{g}/\text{m}^3$ . The RWQCB ESLs for commercial land uses for TCE and PCE are 3,000 and 2,100  $\mu\text{g}/\text{m}^3$ , respectively. The area is zoned for industrial and other uses, and the fitness club is designed to include an area for hourly child care.

### *1155 East Arques Avenue (KinderCare)*

The two most recent indoor air sampling events at this building were performed in June 2012. On June 16, 2012, indoor air samples were collected with the heating, ventilation, and air conditioning (HVAC) system off to represent a hypothetical worst case scenario for vapor intrusion. On June 23, 2012, indoor air samples were collected with the HVAC system under normal operating conditions to be consistent with historical sampling efforts.

The indoor air samples collected within the building at the 1155 property did not yield concentrations of PCE, TCE, cis-1,2-DCE, 1,1,1-TCA, or vinyl chloride at or above their respective residential land use ESLs. These results are consistent with those obtained during the previous five years and indicate that there is no currently unacceptable risk present to workers or children attending the daycare posed by indoor air quality within the building.

### *1160 Kern Avenue (Building 3)*

Indoor air investigations were undertaken in August 2011 in response to the recommendations and follow-up actions outlined by RWQCB and EPA in their third Five-Year Review of the MMI Site. Results from the most recent indoor air sampling at Building 3 found that the warehouse women's bathroom had concentrations slightly above the screening levels in the breathing zone, and that pathway samples from the lobby women's bathroom are elevated. Continued monitoring and investigation is underway and will enhance an understanding of the pathway for vapors to enter the building. Table 3 indicates sample types (i.e., ambient, preferential pathway, or breathing zone), locations, and results. Sample localities are shown on Figure 5.

**Table 9. Historical Analytical Results for Indoor Air Samples at 1160 Kern Avenue (Building 3)**

Results reported in micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ )

Sample ID	Sample Type	Location	Date Collected	Chloro-benzene	1,2-DCB	1,1-DCA	cis-1,2-DCE	trans-1,2-DCE	1,1-DCE	PCE	1,1,1-TCA	TCE	Freon 113	Vinyl Chloride
<b>August 2011</b>														
AMB-1	Ambient <sup>1</sup>	Parking lot	8/21/2011	<0.092 <sup>2</sup>	<0.30	<0.020	<0.055	<0.055	<0.040	<0.14	<0.11	<0.027	<b>0.79<sup>3</sup></b>	<0.013
AMB-2	Ambient	Roof	8/21/2011	<0.092	<0.30	<0.020	<0.055	<0.055	<0.040	<0.14	<0.11	<b>0.053</b>	<b>0.74</b>	<0.013
IA-1	Breathing Zone <sup>4</sup>	Warehouse/storage	8/21/2011	<0.092	<0.30	<0.020	<0.055	<0.055	<0.040	<b>1.6</b>	<0.11	<b>1.2</b>	<b>0.75</b>	<0.013
IA-10	Blind Field Duplicate <sup>5</sup>		8/21/2011	<0.092	<0.30	<0.020	<0.056	<0.056	<0.040	<b>1.4</b>	<0.11	<b>1.2</b>	<b>0.66</b>	<0.013
IA-2	Preferential Pathway <sup>6</sup>	Womens restroom in warehouse	8/21/2011	<0.092	<0.30	<b>0.021</b>	<b>0.25</b>	<0.055	<0.040	<b>14<sup>7</sup></b>	<b>0.16</b>	<b>27</b>	<b>1.4</b>	<b>0.017</b>
IA-3	Breathing Zone	Conference room	8/21/2011	<0.092	<0.30	<0.020	<0.055	<0.055	<0.040	<b>2.1</b>	<0.11	<b>1.6</b>	<b>0.83</b>	<0.013
IA-4	Breathing Zone	Lobby	8/21/2011	<0.092	<0.30	<0.020	<0.055	<0.055	<0.040	<b>1.0</b>	<0.11	<b>0.84</b>	<b>0.71</b>	<0.013
IA-5	Breathing Zone	Volunteer room	8/21/2011	<0.092	<0.30	<0.020	<0.055	<0.055	<0.040	<b>2.4</b>	<0.11	<b>1.8</b>	<b>0.88</b>	<0.013
IA-6	Breathing Zone	Warehouse/storage	8/21/2011	<0.092	<0.30	<0.020	<0.056	<0.056	<0.040	<b>3.0</b>	<0.11	<b>1.7</b>	<b>0.62</b>	<0.013
<b>December 2011</b>														
AMB-3	Ambient	Parking lot	12/22/2011	<0.092	<0.30	<0.020	<0.055	<0.055	<0.040	<0.14	<0.11	<b>0.040</b>	<b>0.70 J<sup>8</sup></b>	<0.013
IA-2R	Preferential Pathway (and Blind Field Duplicates)	Womens restroom in warehouse	12/22/2011	<0.092	<0.30	<0.020	<0.055	<0.055	<0.040	<b>3.7</b>	<0.11	<b>6.9</b>	<b>1.1 J</b>	<0.013
IA-20R	Preferential Pathway		12/22/2011	<0.092	<0.30	<0.020	<0.055	<0.055	<0.040	<b>4.2</b>	<0.11	<b>7.6</b>	<b>1.5 J</b>	<0.013
IA-7	Preferential Pathway	Mens restroom in warehouse	12/22/2011	<0.092	<0.30	<0.020	<0.056	<0.056	<0.040	<b>1.2</b>	<0.11	<b>1.3</b>	<b>0.74 J</b>	<0.013
IA-8	Preferential Pathway	Mens restroom off lobby	12/22/2011	<0.092	<0.30	<0.020	<0.056	<0.056	<0.040	<b>1.4</b>	<0.11	<b>1.4</b>	<b>0.76 J</b>	<0.013
IA-9	Preferential Pathway	Womens restroom off lobby	12/22/2011	<b>1.0</b>	<b>0.81</b>	<0.020	<0.055	<0.055	<0.040	<b>1.5</b>	<0.11	<b>2.0</b>	<b>0.79 J</b>	<0.013
<b>July 2012</b>														
AMB-4	Ambient	Parking lot	7/8/2012	<0.092	<0.30	<0.020	<0.056	<0.056	<0.040	<b>0.52 J</b>	<0.11	<0.027	<b>0.70</b>	<0.013
IA-2B <sup>9</sup>	Preferential Pathway (and Blind Field Duplicates)	Womens restroom in warehouse	7/8/2012	<0.092	<0.30	<0.020	<0.056	<0.056	<0.040	<b>6.0 J</b>	<b>0.14</b>	<b>14</b>	<b>0.88</b>	<0.013
IA-20B	Preferential Pathway		7/8/2012	<0.092	<0.30	<0.020	<0.056	<0.056	<0.040	<b>7.8 J</b>	<b>0.15</b>	<b>15</b>	<b>1.0</b>	<0.013
IA-7B	Preferential Pathway	Mens restroom in warehouse	7/8/2012	<0.092	<0.30	<0.020	<0.056	<0.056	<0.040	<b>2.5 J</b>	<b>0.11</b>	<b>2.2</b>	<b>0.75</b>	<0.013
IA-8B	Preferential Pathway	Mens restroom off lobby	7/8/2012	<0.092	<0.30	<0.020	<0.056	<0.056	<0.040	<b>2.7 J</b>	<0.11	<b>2.1</b>	<b>0.74</b>	<0.013
IA-9B	Preferential Pathway	Womens restroom off lobby	7/8/2012	<0.092	<0.30	<0.020	<b>0.15</b>	<0.055	<0.040	<b>3.2 J</b>	<0.11	<b>4.2</b>	<b>0.74</b>	<0.013
<b>September 2013</b>														
AMBIENT-09272013	Ambient	Roof	9/27/2013	<4.5	<5.8	<3.9	<3.8	<3.8	<3.8	<6.6	<5.3	<1.0	<7.4	<0.50
IA-2	Breathing Zone	Womens restroom in warehouse	9/27/2013	<4.9	<6.5	<4.4	<4.3	<4.3	<4.3	<7.3	<5.9	<b>5.2</b>	<8.2	<0.55
IA-5	Breathing Zone	Volunteer room	9/27/2013	<4.7	<6.2	<4.2	<4.1	<4.1	<4.1	<7.0	<5.6	<1.1	<7.9	<0.53
IA-6	Breathing Zone	Warehouse/storage	9/27/2013	<4.3	<5.6	<3.8	<3.7	<3.7	<3.7	<6.3	<5.1	<1.0	<7.1	<0.48
IA-9	Breathing Zone	Womens restroom off lobby	9/27/2013	<7.8	<10	<6.8	<6.7	<6.7	<6.7	<11	<9.2	<1.8	<13	<0.86
IA-9B			9/27/2013	<7.8	<10	<6.9	<6.7	<6.7	<6.7	<12	<9.3	<1.8	<13	<0.87
<b>February 2014</b>														
AMBIENT-02102014	Ambient	Parking lot	2/10/2014	<b>0.042 J</b>	<b>0.074 J</b>	<0.081	<0.079	<0.079	<0.079	<0.14	<b>0.063 J</b>	<b>0.081 J</b>	<b>0.96</b>	<0.051
IA-2	Breathing Zone	Womens restroom in warehouse	2/10/2014	<b>0.040 J</b>	<0.30	<0.081	<0.079	<0.079	<0.079	<b>1.8</b>	<b>0.12</b>	<b>3.5</b>	<b>0.78</b>	<0.051
IA-02B			2/10/2014	<b>0.033 J</b>	<0.30	<0.081	<0.079	<0.079	<0.079	<b>1.7</b>	<b>0.13</b>	<b>3.3</b>	<b>0.78</b>	<0.051
IA-5	Breathing Zone	Volunteer room	2/10/2014	<b>0.038 J</b>	<0.30	<0.081	<0.079	<0.079	<0.079	<b>0.92</b>	<b>0.063 J</b>	<b>0.97</b>	<b>0.62</b>	<0.051
IA-6	Breathing Zone	Warehouse/storage	2/10/2014	<b>0.034 J</b>	<0.30	<0.081	<0.079	<0.079	<0.079	<b>0.98</b>	<b>0.068 J</b>	<b>0.98</b>	<b>0.62</b>	<0.051
IA-7	Breathing Zone	Mens restroom in warehouse	2/10/2014	<b>0.030 J</b>	<0.30	<0.081	<0.079	<0.079	<0.079	<b>0.72</b>	<b>0.085 J</b>	<b>0.91</b>	<b>0.50</b>	<0.051
<b>U.S. EPA Region 9 Regional Screening Level (RSL) for Industrial Air</b>				<b>220</b>	<b>880</b>	<b>7.7</b>	<b>31<sup>10</sup></b>	<b>260</b>	<b>310<sup>10</sup></b>	<b>2.08<sup>10</sup></b>	<b>4,400<sup>10</sup></b>	<b>3.0<sup>11</sup></b>	<b>130,000</b>	<b>0.16<sup>10</sup></b>

**Notes**

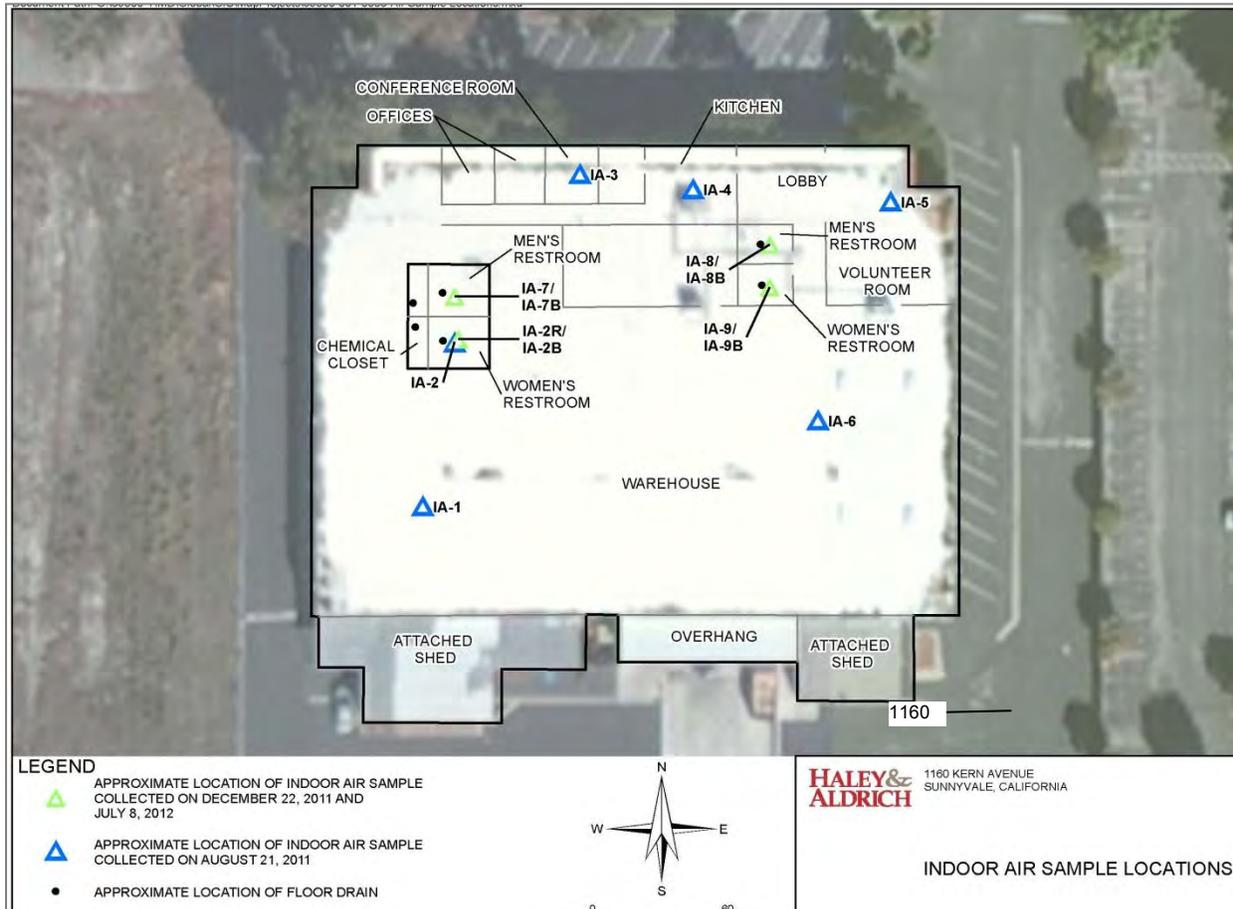
- Ambient samples were collected outdoors, in an approximate upwind direction of the building and/or near the intake of the building's passive air intake.
- "<" indicates that the analyte was not detected at or above the laboratory reporting limit shown.
- Results shown in **bold** indicate that the analyte was detected in the sample at or above the laboratory reporting limit.
- Breathing zone samples were collected indoors from the approximate height of a seated worker.
- Each duplicate sample was collected simultaneously the associated primary sample, using a T-splitter.
- Preferential pathway samples were collected indoors, as close as possible to a potential source. Preferential pathway sample results are not necessarily representative of employee exposure.
- Shaded cells indicate that the analyte was detected in the sample above the RSL.
- "J" indicates that the analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
- Sample IA-2B is considered a "grab" sample; the canister had filled completely by the time field personnel arrived to close it.
- Alternative air screening level currently recommended in lieu of the November 2012 RSLs (DTSC, 2012, HERO HHRA Note 3).
- The U.S. EPA updated the RSL for TCE in November 2011; the RSL for TCE used in prior reports for this site is 6.1  $\mu\text{g}/\text{m}^3$ .

**Abbreviations**

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

cis-1,2-DCE = cis-1,2-dichloroethene  
 Freon 113 = 1,1,2-trichloro-1,2,2-trifluoromethane  
 PCE = tetrachloroethene  
 RSL = U.S. EPA Region 9 Regional Screening Level

TCE = trichloroethene  
 trans-1,2-DCE = trans-1,2-dichloroethene  
 U.S. EPA = U.S. Environmental Protection Agency



**Figure 5. Air sampling locations at 1160 Kern Drive**

Halogenated volatile organic compounds (HVOCs) including PCE, TCE, cis-1,2-DCE, vinyl chloride, 1,1-DCA, 1,1,1-TCA, and/or Freon 113, were detected in at least one indoor air sample (Table 12) in 2011. Of the HVOCs detected, two (TCE and PCE) were detected at concentrations that exceeded their respective RSL. The highest concentrations of TCE and PCE (27 and 14  $\mu\text{g}/\text{m}^3$ , respectively) were both in sample IA-2 which targeted a preferential pathway (a floor drain) in the warehouse women's restroom.

Following mitigation, confirmation samples were collected from each restroom and at one outdoor location. PCE and TCE were not detected in the ambient air samples collected from outside the building. All indoor air results were below RSLs, with the exception of TCE in the warehouse women's restroom (sample IA-2). A second round of confirmation sampling occurred in July 2012, which confirmed that concentrations of VOCs in indoor air were below RSLs, with the exception of TCE in both the warehouse and lobby women's restrooms (Table 104). Based on these results, the EPA and RWQCB requested that AMD undertake additional mitigation measures to further reduce TCE concentrations in the women's restroom (sample location IA-2). PCE concentrations in the 2014 samples were below the RSL of 2.1  $\mu\text{g}/\text{m}^3$ .

Concentrations reported in micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ )<sup>1</sup>

Sample ID	Date	Sample Type	Sample Location	PCE	TCE
<b>Ambient Samples</b>					
001	5/24/2013	Ambient Blank	Outside, north of building	0.04 <sup>2</sup>	ND <sup>3</sup>
034	5/24/2013	Ambient Blank	Outside, north of building	0.07	0.19
<b>Women's Restroom In Western Portion of Building</b>					
003	5/24/2013	Breathing Zone	Near door	2.8 <sup>4</sup>	2.4
004	5/24/2013	Breathing Zone	Near floor drain	5.6	7.5
005	5/24/2013	Breathing Zone	In shower area	4.4	5.5
006	5/24/2013	Pref. Pathway	Beneath left sink, inside crack near piping	2.3	1.5
007	5/24/2013	Pref. Pathway	Behind left toilet, next to joint in pipe	2.3	1.4
009	5/24/2013	Pref. Pathway	Inside/beneath floor drain trap guard	177	369
031	5/24/2013	Pref. Pathway	Exterior of floor drain trap guard (with mylar)	158	384
008	5/24/2013	Pref. Pathway	Exterior of floor drain trap guard (with non-airtight plastic cover)	6.5	5.7
011	5/24/2013	Pref. Pathway	Crack in base of corner of wall near toilet (with mylar)	7.0	18
012	5/24/2013	Pref. Pathway	Crack in base of corner of wall near shower (with mylar)	3.2	2.7
013	5/24/2013	Pref. Pathway	Women's restroom in warehouse, inside shower drain	16	32
014	5/24/2013	Pref. Pathway	Crack in floor tiles (with mylar)	213	451
030	5/24/2013	Pref. Pathway	Crack in floor tiles (re-sample of sample 014)	222	471
032	5/24/2013	Indoor Source	In chemical storage closet	3.6	5.6
<b>Outside Women's Restroom In Western Portion of Building</b>					
002	5/24/2013	Breathing Zone	Inside warehouse, adjacent to restroom	2.2	1.5
033	5/24/2013	Pref. Pathway	Patched concrete outside women's restroom in warehouse (with mylar)	1.1	1.1
<b>Men's Restroom In Western Portion of Building</b>					
015	5/24/2013	Breathing Zone	Center of restroom near stalls	1.8	1.4
016	5/24/2013	Breathing Zone	In shower area	1.7	1.1
017	5/24/2013	Pref. Pathway	Inside shower drain	1.6	0.95
018	5/24/2013	Pref. Pathway	Inside floor drain	10	22
019	5/24/2013	Pref. Pathway	At floor tiles - no cracks noted (with mylar)	Sample failed; no results	
029	5/24/2013	Pref. Pathway	At floor tiles - no cracks noted (re-sample of sample 19)	1.1	0.51
<b>Women's Restroom In Eastern Portion of Building</b>					
021	5/24/2013	Breathing Zone	Near floor drain	2.4	2.9
022	5/24/2013	Breathing Zone	In corner stall	2.2	2.4
023	5/24/2013	Pref. Pathway	Inside hole in base of corner wall	2.1	1.5
024	5/24/2013	Pref. Pathway	Inside/beneath floor drain trap guard	35	43
<b>Men's Restroom In Eastern Portion of Building</b>					
025	5/24/2013	Breathing Zone	Near floor drain	1.6	1.0
026	5/24/2013	Pref. Pathway	Inside floor drain	Sample failed; no results	

Sample result above 10  $\mu\text{g}/\text{m}^3$   
 Sample result above 100  $\mu\text{g}/\text{m}^3$

**Notes:**

1. Results converted from parts per billion by volume to micrograms per cubic meter for clarity.
2. Sample results not shown in bold indicate that the compound is not considered detected in the sample despite a numerical value; see "Portable GC/MS Results" in the report for details.
3. "ND" indicates that the compound was not detected in the sample.
4. Sample results shown in bold indicate the compound was detected in the sample.

**Abbreviations:**

PCE = tetrachloroethene  
 TCE = trichloroethene  
 cDCE = cis-1,2-dichloroethene  
 tDCE = trans-1,2-dichloroethene  
 VC = vinyl chloride

Table 10. Field GC/MS 2013 Results for VOCs at 1160 Kern Avenue (Building 3)

## 6.5. *Site Inspection*

A site inspection was conducted on October 24, 2013. In attendance were Ellen Engberg and Aaron King (USACE, Seattle district), Melanie Morash (USEPA Region 9), Max Shahbazian (RWQCB), Peter Bennett and Michael Calhoun (Haley & Aldrich), Do Cao (AMD), and Joel Summers (RAFT).

## 6.6. *Interviews*

During the FYR process, interviews are recommended to be 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 is 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. Peter Bennett, Lead Hydrogeologist for Haley & Aldrich, contractor for the responsible party (RP) was interviewed. No other interviews were conducted. No problems or issues were identified during the interview. All of the interviews were conducted during the Site visit on October 24, 2013. The complete interview record is included in Appendix C.

## 6.7. *Institutional Controls*

The ROD calls for Institutional Controls prohibiting the use of the A- and B-aquifer groundwater and controlling activities that could endanger the public health or the environment.

In 1992, an initial restrictive covenant was recorded with the Santa Clara County Records Office. AMD filed a land use covenant on April 29, 2005 restricting the use of property at 1165 Arques Avenue (former Building 1) to industrial/commercial usages and prohibiting the use of groundwater from the shallow A and B aquifers as a source of drinking water. On March 19, 2013, TWC recorded a Covenant and Environmental Restriction on Property for the 1165 East Arques Ave property. The document restricts residential development for human habitation, construction of hospitals, day care centers, and schools. It further restricts drilling, and groundwater extraction, and activities that disturb site soils. The covenant was recorded with the County of Santa Clara which binds future owners and lessees and is consistent with current state law (California Civil Code Section 1471) which established the framework for environmental covenants in California.

These institutional controls restricting land use sufficiently satisfy the requirements of the ROD, and help protect human health. The most recent covenant is consistent with current state law (California Civil Code Section 1471), which established the framework for environmental covenants in California.

# 7. Technical Assessment

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

The ROD called for air stripping of extracted groundwater, use of a soil vapor extraction (SVE) system for soils, and the discharge of extracted groundwater to the storm sewers under a NPDES permit. None of

these actions are being used at the MMI Site as per RWQCB approval since soil cleanup has been achieved through excavation and soil vapor extraction (SVE). Groundwater concentrations after the 2005 PCE spill are below the concentrations in the commingled plume found prior to the 2005 spill so extraction ceased in 2008, and the current monitoring of groundwater has been taken over by TI. The current groundwater monitoring program is sufficient to track the commingled plume and detect any migration beyond the current boundaries, as well as track the effectiveness of remedial actions. Concentrations in down-gradient monitoring wells have remained at non-detect or below the ROD cleanup level. Thus, the commingled plume has not expanded in size and has not migrated vertically. Contamination remains confined to the shallow groundwater-bearing zones. TI is evaluating alternate groundwater cleanup technologies to determine whether other methods could achieve cleanup standards.

Institutional controls in place include prohibitions on the use of groundwater. A new Covenant and Environmental Restriction for the property on 1165 East Arques Ave (former Building 1) was recorded on March 19, 2013. This prohibits the use of the property for residential uses or as a school for children less than 21 years of age, and limits use to only commercial or industrial. The most recent covenant is consistent with current state law (CCC Section 1471), which established the framework for environmental covenants in California.

## ***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?***

There have been no changes to ARARs for the site and no new standards that would affect the protectiveness of the remedy. There is no exposure to contaminated groundwater, the current restrictive covenant prevents the extraction of site groundwater for the purpose of drinking water. Groundwater cleanup standards for TCE, PCE, and cis-1,2-DCE (primary chemicals which routinely exceed cleanup standards in the commingled plume) have not changed since the ROD was issued.

Land use has not changed in the previous five years as the newly constructed fitness center is considered a commercial enterprise, despite the inclusion of the hourly day care center. The Site is zoned light industrial and commercial and the environmental covenant is in place that prohibits the installation of groundwater wells for domestic use or the use of the MMI Site as a residential zone.

Within the last five years there have not been any newly identified human health or ecological routes of exposure or receptors. The vapor intrusion pathway was identified in the third FYR and is being evaluated and addressed at the MMI Site. Results of the 2011 through 2014 indoor air investigation suggest VOC concentrations in the indoor air are below protective levels for the KinderCare child care center (associated with the 2005 spill) and within the health protective risk range for the 1160 Kern Ave building (Building 3; associated with historic releases). The warehouse women's restroom still has breathing zone concentrations of TCE of  $3.5 \mu\text{g}/\text{m}^3$  which is above the RSL for commercial/industrial use ( $3.0 \mu\text{g}/\text{m}^3$ ), however, additional investigation is underway to determine what additional measures may be taken to lower these concentrations even further.

Vapor intrusion may need to be re-evaluated if the building use changes significantly or if the current building is removed and replaced by a new structure(s). While vapor intrusion was not a component of the original ROD, only the warehouse women's bathroom at 1160 Kern Ave (Building 3) currently has exceedances of the RSL for indoor air.

A number of toxicity value revisions have occurred since the ROD. These changes do not affect the protectiveness of the cleanup levels selected in the ROD.

There have been no changes in standardized risk assessment methodologies during this FYR period that could affect the protectiveness of the remedy.

The existing covenant restricts usage of groundwater for a drinking water source and prevents the use of the Site by residential dwellings.

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

No, there is no new information that has become available that could call into question the effectiveness of the remedy.

### ***7.4. Technical Assessment Summary***

Historical usages at the MMI Site resulted in the contamination of soils and groundwater. The exposure assumptions used at the time of the remedy selection are still valid. However, the 2005 PCE spill added to the chemical concentrations of the groundwater and became a component of the commingled plume. Soil excavation and SVE have remediated the soil and groundwater extraction ceased in 2008 due to limited removal of contaminants. The 2005 spill component of the commingled spill has been remediated to those groundwater contaminant levels that existed prior to the spill; however, PCE groundwater concentrations remain elevated above the cleanup standard of 5 µg/L as specified in the ROD in certain wells (including up to 34 µg/L measured during a 2013 sampling event in a well historically shown to be impacted by PCE from the 2005 release). Further vapor intrusion assessment is needed to investigate and monitor the exceedances of TCE above the RSL which exist in the warehouse women's bathroom (3.5 µg/m<sup>3</sup> vs. 3.0 µg/m<sup>3</sup>, respectively) in the 1160 Kern Avenue building (Building 3) and determine the effectiveness of the mitigation measures implemented in 2013 and 2014. The remedy is functioning as intended because groundwater contamination is not migrating and chemical concentrations have been reduced. In addition, institutional controls prohibit the usage of groundwater as a source of drinking water. Natural disasters such as major earthquakes (which are known to occur in California) may have an impact on the remedy, but this is not expected.

## 8. Issues

**Table 11. Current Issues for the Monolithic Memories Site**

Issue	Affects Current Protectiveness  (Yes or No)	Affects Future Protectiveness  (Yes or No)
Air monitoring at Building 3 1160 Kern Ave shows exceedances (3.5 µg/m <sup>3</sup> ) of commercial/industrial RSL of 3.0 µg/m <sup>3</sup> .	No	Yes
The pump and treat system selected in the ROD was shut down in 2005 at the time of the PCE spill when actions were taken to address the PCE spill.	No	Yes

## 9. Recommendations and Follow-up Actions

Table 16 provides recommendations to address the current issues at the Monolithic Memories.

**Table 12. Recommendations to Address Current Issues at the Monolithic Memories Site**

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Yes or No)	
					Current	Future
Air monitoring at 1160 Kern Ave (Building 3) shows exceedances (3.5 µg/m <sup>3</sup> ) of commercial/industrial RSL of 3.0 µg/m <sup>3</sup>	Continue preferential pathway investigation, mitigation and indoor air monitoring at 1160 Kern Ave (Building 3) to ensure protection of public health from the vapor intrusion pathway.	PRP	RWQCB	06/2015	No	Yes
The pump and treat system selected in the ROD was shut down in 2005.	An evaluation of the need for restarting the pump and treat system or a determination of an alternate remedy needs to be done. This should also be documented in a decision document.	PRP	RWQCB/ EPA	09/2017	No	Yes

In addition, the following recommendations are to improve management of the O&M but do not affect current protectiveness.

- It appears that there may be an increase of chlorobenzene concentrations in well MM07A. Recommend that an additional review of the historical chemical concentrations (of chlorobenzene in MM07A) over time be conducted to determine if additional investigations or sampling is required.
- A groundwater monitoring event in October 2013 related to the 2005 PCE release showed PCE breakdown products elevated in some locations, indicative of continued degradation of PCE into innocuous end products such as ethane and ethene. These two compounds, together with vinyl chloride, were the only PCE and TCE breakdown products detected at concentrations greater than those in the upgradient area (for vinyl chloride, up to a maximum of 130 µg/L, compared to the cleanup standard of 0.5 µg/L). Additional monitoring is appropriate to show that cleanup goals are achieved and that rebound does not occur.

Regarding vapor intrusion, the following activities are recommended for the 1160 Kern Avenue building:

- Collection of ventilation-off breathing zone samples from another bathroom within the building (the women's restroom off the lobby), where one pathway sample collected in July 2012 yielded 4.2 µg/m<sup>3</sup> for TCE; and
- An evaluation of additional mitigation measures that may be appropriate for both the men's and women's restrooms off the lobby, consistent with the findings and mitigation work at the other restrooms in the building.

## 10. Protectiveness Statement(s)

The remedy at the MMI Site is currently protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. Institutional Controls restrict the use of groundwater as a drinking water source. In order to be protective in the long-term, the preferential pathway investigation, mitigation and indoor air monitoring at 1160 Kern Avenue (Building 3) should be continued and an evaluation of the need for restarting the pump and treat system or a determination of an alternate remedy needs to be completed.

## 11. Next Review

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

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## Appendix A: List of Documents Reviewed

Regulatory activities documents and environmental data and site reports pertaining to the AMD Arques (Monolithic Memories) Site (SL720801215) stored in the State of California State Water Resource Control Board Geotracker database:

[http://geotracker.waterboards.ca.gov/profile\\_report.asp?global\\_id=SL7208012155](http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL7208012155)

Regulatory activities documents and environmental data and site reports pertaining to the TWC Storage Site (SL0608512762) stored in the State of California State Water Resource Control Board Geotracker database: [http://geotracker.waterboards.ca.gov/profile\\_report.asp?global\\_id=SL0608512762](http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL0608512762)

Regulatory activities documents and environmental data and site reports pertaining to the Texas Instruments, Santa Clara Site (SL720841216) stored in the State of California State Water Resource Control Board Geotracker database:

[http://geotracker.waterboards.ca.gov/profile\\_report.asp?global\\_id=SL720841216](http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL720841216)

AMEC, 2011, Final Work Plan for Indoor Air Investigation, 1160 Kern Avenue, Sunnyvale, California, July 29.

Arcadis, September 2012, Report on Indoor Air and Soil Gas Sampling 1155 East Arques Sunnyvale, California

Arcadis. August 2013. Well Destruction Report and Ongoing Monitoring Work Plan 1165/1175 East Arques Avenue, Sunnyvale, California for TWC Storage, LLC

Environmental Protection Agency. September 1991. EPA Superfund Record of Decision: National Semiconductor Corp. and Monolithic Memories EPA ID: CAD041472986 and CAD049236201 OU(s) 01 & 01

Environmental Risk Specialties Corporation. January 2013. Soil Gas Investigation Report 1165 East Arques Avenue, Sunnyvale CA

Haley and Aldrich, July 2013. Preferential Pathway Investigation Report and Proposed Mitigation Measures

Haley and Aldrich, February 2014. Vapor Intrusion Evaluation Report, 1160 Kern Avenue- Sunnyvale, California.

Haley & Aldrich. January 2014. Fourth Five-Year Review Report 1165/1175 East Arques Avenue Sunnyvale, California

Order No. 91-139, *Site Cleanup Requirements for: Advanced Micro Devices, National Semiconductor, United Technologies Corporation, Hewlett-Packard, and Shahinian Trust, Subunit 2, Operable Unit 1, Sunnyvale and Santa Clara, Santa Clara County.*

Treadwell & Rollo. 2005. Soil Gas Sampling Report 1155 East Arques Avenue Sunnyvale, California

Treadwell & Rollo. July 2013. Site Management Plan 1165 East Arques Avenue Sunnyvale, California

TWC Storage, LLC. May 2013. Covenant and Environmental Restriction on Property

## **Appendix B: Press Notice**

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PROOF OF PUBLICATION  
(2015.5 C.C.P.)  
County of Santa Clara  
State of California

PUBLIC NOTICE

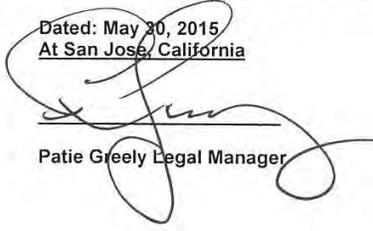
I am a citizen of the United States and a resident of the County aforesaid. I am over the age of 18 years, and not party to or interested in the above entitled matter. I am the principal clerk of the printer of the:

The Sunnyvale Sun, 1095 The Alameda, San Jose, CA 95126 a newspaper of general circulation in the City of Sunnyvale, printed in the City of San Jose, State of California, County of Santa Clara, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Santa Clara, State of California, Case Number CV742853 dated September 22, 1994 that the notice of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said Newspaper and not in any

supplement thereof on the following dates, to wit:  
Published 5/30/2014

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated: May 30, 2015  
At San Jose, California

  
Patie Greely Legal Manager

**PUBLIC NOTICE  
REGIONAL WATER  
BOARD AND EPA BEGIN  
FOURTH FIVE-YEAR RE-  
VIEW OF CLEANUP AT  
Former Monolithic  
Memories, Inc., (Ad-  
vanced Micro Devices -  
Arques)  
1165 and 1175 E. Arques  
Avenue; Sunnyvale, Cal-  
ifornia**

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 re-view of cleanup actions at Monolithic Mem-ories, Inc (Advanced Mi-cro Devices - Arques) Superfund Site located in Sunnyvale California. The review will evalu-ate whether the clean-up actions for the Site remain protective of human health and the environment.

This is the fourth Five-Year Review for both the Monolithic Mem-ories, Inc Superfund. During this upcoming review process, the Re-gional Water Board and EPA will study site-specific information for the period between 2009 and 2014, and will evaluate the Site's re-medial protectiveness. The Regional Water Board and EPA's project managers conducted facility inspections and will talk with company representatives, other regulatory authorities, and interested mem-bers of the public. The methods, findings and conclusions from the review will be docu-

mented in the Five-Year Review to be issued by Fall 2014 and will be placed in the infor-mation repositories listed below.

The major chemicals of concern are PCE and TCE. In 1982, the source for groundwater con-tamination (i.e., UST) and surrounding soils at the Monolithic Mem-ories Site was removed for off-site disposal. Between 1993 and 1996, a soil vapor extraction (SVE) system north of Building 2 was operated to treat soil contamina-tion. Groundwater treatment system were installed and operated until 2005. The systems are currently not oper-ating while alternative cleanup actions are be-ing tested. Long-term groundwater monitor-ing is required and an environmental deed re-striction was recorded on the property to pre-vent exposure.

The Regional Water Board and EPA invite the community to learn more about this review process and provide in-put 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 msha.hbazian@waterboards.ca.gov or Alejandro Diaz, Community In-volvement Coordinator, at (415) 972-3242 or diaz.alejandroe@epa.gov. You can obtain further site information at the following Regional Wa-ter Board's website at: <http://geotracker.wate-rboards.ca.gov/search.asp>. Enter the unique Case/Global ID number for this Site, which is S1720801215. Then click on "Report", then on "Geo Report/Site Docu-ments" link under the Electronic Submittals heading.

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

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# Appendix C: Interview Forms

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Five-Year Review Interview Record			
<b>Site:</b>	Monolithic Memories	<b>EPA ID No:</b>	CAD049236201
<b>Interview Type:</b>	Visit		
<b>Location of Visit:</b>	At AMD building- 1 AMD place, Sunnyvale, Ca		
<b>Date:</b>	24 October, 2013	<b>Time:</b>	
<b>Interviewer:</b>	Aaron King Ellen Engberg	<b>Title:</b>	Environmental Engineer Geologist USACE USACE
<b>Individual Contacted</b>			
<b>Name:</b>	Peter Bennett	<b>Title:</b>	Lead Hydrogeologist Organization: Haley & Aldrich
<b>Telephone:</b>	(510) 879-4547	<b>Address:</b>	1956 Webster St, Suite 450 Oakland, CA 94612
<b>Name:</b>	Michael Calhoun	<b>Title:</b>	Senior Specialist, Hydrogeologist Organization: Haley & Aldrich
<b>Telephone:</b>	(510) 879-4554	<b>Address:</b>	1956 Webster St, Suite 450 Oakland, CA 94612
<b>Name:</b>	Do Cao	<b>Title:</b>	Site Manager, Sunnyvale Organization: AMD
<b>Telephone:</b>	(408) 749-06635	<b>Address:</b>	One AMD Place Sunnyvale, CA 98088
Summary of Conversation			
1) What is your overall impression of the project?			
Project is winding down after much remediation. Completed as project is transitioning into a new fitness center. This is good for the area.			
2) Is the remedy functioning as expected? How well is the remedy performing?			
Yes- there is still containment within the overall OU, bioremediation is still working. Overall there has been tremendous progress.			
3) What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?			
concentration trends have declined a lot, especially since the 1980's. Trends summarized in the last 5 year report [by contractor]. Upgradient contaminates mean we will continue to see concentrations above cleanup goals.			
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, no active remediation. Groundwater monitoring is accomplished by contractor for the NSC site, T&R.			
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 changes on AMD's part since '09.			
6) What are the annual operating costs for your organization's involvement with the site?			
Normally >\$50K, >\$100k this year. Change is due to mitigation of VI at 1160 Kern.			
7) Have there been unexpected O&M difficulties or costs at the site in the last five years? If so, please give details.			
Increased indoor air difficulties, nothing with GW.			
8) Have there been opportunities to optimize O&M or sampling efforts? Describe changes and resultant cost savings or improved efficiency.			
2001 improved efficiency, but nothing noteworthy in the last five years. N/A.			
9) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy?			
The only change is the VI related sampling for TCE- RSL for PCE is increasing, but California is not adopting it.			
10) Do you have any comments, suggestions, or recommendations regarding the project?			
Main comment is that since this site mostly deals with VI, communication with the public is most important, and complicated. Risk assessment is hard when communication with the public- News media makes it harder. This is the biggest challenge.			

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## **Appendix D: Site Inspection Checklist**

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<b>I. SITE INFORMATION</b>	
<b>Site name:</b> Monolithic Memories	<b>Date of inspection:</b> 10/24/2013
<b>Location:</b> Sunnyvale, CA	<b>EPA ID:</b> CAD049236201
<b>Agency, office, or company leading the five-year review:</b> State of California	<b>Weather/temperature</b>
<b>Remedy Includes:</b> (Check all that apply)  <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"><input type="checkbox"/> Landfill cover/containment</div> <div style="width: 50%;"><input type="checkbox"/> Monitored natural attenuation</div> <div style="width: 50%;"><input type="checkbox"/> Access controls</div> <div style="width: 50%;"><input type="checkbox"/> Groundwater containment</div> <div style="width: 50%;"><input checked="" type="checkbox"/> Institutional controls</div> <div style="width: 50%;"><input type="checkbox"/> Vertical barrier walls</div> <div style="width: 50%;"><input checked="" type="checkbox"/> Groundwater pump and treatment</div> <div style="width: 50%;"><input type="checkbox"/> Surface water collection and treatment</div> <div style="width: 50%;"><input checked="" type="checkbox"/> Other: <i>VI mitigation</i> _____</div> </div>	
<b>Attachments:</b> <input type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached	
<b>II. INTERVIEWS</b> (Check all that apply)	
1. <b>O&amp;M site manager</b> <u>Peter Bennett</u> <u>Lead Hydrogeologist, Haley &amp; Aldrich</u> <u>24 October, 2013</u>	
Name	Title
Date	
Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone   Phone no. _____	
Problems, suggestions; <input checked="" type="checkbox"/> Report attached _____ _____	
2. <b>O&amp;M staff</b> _____	
Name	Title
Date	
Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone   Phone no. _____	
Problems, suggestions; <input type="checkbox"/> 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.	<b>Other interviews (optional)</b> <input type="checkbox"/> Report attached.
<b>III. ON-SITE DOCUMENTS &amp; RECORDS VERIFIED</b> (Check all that apply)	
1.	<b>O&amp;M Documents</b> <input type="checkbox"/> O&M manual <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> As-built drawings <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date <input type="checkbox"/> N/A <input type="checkbox"/> Maintenance logs <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A Remarks _____ _____
2.	<b>Site-Specific Health and Safety Plan</b> <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Contingency plan/emergency response plan <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A Remarks _____ H&S plan done on a per-job basis _____ _____
3.	<b>O&amp;M and OSHA Training Records</b> <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date <input type="checkbox"/> N/A Remarks _____ _____

4.	<b>Permits and Service Agreements</b>	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	<input type="checkbox"/> Air discharge permit			
	<input type="checkbox"/> Effluent discharge	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	<input type="checkbox"/> Waste disposal, POTW	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	<input type="checkbox"/> Other permits _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	Remarks _____ _____			
5.	<b>Gas Generation Records</b>	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	Remarks _____ _____			
6.	<b>Settlement Monument Records</b>	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	Remarks _____ _____			
7.	<b>Groundwater Monitoring Records</b>	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A
	Remarks _____ From NSC contractor _____ _____			
8.	<b>Leachate Extraction Records</b>	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	Remarks _____ _____			
9.	<b>Discharge Compliance Records</b>			
	<input type="checkbox"/> Air	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	<input type="checkbox"/> Water (effluent)	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	Remarks _____ _____			
10.	<b>Daily Access/Security Logs</b>	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> 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 \_\_\_\_\_  Breakdown attached

Total annual cost by year for review period if available

From _____	To _____	_____	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	
From _____	To _____	_____	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	
From _____	To _____	_____	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	
From _____	To _____	_____	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	
From _____	To _____	_____	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	

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

Describe costs and reasons: \_\_\_\_\_

\_\_\_\_\_ There is technically no O&M cost, as there is no operation of extraction systems called for in the ROD. Estimates for the costs over the last 5 year period have increased due to mitigation of VI \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**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 \_\_\_\_\_ New deed restriction filed within the last 5 years. \_\_\_\_\_

**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) \_\_\_None\_\_\_\_\_

Frequency \_\_\_\_\_

Responsible party/agency \_\_\_\_\_

Contact \_\_\_\_\_

Name	Title	Date	Phone no.
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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.	<b>Vandalism/trespassing</b>	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> No vandalism evident
Remarks _____ _____			
2.	<b>Land use changes on site</b>	<input type="checkbox"/> N/A	
Remarks __New building under construction at 1175 Arques. _____ _____			
3.	<b>Land use changes off site</b>	<input checked="" type="checkbox"/> N/A	
Remarks _____ _____			
<b>VI. GENERAL SITE CONDITIONS</b>			
<b>A. Roads</b> <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	<b>Roads damaged</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Roads adequate <input checked="" type="checkbox"/> N/A
Remarks _____ Access to site is off of public roads. _____ _____			
<b>B. Other Site Conditions</b>			
Remarks _____ _____ _____ _____ _____ _____			
<b>VII. LANDFILL COVERS</b> <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
<b>VIII. VERTICAL BARRIER WALLS</b> <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			

1.	<b>Settlement</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Settlement not evident
	Areal extent _____	Depth _____	
	Remarks _____ _____		
2.	<b>Performance Monitoring</b> Type of monitoring _____		
	<input type="checkbox"/> Performance not monitored		
	Frequency _____	<input type="checkbox"/> Evidence of breaching	
	Head differential _____		
	Remarks _____ _____		
<b>IX. GROUNDWATER/SURFACE WATER REMEDIES</b> <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A			
<b>A. Groundwater Extraction Wells, Pumps, and Pipelines</b>		<input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	<b>Pumps, Wellhead Plumbing, and Electrical</b>		
	<input checked="" type="checkbox"/> Good condition	<input type="checkbox"/> All required wells properly operating	<input type="checkbox"/> Needs Maintenance <input checked="" type="checkbox"/> N/A
	Remarks _____ These items, though on site property are covered and operated by the NSC site. They are not currently in use. _____ _____		
2.	<b>Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances</b>		
	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs Maintenance	<input checked="" type="checkbox"/> N/A
	Remarks _____ _____		
3.	<b>Spare Parts and Equipment</b>		
	<input type="checkbox"/> Readily available	<input type="checkbox"/> Good condition	<input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided
	Remarks _____ _____		
<b>B. Surface Water Collection Structures, Pumps, and Pipelines</b>		<input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
<b>C. Treatment System</b>		<input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	

1.	<p><b>Treatment Train</b> (Check components that apply)</p> <p> <input type="checkbox"/> Metals removal                      <input type="checkbox"/> Oil/water separation                      <input type="checkbox"/> Bioremediation  <input type="checkbox"/> Air stripping                              <input type="checkbox"/> Carbon adsorbers  <input type="checkbox"/> Filters _____  <input type="checkbox"/> Additive (e.g., chelation agent, flocculent) _____  <input type="checkbox"/> Others _____  <input type="checkbox"/> Good condition                      <input type="checkbox"/> Needs Maintenance  <input type="checkbox"/> Sampling ports properly marked and functional  <input type="checkbox"/> Sampling/maintenance log displayed and up to date  <input type="checkbox"/> Equipment properly identified  <input type="checkbox"/> Quantity of groundwater treated annually _____  <input type="checkbox"/> Quantity of surface water treated annually _____  Remarks _____  _____ </p>
2.	<p><b>Electrical Enclosures and Panels</b> (properly rated and functional)</p> <p> <input checked="" type="checkbox"/> N/A                      <input type="checkbox"/> Good condition                      <input type="checkbox"/> Needs Maintenance  Remarks _____  _____ </p>
3.	<p><b>Tanks, Vaults, Storage Vessels</b></p> <p> <input checked="" type="checkbox"/> N/A                      <input type="checkbox"/> Good condition                      <input type="checkbox"/> Proper secondary containment                      <input type="checkbox"/> Needs Maintenance  Remarks _____  _____ </p>
4.	<p><b>Discharge Structure and Appurtenances</b></p> <p> <input checked="" type="checkbox"/> N/A                      <input type="checkbox"/> Good condition                      <input type="checkbox"/> Needs Maintenance  Remarks _____ One stripper, no longer in use _____  _____ </p>

5.	<b>Treatment Building(s)</b>	<input checked="" type="checkbox"/> N/A <input type="checkbox"/> Good condition (esp. roof and doorways) <input type="checkbox"/> Needs repair  <input type="checkbox"/> Chemicals and equipment properly stored  Remarks _____  _____
6.	<b>Monitoring Wells</b> (pump and treatment remedy)	<input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition  <input checked="" type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A  Remarks: These items, though on site property are covered and operated by the NSC site.  _____
<b>D. Monitoring Data</b>		
1.	Monitoring Data	<input checked="" type="checkbox"/> Is routinely submitted on time <input checked="" type="checkbox"/> Is of acceptable quality
2.	Monitoring data suggests:	<input checked="" type="checkbox"/> Groundwater plume is effectively contained <input checked="" type="checkbox"/> Contaminant concentrations are declining
<b>D. Monitored Natural Attenuation</b>		
1.	<b>Monitoring Wells</b> (natural attenuation remedy)	<input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition  <input checked="" type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A  Remarks: These items, though on site property are covered and operated by the NSC site.  _____
<b>X. OTHER REMEDIES</b>		
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.		
<b>XI. OVERALL OBSERVATIONS</b>		
<b>A.</b>	<b>Implementation of the Remedy</b>	

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 pump and treat on site is no longer functioning. Cleanup levels are near goal, and concentrations leaving the site are the same as concentrations entering the site.

Ventilation has been improved at the bathroom at 1160 Kern, and work toward eliminating vapor intrusion is ongoing.

Construction activities at 1165 Arques appear to be following standards for protecting wells, and presumably those set forth for excavation depths, and worker safety.

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**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.

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There are few visual elements to the remedy, but there appear to be no issues with the O&M at the site. \_\_\_\_\_

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**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.

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There are no indicators of potential remedy problems.

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**D. Opportunities for Optimization**

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

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No opportunities for optimization were observed during the site visit.

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# **Appendix E: Photographs from Site Inspection Visit**

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1. 1160 Kern (building 3)



2. Door vents installed on bathroom doors (1160 Kern) (building 3).



3. Highest VOC detection occurred in this restroom (1160 Kern) (building 3).



4. Construction activity on 1165/1175 Arques property (former Buildings 1&2).



5. Rear of the building 3 at 1160 Kern .



6. Construction at 1175 Arques (former Building 2).



7. Extraction well E44A (sampled, but never used for extraction).



8. Monitoring wells ME43A and ME19B2.



9. KinderCare next door to 1165/1175 (former Buildings 1&2), from behind at building 3, 1160 Kern.