FOURTH FIVE-YEAR REVIEW REPORT FOR WESTINGHOUSE ELECTRIC CORPORATION SUPERFUND SITE SUNNYVALE, SANTA CLARA COUNTY, CALIFORNIA

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Region IX

Approved by: Date:

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Executive Summary

This is the fourth Five-Year Review (FYR) of the Westinghouse Electric Corporation Superfund Site (Site) 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 Westinghouse Site is approximately 75 acres and is currently operating as a Northrop Grumman Systems Corporation (NGSC) manufacturing facility. During the mid-1950s, Westinghouse manufactured transformers that contained Inerteen, a (PCB) and chlorinated benzene mixture with mineral oil added as an insulating fluid. The primary contaminants of concern (COCs) affecting the soil and groundwater were PCBs, solvents, and fuel compounds. In both soil and groundwater, the highest concentrations of COCs at the Site were discovered near the tanks and beneath the underground pipelines. PCBs in soils often exceeded 500 milligrams per kilogram (mg/kg) and ranged up to 28,000 mg/kg from the surface to depths of approximately 45 feet (ft).

The selected remedy for the Westinghouse Site required extraction and treatment of groundwater, containment of groundwater in the PCB source area, removal and offsite incineration of contaminated soil, institutional controls (ICs), and monitoring. The cleanup plan outlined in the Record of Decision (ROD) included leaving contamination above health-based levels in both soil and groundwater on the Site, but required a cap and restrictions on excavation for those areas where soil PCB concentrations exceed 25 mg/kg. A technical impracticability waiver was invoked in the ROD for the groundwater area that contained dense non-aqueous phase liquid (DNAPL). The ROD requires that this area be permanently contained and that land use restrictions prevent access to this contamination. The aquifers are classified as a potential source of drinking water, thus groundwater cleanup goals (except for PCBs in the contained source area) were set at Maximum Contaminant Levels (MCLs). The soil cleanup goal for PCBs was determined based on, *Guidance on Remedial Actions For Superfund Sites With PCB Contamination, OSWER Directive No. 9355.4-01, August 1990.*

The 1997 Explanation of Significant Differences (ESD) allowed soils from the North Parking Lot area of the Site, containing PCBs at concentrations less than 500 mg/kg, to be disposed at an approved hazardous waste landfill instead of by incineration. This ESD was updated with a memorandum to the Site File in 2010 that extended the applicability of the decision in the 1997 ESD to the rest of the Site.

The 2008 ESD added a requirement for land use restrictions for other areas of the Site where PCB-contaminated soils remained above levels suitable for unrestricted use. The ROD did not explicitly state ICs would restrict the use of the Site to commercial/industrial use. Thus, this ESD ensured that the ROD assumptions regarding land use remained valid. Since PCBs occur in many areas of the Site at concentrations exceeding those appropriate for unrestricted use, the entire Site will be restricted to commercial/industrial use.

The containment portion of the Site remedy is functioning as intended by the ROD; however, contaminants of concern reduction within the theoretical capture zones is approaching asymptotic rates. All institutional controls have been implemented except for two remaining land use covenants scheduled to be recorded by the end of the year. There have been no changes to Applicable or Relevant and Appropriate Requirements. There have been changes to toxicity values, but the changes do not affect protectiveness. A vapor intrusion report was completed in 2014, and concluded that there is no risk from the vapor intrusion pathway. The remedy remains protective, but questions regarding hydraulic containment system effectiveness limit its assessment and possible optimization.

The excavation of shallow surface soil contaminated with PCBs throughout the site is in the final stages. All soil excavation is planned to be completed by the end of September 2016. Street soil sampling and storm drain sediment sampling indicated that concentrations of PCBs spiked this past winter, and storm water sediment samples have been historically elevated over the past 15 years.

The remedy at the Westinghouse Electric Corporation Superfund Site currently protects human health and the environment because exposure pathways that could result in unacceptable risks are being controlled. However, in order for the remedy to be protective in the long term, the following actions need to be taken: Record the Land Use Covenants, investigate the source of elevated PCBs levels outside the Westinghouse property, and conduct a groundwater remediation system evaluation study.-

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List of Abbreviations

1,1-DCE	1,1-dichloroethene
1,2-DCA	1,2-dichloroethane
1,2-DCB	1,2-dichlorobenzene
1,2,4-TCB	1,2,4-trichlorobenzene
1,3-DCB	1,3-dichlorobenzene
1,4-DCB	1,4-dichlorobenzene
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
ARAR	applicable or relevant and appropriate requirement
ASTM	ASTM International (formerly American Society for Testing and Materials)
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
COC	contaminant of concern
DNAPL	dense non-aqueous phase liquid
DTSC	California Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
ft	foot/feet
FYR	Five-Year Review
GETS	groundwater extraction and treatment system
ICs	institutional controls
lbs	pounds
LUC	land use covenants
MCL	maximum contaminant levels
mg/kg	milligrams per kilogram
NGSC	Northrop Grumman Systems Corporation
OSWER	Office of Solid Waste and Emergency Response
O&M	operations and maintenance
PCB	polychlorinated biphenyl
PCE	tetrachloroethylene (also known as perchloroethylene)
ppm	parts per million
PRP	Potentially Responsible Parties
QA/QC	quality assurance/quality control
RAO	remedial action objective
ROD	Record of Decision
RSL	regional screening level
TBC	factors to be considered
TCE	trichloroethene
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

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 reviews 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) is preparing this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, 40 Code of Federal Regulation (CFR) Section 300.430(f)(4)(ii) of the National Contingency Plan and EPA policy.

This is the fourth FYR for the Westinghouse Electric Corporation Superfund Site (Site). The triggering action for this statutory review is September 29, 2011, the date of the third FYR. The FYR has been prepared because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

The Westinghouse Superfund Site FYR was led by Mark Samolis, EPA Remedial Project Manager. Participants included Miriam Gilmer, U.S. Army Corps of Engineers (USACE) project manager, Jacob Williams, USACE chemist, and Drew Clemens, USACE geologist. The review began on October 1, 2015.

Table 1. Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Westinghouse Electric Corporation Superfund Site		
EPA ID: CAD001864081		
Region: 9	**State:** CA	**City/County:** Sunnyvale/Santa Clara County

SITE STATUS	
NPL Status: Final	
Multiple OUs? NoChoose an item	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA
Author name (Federal or State Project Manager): Mark Samolis
Author affiliation: EPA
Review period: 10/1/2015 - 8/1/2016
Date of site inspection: 1/28/2016
Type of review: Statutory
Review number: 4
Triggering action date: 9/29/2011
Due date *(five years after triggering action date)*: 9/29/2016

1.1 Physical Characteristics

The Westinghouse Electric Corporation Superfund Site (Site) is located approximately 5 miles south of the south end of the San Francisco Bay and 5 miles northeast of the Santa Clara Mountains, in the Santa Clara Valley of California (Figure 1). The Site occupies a 75-acre parcel of land, located at 401 Hendy Avenue in Sunnyvale, California. It is bounded by California Avenue to the north, North Sunnyvale Avenue to the west, and North Fair Oaks Avenue to the east. The North Parking Lot is located on the north side of California Avenue. The surrounding area is heavily urbanized, and is currently zoned for commercial, residential, and industrial use. Some residential parcels adjoin the facility on the west side (Figure 2).

The Site is operating as a Northrop Grumman Systems Corporation (NGSC) manufacturing facility, which manufactures steam generators, marine propulsion systems, and missile launching systems for the U.S. Government. No significant changes to land use are anticipated at the Site in the near future. Municipal and industrial water supplies are drawn from groundwater aquifers below a depth of 250 feet (ft), but a current well inventory use report is not available.

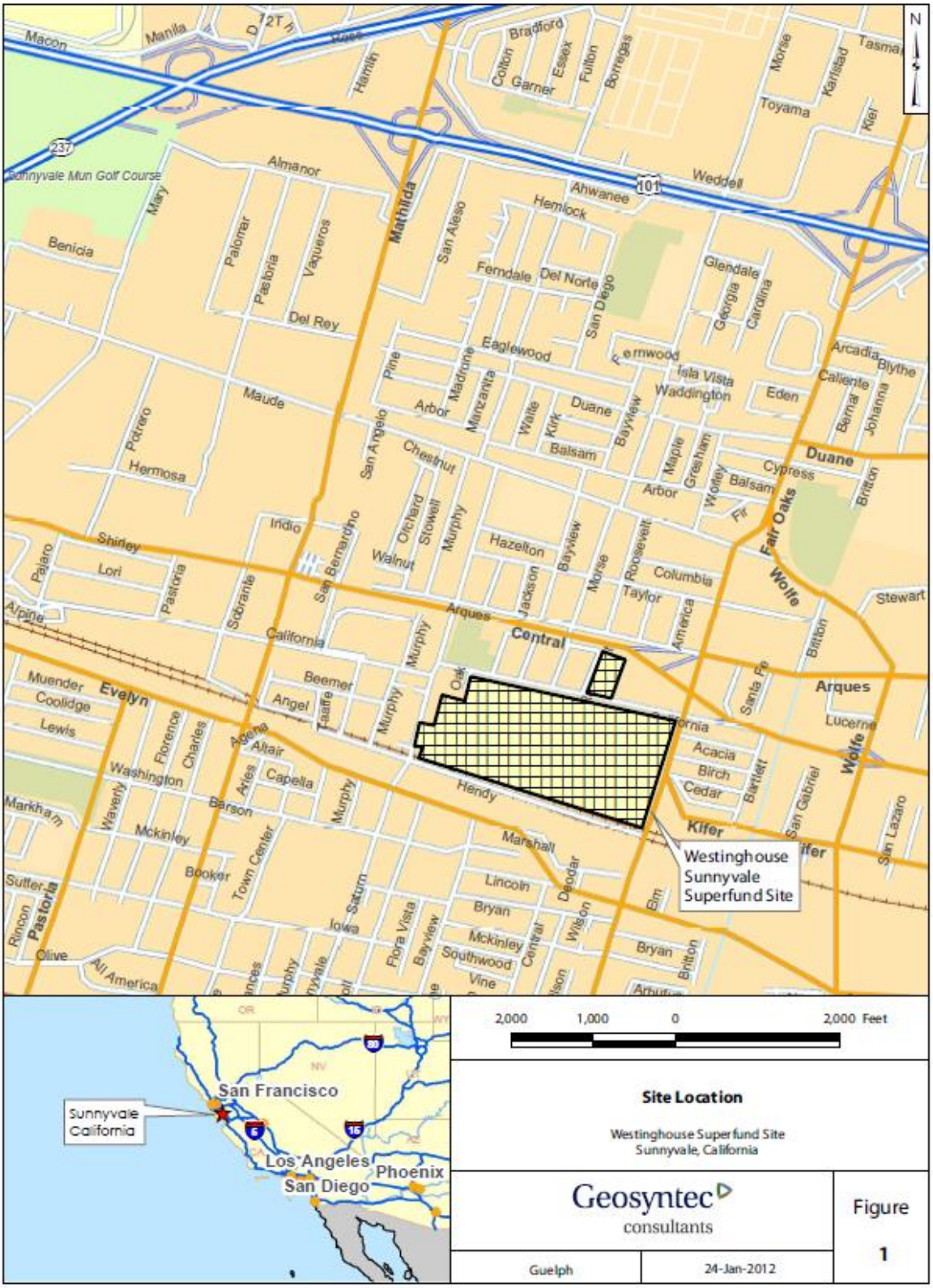
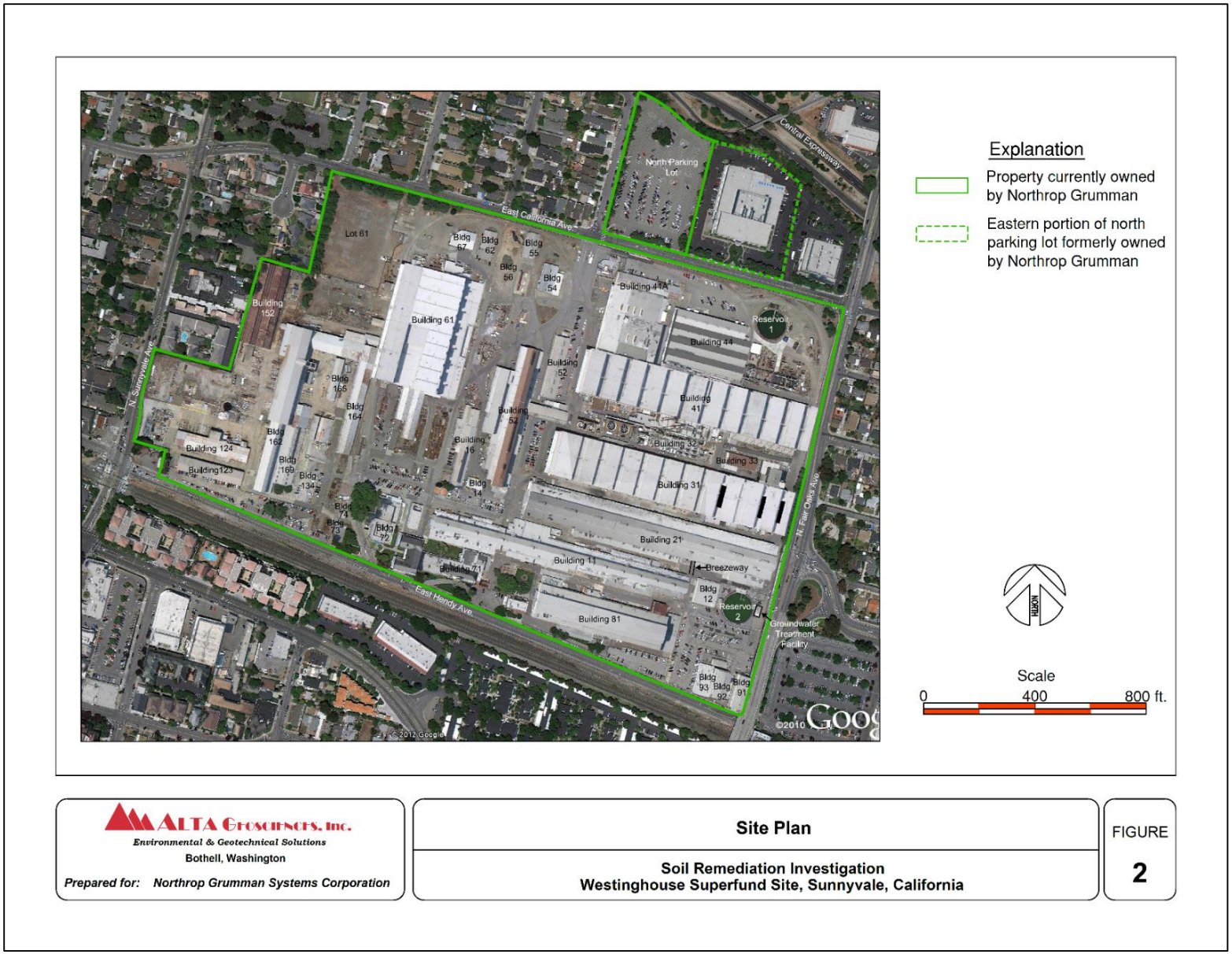


Figure 1: Location Map for the Westinghouse Electric Corporation Superfund Site



ALTA GEOSCIENCES, Inc.
Environmental & Geotechnical Solutions
Bothell, Washington
Prepared for: Northrop Grumman Systems Corporation

Site Plan

Soil Remediation Investigation
Westinghouse Superfund Site, Sunnyvale, California

FIGURE
2

Figure 2: Site Plan of the Westinghouse Electric Corporation Superfund Site

1.2 Hydrology

1.2.1 Geology

The Site is located within a region of significant seismic activity and geotechnical instability. Sunnyvale lies in a valley created by tectonic deformation including development of the San Andreas Fault System, of which the main trace is located approximately 8 miles to the southwest.

Geologically young basin deposits underlie the Santa Clara Valley. Previous geotechnical studies indicate the deposits near the alignment are young, fine-grained alluvium (horizontally stratified clay and silt) and slightly older fine- to coarse-grained alluvium (moderately to poorly bedded, poorly sorted clay, silt, sand, and gravel). The clayey portions of the material are prone to expansion and do not drain easily. The slightly coarser-grained sediments drain more readily.

1.2.2 Hydrogeology

The San Francisco Bay Regional Water Quality Control Board established a series of aquifer designations in the Santa Clara Valley area. The shallowest of these is designated as the A-aquifer. The A-aquifer is underlain by the B-aquifer zone, which has been divided into the B1-, B2-, and B3-aquifers (from shallowest to deepest). The approximate depths below ground surface (bgs) at which these aquifer zones occur near the Site are: A, 0 to 50 ft; B1, 50 to 70 ft; B2, 75 to 90 ft; and B3, 90 to 115 ft. One or more water-bearing sand/gravel layers may occur within a particular aquifer zone. Near the Site, the A-aquifer generally has one or more medium to coarse-grained (sand/gravel) units within the interval that extends from the water table (approximately 16 to 20 ft bgs) to a depth of 45 to 52 ft bgs. All aquifers in the Santa Clara Valley Basin are designated drinking water aquifers.

Groundwater flow in both A- and B-aquifer zones is to the north-northeast, consistent with the topography that slopes gently downward toward the north-northeast (toward San Francisco Bay). The regional hydraulic gradient is relatively flat: A, 0.005 to 0.010 and B1, 0.001 to 0.002. Groundwater levels fluctuate seasonally, and are typically lowest in late fall and highest (1 to 2 ft increase) in late spring. Typical depth to water table is 20 ft bgs in the A-aquifer, and 18 ft bgs in the B1-aquifer.

2 Remedial Actions Summary

2.1 Basis for Taking Action

Contaminants identified in the Record of Decision (ROD) as the contaminants of concern (COCs) in the groundwater are:

- Benzene
- Polychlorinated biphenyls (PCBs)
- 1,2,4-trichlorobenzene (1,2,4-TCB)
- 1,4-dichlorobenzene (1,4-DCB)
- 1,2-dichloroethane (1,2-DCA)

Contaminants identified in the ROD as the COCs in the soil include all of the above, and:

- Ethylbenzene
- Chlorobenzene (CB)
- 1,2-dichlorobenzene (1,2-DCB)
- Toluene
- 1,3-dichlorobenzene (1,3-DCB)
- Trichloroethane (1,1,1-TCA)
- Trichloroethene (TCE)
- 1,1-dichloroethene (1,1-DCE)
- Xylene
- *cis*-1,2-dichloroethene (*cis*-1,2-DCE)

PCB-contaminated groundwater was found in both A- and B-a aquifers. The groundwater contamination, in both aquifers, was detected by the Reservoir 2 area, in the southeast area of the Site. Soil contamination of PCBs was detected also in the Reservoir 2 area, as well as along fence lines in the northwest yard, in the northeast yard, and along the railroad tracks adjacent to Building 61, which is in the western area of the Site.

The exposure assessment in the ROD identifies potential exposure pathways and segments of the population that may be exposed to Site-related COCs via those pathways. Exposure to soil containing COCs may occur between two types of outdoor workers: those engaged only in surface activities (surface workers), and those engaged in subsurface construction activities (subsurface workers) such as installation or maintenance of underground utilities. The risk from incidental ingestion of soil and dermal contact with soils are evaluated for both the surface and subsurface workers. Inhalation risk for surface workers was considered minimal because of the small, uncovered soil surface area (50-foot diameter at the surface) and because the ground surface is paved. For subsurface workers, inhalation risks were factored into the evaluation. Groundwater and air can also serve as exposure media for the potential receptor populations. There are three possible routes of exposure to contamination in these soils: ingestion, dermal contact, and inhalation. Groundwater COCs have been detected in at least one of the two water-bearing zones on and off the Site. Ingestion, dermal contact, and inhalation risk of contaminated soils, groundwater, and air to industrial workers were evaluated. The risks to these workers was the basis for taking remedial action.

2.2 Remedy Selection

The following section discusses the remedial action objectives (RAOs) and the selected remedy for the Site.

The 1991 ROD did not specifically identify RAOs or cleanup timeframe, but did identify the following anticipated results from the remedy selected, which would result in protectiveness:

- Groundwater will be restored to health-based standards for all chlorobenzene contaminants outside of the source area (the source area is characterized by a DNAPL), thus preventing potential exposures, should these shallow aquifers ever be used for water supply purposes.
- Permanent hydraulic containment of the source area will prevent pollutant migration and further contamination of the shallow aquifers, which are potential drinking water supplies. This containment will be combined with land use restrictions to prevent construction of supply wells in the source area where DNAPL has been detected
- The extracted groundwater will be treated, prior to onsite discharge into a storm sewer, which will meet all applicable or relevant and appropriate requirements (ARARs) identified for such discharges.
- Contaminated soil containing greater than 25 parts per million (ppm) PCB, which represents a 10^{-6} health risk in an industrial setting, will be removed to a depth of 8 ft, thereby preventing potential exposure at the surface, or in the subsurface (e.g., exposure to utility line workers).
- The removed soil, spent filtration membranes, and spent carbon will be incinerated off site, resulting in the destruction of these contaminants and thereby preventing further possibility of exposure to them.
- Land use restrictions will prevent excavation and, therefore, exposure in the area where contaminated soils remain at depths greater than 8 ft.
- Land use restrictions will also prevent any residential development in the source area, in order to further preclude any risk of exposure due to contact with soil contamination.

Major components of the remedy selected in the 1991 ROD included:

- Permanent hydraulic containment of contaminated groundwater in the source area where DNAPL was detected to prevent pollutant migration and further contamination of the shallow aquifers, using extraction.
- Restoration of contaminated groundwater, using extraction, to the California Department of Health Services Action Level for 1,3-DCB, to the proposed maximum contaminant level (MCL) for 1,2,4-TCB, and to the Federal and State MCLs for other contaminants (with the exception of the standard for PCBs in the onsite source area where DNAPL occurs).
- Treatment of the extracted groundwater to meet all ARARs identified for this discharge prior to discharge to the onsite storm sewer, unless an evaluation indicates that an alternative "end use" for the treated effluent (such as use for facility process water) can be practicably implemented;
- Removal of contaminated soil containing greater than 25 ppm PCB to a depth of 8 ft.
- Offsite incineration of excavated soils at a federally permitted facility.
- Institutional controls (ICs), such as land use restrictions, to prevent well construction (for water supply purposes) in source areas that remain contaminated and excavation below the 8 ft where soil has been removed will be restricted. Restrictions will also preclude excavation, other than

temporary subsurface work, in the upper 8 ft and will require complete restoration of any disturbed fill or the asphalt cap once any such temporary work is completed.

- A requirement that EPA receive notification of any future intention to cease operations in, abandon, demolish, or perform construction in (including partial demolition or construction) Building 21.
- Permanent and ongoing monitoring of the affected aquifers to verify that the extraction system is effective in capturing and reducing the chemical concentrations and extent of the aqueous phase plume, and containing the aqueous phase contamination in the DNAPL source area.

See Table 2 for groundwater cleanup criteria from the ROD.

Table 2: ROD Groundwater Cleanup Levels

Compound	ROD Cleanup Level (µg/L)
Benzene	1
CB or Monochlorobenzene	30
1,2-DCB	600
1,3-DCB	130
1,4-DCB	5
1,2,4-TCB	5
PCBs	0.5
1,1-DCA	5
1,2-DCA	0.5
1,1-DCE	6
cis-1,2-DCE	6
1,1,1-TCA	200
Ethylbenzene	680
Toluene	1,000
TCE	5
Xylene(s)	1,750

Note: µg/L = micrograms per liter

In the absence of a known technology to effectively remove the DNAPL containing PCBs from the subsurface soil, a technical impracticality waiver was invoked in the ROD. This legal mechanism waived the requirement to meet the standard for PCB in the source area where DNAPL was present in the 1990s. The ROD requires that this area be permanently contained, that groundwater in this area be restored to health-based standards for all contaminants except PCBs, and that land use restrictions prevent access to this contamination. Compliance points were set at the perimeter of the DNAPL source area in the groundwater. Soil cleanup levels were based on the reasonably anticipated future use, which is commercial/industrial. Because the aquifers were classified as a potential source of drinking water, soil cleanup levels were also based on whether the contaminants posed a threat to groundwater through leaching.

2.2.1 Explanation of Significant Differences (1997)

The February 14, 1997 Explanation of Significant Differences (ESD) established a remedy change for the disposal method for PCB-contaminated soils in the North Parking Lot area of the Site. The 1997 ESD changed the method of disposal for soils containing PCBs less than 500 mg/kg to disposal at an approved

landfill. The 1997 ESD reaffirmed the 25 mg/kg soil cleanup level for PCBs at the Site and the need for ICs to restrict the entire Site to only industrial uses. All soils (including those removed from the North Parking Lot area) with PCB concentrations greater than 500 mg/kg were to be incinerated as required in the 1991 ROD.

2.2.2 Explanation of Significant Differences (2008)

The September 30, 2008 ESD retained the ICs for the source area from the 1991 ROD. To ensure long-term protectiveness, the 2008 ESD required that ICs be put in place to prohibit sensitive uses (i.e., residential) in other areas of the Site (including a portion of the North Parking Lot) where PCB contamination exceeds levels to remain uncapped on site (i.e., levels exceeding 25 mg/kg) (EPA, 2008). Because of this new requirement, an IC must now be implemented everywhere throughout the Site. In addition, an asphalt or other pavement cap as required in the ROD will cover areas where soil PCBs equal or exceed 25 mg/kg. Any future subsurface excavation work must be conducted in accordance with a Soils Management Plan approved by EPA and California Department of Toxic Substances Control (DTSC). The land use covenants (LUCs) shall be entered into by the owner with DTSC, naming EPA as a third-party beneficiary, and be recorded in the County records.

2.2.3 Memorandum to Site File (2010)

An EPA memorandum dated March 25, 2010, extended the applicability of the decision in the 1997 ESD to the rest of the Site with soil PCB levels below 500 mg/kg. The memorandum allows that soils with PCB levels between 25 and 500 mg/kg may be disposed at an appropriate landfill rather than incinerated. However, this does not apply to the PCB source area, which is defined as the area near the former storage tanks (used to hold both Inerteen and mineral oil), Building 21, and all associated piping between the tanks and Building 21. Soils with PCB levels less than 25 mg/kg may remain in place as per the 1991 ROD. Soils with levels above 500 mg/kg will continue to be incinerated as specified in the ROD.

2.3 Remedy Implementation

2.3.1 Institutional Controls

One Land Use Covenant (LUC) was recorded on the North Parking Lot parcel on August 8, 2013. EPA did a search for the LUC for the sold property on February 3, 2016, and the LUC was completed and sufficient. The two LUCs for the Main Site have been drafted, but not yet been executed and recorded. Of the remaining two LUCs, one LUC covers the groundwater restrictions at the DNAPL area. The other LUC is for the remaining parcels on the Main property and addresses the soil restrictions.

2.3.2 Groundwater Remediation

The initial groundwater extraction and treatment system (GETS) included a pilot system that provided groundwater extraction in the source areas and treatment with an onsite treatment plant. Pilot system construction was started in December 1992 and completed the following year.

The pilot GETS was incorporated into the full-scale system and expanded in 1994 to 1995 with the addition of six extraction wells (see Figure 5 and Figure 6). The eight wells forming the “barrier system” downgradient of the PCB source area were operational from 1995 to 2001. During that time, groundwater

from these wells was not contaminated, but operation of the extraction wells continued as an assurance that potentially impacted water would not leave the containment area. Currently, all treated water is discharged to the sanitary sewer that connects to the City of Sunnyvale Sewage Treatment Plant

The current monitoring program was modified in 2006 (Geosyntec/ALTA, 2006b) using 20 wells located within and down gradient of the contaminant plume. Four more wells were located within the plume (or impact zone), and the remaining serve as downgradient sentinel wells.

Monitoring, optimization, and maintenance activities continued during this FYR period. Routine sampling occurred in 2011 and 2012. The monitoring network was optimized in 2013 as follows:

- Wells W26, W67, W74, W75, W83, W84, and W85 were reported destroyed.
- Wells W10, W11, W30, W31, W59, W60, W61, W67, W70, W71, W74, W75, W83, W84, W85, E9, CCG-1, and CCG-2 were abandoned.
- Well W26R replaced W26.

During 2014, offsite A-aquifer monitoring well W60 was replaced with well W60R, and W26R, Wells W-39, W-47, and W60R were redeveloped using the surge and pump method to improve sample quality. Replacement wells W26R and W60R were not surveyed, and their elevation was determined using a back-sight method with uncertain precision and accuracy.

Routine monitoring and maintenance (e.g., well cap replacement) were conducted in 2015. No wells were replaced, abandoned, or reported destroyed.

2.3.3 Soil Remediation

The initial soil remediation program (Phase I soils remediation) was started in October 1992 and completed in 1993, in conjunction with the installation of the pilot groundwater extraction and treatment system. During Phase I, the easterly-located piping was removed, along with related PCB impacted soils. Site restoration included backfilling excavated trenches, replacement of asphalt paving, and construction of the concrete slab for the GETS.

During Phase II, the second of two PCB and mineral oil pipelines running from the tank area south of Reservoir 2 toward Building 21 was removed. Impacted soils surrounding the pipelines and underlying parts of the former tank site were removed. In some areas, excavation to the desired 8 ft was not possible, due to the presence of utilities. In all areas where excavation was not to 8 ft, the asphalt cap was left in place. Restoration work included backfill of excavations with imported material and replacement of asphalt or concrete areas.

As part of the October 1994 Phase II soils remediation, a 20,000-gallon underground storage tank was removed from the Area 91 Parking Lot. Five confirmation samples were collected from the surrounding tank soils, and only one was found to contain low-level PCB concentrations, which did not require remediation.

On March 14, 1997, EPA signed an ESD relating to soil disposals from the North Parking Lot. The average PCB concentration of the North Parking Lot soils was about 150 mg/kg (Geosyntec/ALTA 2006). These soils were not considered a Principal Threat (containing greater than 500 mg/kg PCB), EPA allowed landfill disposal of the majority of these soils.

In April 1997, NGSC prepared to close a sump outside their Building 44 machine shop. Under geologic oversight by ALTA Geosciences, a soil boring was installed next to the sump, and samples collected. The analytical testing identified total petroleum hydrocarbons (quantified as diesel) at concentrations ranging from 2,600 to 29,000 mg/kg. Three monitoring wells (W83, W84, and W85) were installed north (down gradient) of the former sump and incorporated into the groundwater monitoring plan.

In preparation for building improvements in 1999, NGSC notified EPA of intended construction in Building 21. Under an EPA-approved work plan, ALTA Geosciences installed nine soil borings and four monitoring wells inside Building 21, to identify potential PCB impacts. The results of the investigations indicated soil impacts at the east end of the building, adjacent to and beneath the former PCB pipeline and transformer filling station; however, no groundwater impacts from PCBs were identified. Excavation and disposal of contaminated soils commenced in August 2000. The excavation was backfilled with imported fill, and the area re-paved (Geosyntec/ALTA 2006).

2.4 Operations and Maintenance

NGSC is conducting long-term monitoring, groundwater treatment, maintenance activities, and ICs according to the operations and maintenance (O&M) plan that was approved by EPA. O&M primarily consists of maintenance of the GETS system, as well as maintenance of the asphalt cap at the Reservoir 2 area. There have been no modifications or problems regarding the O&M plan requirements since the last FYR.

Since the last FYR, routine treatment equipment and well maintenance was performed and the GETS system operated within normal parameters. Pumps were replaced in Wells C and E-2 in 2012, including well and equalization tank cleaning. The Well E4 pump and pH probe electronics and control panel autodialer were replaced in 2013. Extraction wells A and C were partially redeveloped in 2014. Various well caps were replaced during the 2015 sampling event.

The average groundwater extraction rates at Wells A, B, C and E8 were 2.8 to 4.1 gallons per minute. Extraction rates for E1 through E5 typically ranged from 1.9 to 7.1 gallons per minute for the intermittent periods that the pumps were operational. Pumping from extraction well E8 was discontinued in September 2015 due to the well achieving ROD cleanup levels.

Extraction and treatment results are summarized Table 3 and Figure 3 including data since the initial inception of the system in 1992 and by FYR review period.

Table 3: Summary of GETS Performance

Parameter	1992-2001	2001-2005	2006-2010	2011-2015	Total 1992-2015
Total Water Extracted (million gallons)	87.9	34.7	40.9	34.8	198.3
PCBs recovered (pounds [lbs])	91.3	8.0	3.7	13.8	116.8
CB recovered (lbs)	3.4	5.4	6.4	5.1	20.3
1,2-DCB recovered (lbs)	6.6	4.1	3.1	1.8	15.6
1,3-DCB recovered (lbs)	23.1	29.4	15.2	11.1	78.8
1,4-DCB recovered (lbs)	23.4	31.1	16.4	9.1	80.0
1,2,4-TCB recovered (lbs)	13.6	118.8	72.2	46.6	251.2

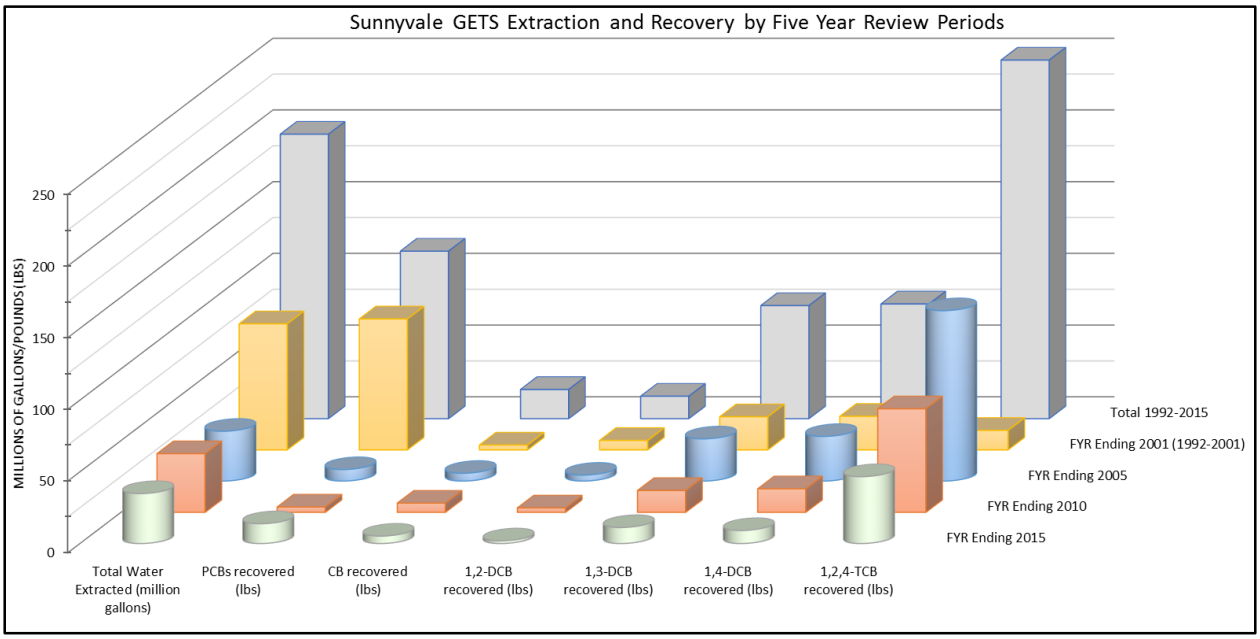


Figure 3: GETS Trends for Last Four Five-year Reviews and Containment System Startup

Note: 40 to 60 percent decrease for most of the dichlorobenzene compounds since the first FYR (Geosyntec, 2016, 2015, 2014, 2013, 2012). It is not known if FYR 2015 PCB recoveries are over-estimated due to surrogate exceedances.

Asphalt Cap Inspection and Repair

The cap inspection program documents that the asphalt cap, used as part of the soil remediation, effectively prevents exposure to contaminated soil. Additionally, cap inspections identify areas that need repair. NGSC assesses the condition of the cap using their Pavement Management Program to determine where repairs are required. Inspection of the whole Site (including the asphalt caps) will be conducted annually. During the Site inspection in January 2016, a visual inspection was completed and no significant issues were identified. In previous repairs, cracks were sealed using hot tar or tar emulsion and extensive damage required removal and repaving of the cap.

3 Progress Since the Last Five-Year Review

3.1 Previous Five-Year Review Protectiveness Statement and Issues

The protectiveness statement from the 2011 FYR for the Westinghouse Electric Corporation Superfund Site (Site) stated the following:

> *A protectiveness determination of the remedy at the Westinghouse Electric Corp. Superfund Site cannot be made at this time until further information is obtained. Further information will be obtained by taking the following action:*
>
> - *Evaluate whether there is a complete vapor intrusion (VI) exposure pathway to onsite employees*

This action was completed in January 2014 and an addendum to the 2011 FYR was issued. The protectiveness statement from the 2014 addendum from the Site stated the following:

The remedy at the Westinghouse Sunnyvale Site is currently protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. However to be protective in the long term, the following actions are needed:

- *Remove or cap shallow surface soils determined to contain in excess of 25 mg/kg PCBs.*
- *Finish implementing ICs by completing the last two LUCs.*
- *Identify and characterize potential unaddressed source areas that may be contributing to groundwater contamination upgradient of known sources.*
- *Evaluate strategies to optimize the remedy, including implementation of active treatment technologies.*

The 2011 FYR included four issues and recommendations. Table 5 lists each recommendation and its status.

Table 4: Status of Recommendations from the 2011 FYR

Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
Shallow surface soils in some areas of the Site contain PCBs exceeding the 25 mg/kg cleanup level as a result of the application of PCBs as herbicides.	Remove or cap shallow surface soils determined to contain in excess of 25 mg/kg PCBs.	Ongoing	Excavation of soils is underway and near completion.	N/A
Deed restrictions have not been implemented to prevent residential use, well construction, and/or excavation in source areas that remain contaminated.	Record an enforceable deed restriction between NGSC and the State of California with the Santa Clara County Recorder's Office. An additional deed restriction is necessary for the North Parking Lot area that was sold to the Valin Corp. The deed restriction should be consistent with current regulations for ICs, be enforceable by the State of California (with EPA listed as a third-party beneficiary) and should run with the land. Parties responsible for complying with the land use restrictions and requirements of the deed restriction should also be identified.	Ongoing	One deed restriction (i.e. North Parking Lot) was completed. Two deed restrictions to be completed.	8/1/2013
The vapor pathway for the Site has not been fully evaluated. Preliminary screening indicates a potential for vapor intrusion in worker-occupied buildings on site.	Evaluate whether there is a complete vapor intrusion exposure pathway to onsite employees.	Completed	Vapor intrusion report completed. Vapor intrusion of COCs was found to be absent at the Site.	January 2014
Progress towards achieving long-term groundwater restoration goals, using extraction and treatment, is limited. There may be some additional source areas outside the previously defined DNAPL zones.	Evaluate and characterize potential unaddressed source areas that may be contributing to upgradient groundwater contamination. Evaluate strategies, including active treatment technologies, to optimize remedy and achieve long-term cleanup goals.	Ongoing	No unaddressed source contributing to groundwater contamination was identified. However, evaluation is still being done to optimize the remedy.	N/A

3.2 Work Completed at the Site during this Five Year Review Period

A vapor intrusion (VI) investigation was completed on January 30, 2014, for Building 21 where employees are currently working full time. The investigation included collection of sub-slab samples and indoor air samples. Results from the sampling events indicates that the vapor intrusion pathway is not complete under existing conditions and does not pose a risk under the current building configuration. However, if Building 21 is ever subdivided into smaller areas or altered by installing self-contained office spaces with minimal ventilation, it is recommended that the potential for vapor intrusion should be reevaluated.

GETS extraction Wells A and C were redeveloped in November 2014 possibly due to increased drawdown, reducing pump efficiency and production. Sediment was bailed out, screens were brushed and bioacid polymer added, then the well was pumped while monitoring turbidity and pumping rates. It is not known if the well's hydraulic characteristics improved after redevelopment, for the field data (e.g., baseline and redevelopment specific capacity, and pH) was not included with the report, and the results were not discussed. Well C showed a nearly threefold increase in total PCBs detected after development, whereas Well A remained below analytical reporting limits. Both extraction wells showed no significant change in chlorobenzene trends after redevelopment based on the 2015 sample results.

Monitoring Wells W26R, W39, W47, and W60R were also redeveloped using the surge and pump method to improve sample quality. The surge and pump method applies the least amount of tangential force applied to the well screen and filter pack (compared to dual surge blocks and jetting), so is not an optimal approach for re-establishing a well's hydraulic connection to the aquifer and improving sample quality (ASTM, 2012, 2005; EPA, 1993; List, 1990). More rigorous well redevelopment methods will reset the filter pack and remove fines, reducing turbidity and sample matrix effects, and improve sample quality.

4 Five-Year Review Process

4.1 Community Notification and Site Interviews

EPA placed a public notice at the Santa Clara City Library in August 2016, stating that EPA is conducting a Five-Year review and invited the public to submit any comments to the U.S. EPA. There were no comments. The results of the review and the report will be made available at the Site information repository located at the following locations:

Santa Clara City Library 2635 Homestead Road Santa Clara, CA 95051 (408) 615-2900	and	Regional Records Center U.S. Environmental Protection Agency 75 Hawthorne Street, Room 3110 San Francisco, CA 94105 (415) 947-8717

Site documents are also located on EPA's web site: www.epa.gov/region09/westinghouse.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date**.** The results of these interviews are summarized below.

NGSC environmental health and safety manager, Jay Tolle, was interviewed because he is knowledgeable about the remedy and frequently observes on site activity. According to Mr. Tolle, the remedy is operating correctly with no recent difficulties or problems implementing ICs.

Mr. Tolle observed that the system shows containment with lower levels of contaminants each year. There have been no unexpected O&M difficulties or costs within the last five years. Lastly, the Mr. Tolle mentioned that there have been no opportunities recently to optimize the O&M or sampling efforts; therefore, the GETS system is removing COCs at a very high cost per pound.

4.2 Data Review

4.2.1 Groundwater

Groundwater elevations in the A- and B-aquifers varied 15 and 20 ft, respectively, over the 2001 through 2015 period, reflecting changes in precipitation and the current drought. During the remedial investigation (1990), the vertical hydraulic gradient between the A- and B1-aquifer was found to be downward, with water level in the A-aquifer 2 to 3 ft higher than the water level in the B-aquifer.

Except for the 2014 low water period, the vertical gradients have been upward since 2001 (some of the gradient results are below the best case surveying error). This indicates that no downward hydraulic gradients are present to drive dissolved phase contaminants into the B-aquifers. B-aquifer monitoring results show no indication of dissolved phase A-aquifer contaminants, indicating no downward contaminant flow against the upward gradients or across the leaky aquitard separating the A- and B-aquifers. Low recharge conditions and regional drought reduce the vertical gradient's magnitude across the A- and B-aquifers in the 2014 monitoring period. In 2015, vertical hydraulic gradient data between the A- and B-aquifers show again upward gradients ranging from 0.01 to 0.19 ft/ft, suggesting no ambient hydraulic driver for downward contaminant migration. It is not known how recently all of the wells were surveyed and to what level of precision and accuracy (two new wells were located using a back sight method), so gradient direction and/or gradient calculations may plot within the survey background noise (e.g., the W43/W62 gradient trend)

The extraction system appears to maintain contaminant containment in the two areas with historic DNAPL and under Building 21 (see Figure 4-6). Spikes in recovered PCBs and 1,2,4-trichlorobenzene appear to be due more to lower regional water levels and extraction system shut down/start up than redevelopment or minor changes in extracted groundwater volumes. Recovery amounts for all compounds peaked before 2005 (Figure 4). Specifically:

1. PCBs. Recovered amounts peaked by 2001, and have reduced by over 60% since then. Trend over the last three FYRs may be asymptotic.
2. Chlorobenzene. Essentially no change since the first FYR (2001).
3. 1,2-DCB. Steady decrease in recovered amounts since the first FYR (2001).
4. 1,3-DCB. Deceasing trend since second FYR (2005) may be approaching asymptotic.
5. 1,4-DCB. Deceasing trend since second FYR (2005).
6. 1,2,4-TCB. Deceasing trend since second FYR (2005).

The early peak of contaminant recoveries followed by flat line to slightly downward recovery trends suggest most of the contaminant mass accessible via a pump and treat system in this aquifer setting may have been removed.

Extraction Well C's theoretical capture zone may or may not be complete, but the remedy remains protective due to downgradient Well B's capture zone (Figures 5 and 6). Downgradient and offsite monitoring wells continue to show concentrations mostly non-detect or below the analytical reporting limits, indicating the remedy is operating as intended.

The GETS PCB samples for March, April, August, September, and December 2015 had analytical surrogate exceedances, but no follow-up investigation was done to assess potential causes, effects on the data (bias high or low, under/over reporting recovered PCB amounts), or implement corrective actions.

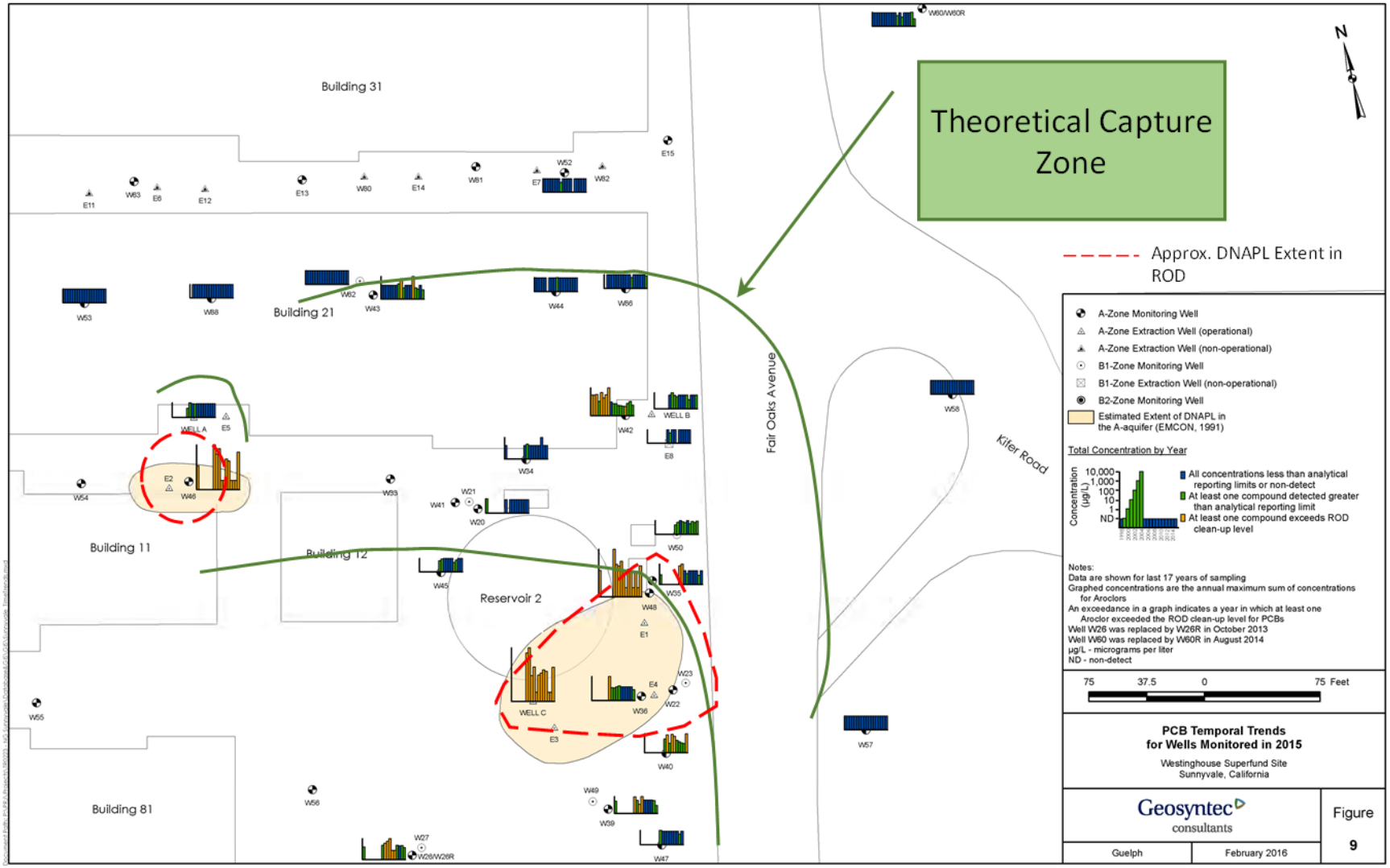


Figure 4: Chlorinated Benzene Trends in Groundwater from 1998 through 2015 and Theoretical Capture Zones
(Geosyntec, 2015)

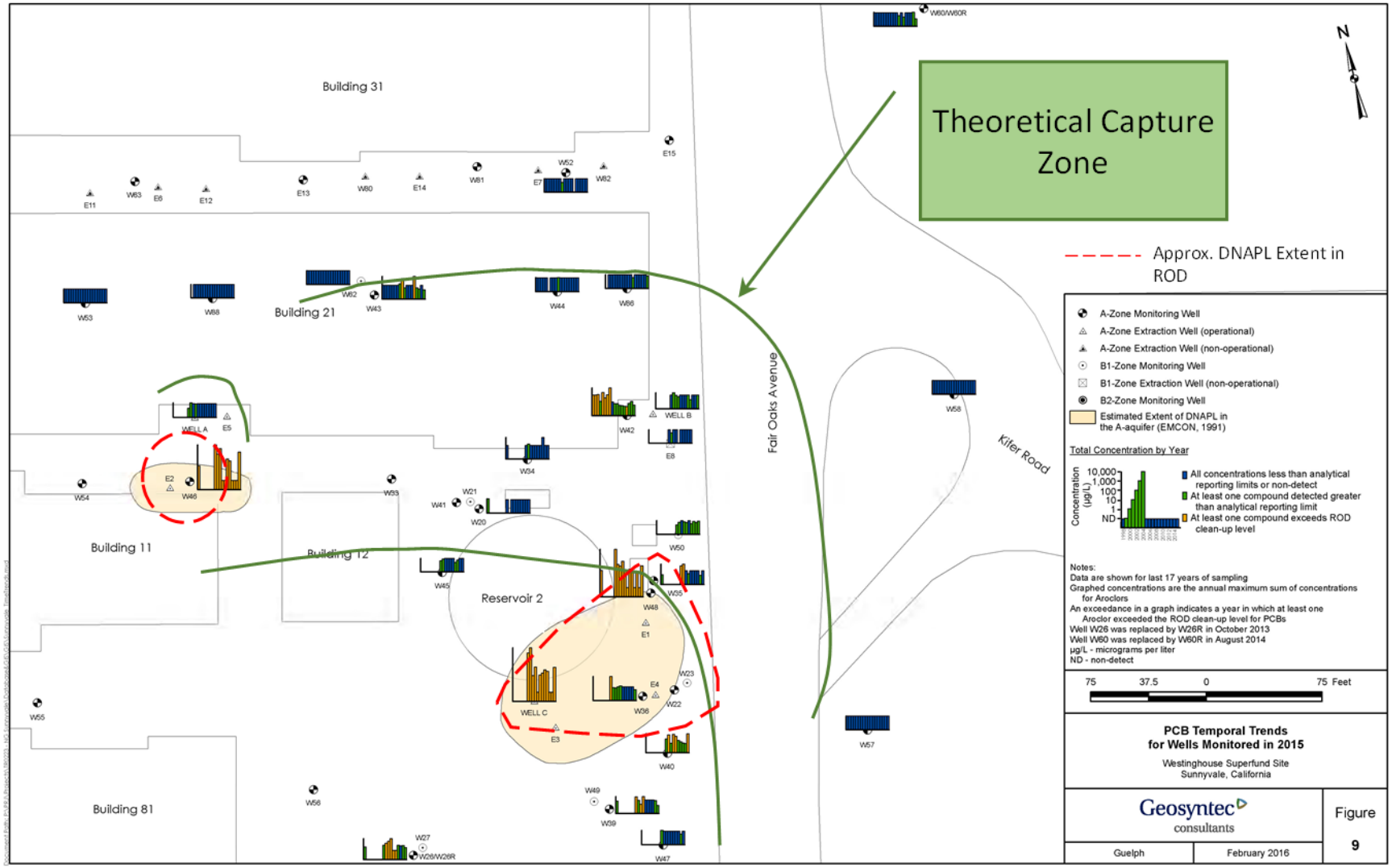


Figure 5: PCB Trends in Groundwater from 1998 through 2015
(Geosyntec, 2015)

Figure 6: COC Recovery Trends Compared to Extraction Volumes (Upper Panel) and Regional Groundwater Levels (Lower Panel)
(Geosyntec, 2015, 2014, 2013, 2012, USGS, 2016)

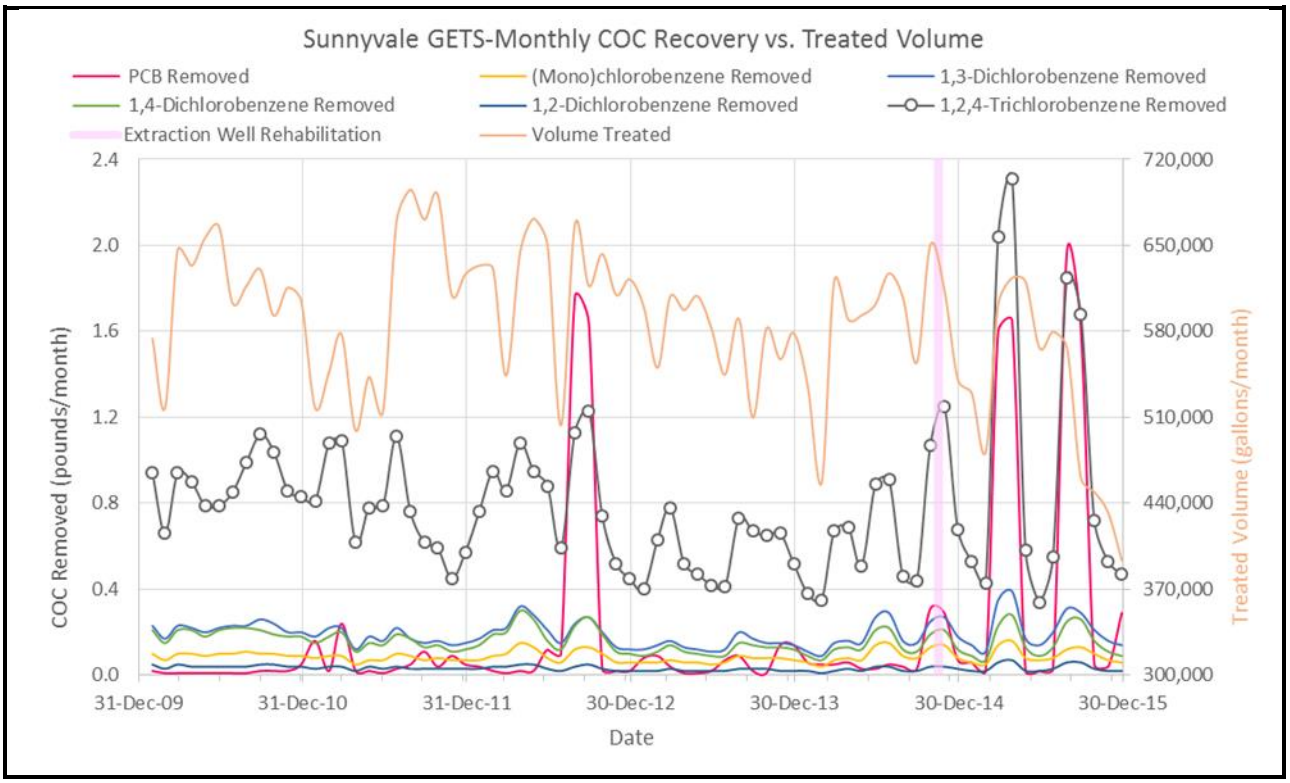


Figure 7. COC Recovery Trends Compared to Treated Volumes
(Geosyntec, 2015, 2014, 2013, 2012, USGS, 2016)

4.2.2 Soil Gas/Indoor Air

A vapor intrusion study was performed in Building 21 in 2012 and 2013. Sub-slab samples and indoor air samples were collected. Sub-slab sampling results were at least an order of magnitude less than the Site-specific screening levels, with the exception of one sample beneath Building 21 which had a TCE concentration of 180 µg/m^3 (the Site specific screening level for TCE is 100 µg/m^3). TCE and 1,2,4-trichlorobenzene (1,2,4-TCB) were not detected in any of the indoor air samples collected from this area of the building, which is consistent with the relatively low concentration of these VOCs in the sub-slab soil gas. Concentrations of the xylenes in indoor air were relatively low (at least an order of magnitude below the screening levels). These data provide evidence that the vapor intrusion pathway is not significant for the current building configuration.

Building 21 is large and includes open areas with significant ventilation. Future uses of this building may involve subdividing into smaller areas or installing of self-contained office spaces with minimal ventilation. The potential for vapor intrusion could become significant if building alterations involved subdividing into smaller areas, installing self-contained office spaces with minimal ventilation, or if there were modifications to the floor slab causing openings (such as sumps, floor drains, utility trenches etc.) to the sub-slab soil gas.

4.2.3 Storm Drain Data

Since the early 2000's the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), has conducted stormwater and sediment monitoring in public right-of-way locations (i.e., roadways, storm drain inlets and creeks/channels) to identify potential sources of PCBs to municipal stormwater conveyance systems. In July 2016, SCVURPP shared its draft memo with EPA containing data from collected in the storm drains adjacent to or downstream of the Westinghouse property. PCB concentrations in the sediment samples collected over the past 15 years near the Westinghouse property were considered elevated[1] in 6 of the 17 samples collected. The most recent sampling conducted in January 26, 2015 resulted in two samples containing the highest concentration of PCBs measured to date (4.84 mg/kg) and was collected from a stormwater conveyance manhole that receives stormwater flow from a public storm drain inlet on the north side of the property and from the Westinghouse property itself. In addition, a soil sample collected from the street near the main entrance also contained elevated levels of PCB[2]s (3.71 mg/kg). Sampling crews observed vehicle traffic leaving the site with vehicle sediment tracked onto East California Avenue. Contaminated soil was being excavated during this past year at the Westinghouse property.

[1] For purposes of addressing mandated TMDL reductions, elevated concentrations are those, which exceed 0.5 mg/kg.
[2] EPA's acceptable risk range for residential soil exposure is between 0.23 and 23 mg/kg. This exposure assumes daily intact over a 26 year period. Therefore, a concentration of 3.71 mg/kg would be consider protective.

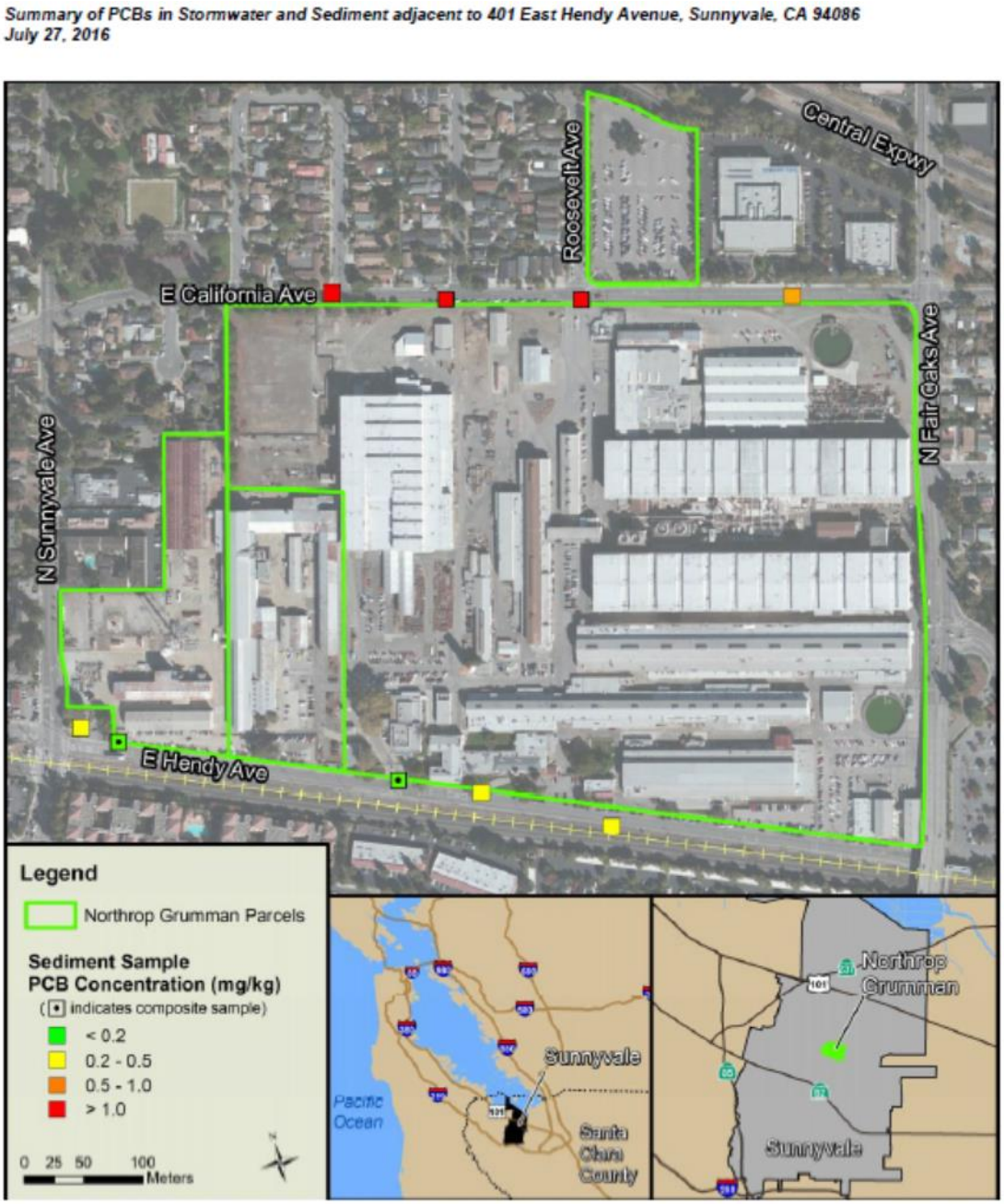


Figure 8 – Summary of PCBs in Stormwater and Sediment around Westinghouse Site

4.3 Site Inspection

The inspection of the Site was conducted on January 28, 2016. In attendance were Mark Samolis, EPA, and Jay Tolle, Northrup Grumman. The purpose of the inspection was to assess the protectiveness of the remedy.

The activities conducted during the Site inspection were inspection of the GETS, access controls, all O&M documents, and the asphalt cap. The interview of Jay Tolle was also conducted at this time. Mark Samolis viewed all areas of the Site visually, took pictures of the Site, and viewed O&M documents to make sure they were up to date and readily available.

During the Site inspection, the GETS system was seen to be functioning as intended and the groundwater remedy as a whole was seen to be effective and functioning as designed. There is no damage to the GETS, and the system is in good condition. The shallow surface soil exceeding the 25 mg/kg clean up level on site is being removed, and the entirety of the excavation work should be completed by the end of September 2016. There were no other significant O&M problems observed on the Site. Appendix G contains the detailed Site inspection notes.

5 Technical Assessment

5.1 Question A: Is the Remedy Functioning as Intended by the Decision Documents?

Yes, the review of documents and the results of the Site inspection indicate that the remedy is functioning as intended by the ROD, as modified by the ESDs. The GETS capture zones appear to be maintaining COC containment, with no ROD exceedances beyond the boundaries. However, the extraction wells' theoretical capture zones and gradient assessments may be affected by inconsistent survey data. The 2014 extraction and monitoring well redevelopment did not improve COC recovery rates or well production (the latter may be due to pump or treatment system limitation). Contaminant concentration trends within the theoretical capture zones are flat or slightly downward, indicating groundwater cleanup to MCLs will not occur over the short term. Monitoring wells outside the theoretical capture zones show sharper downward trends, with most below the analytical reporting limits, showing successful containment.

The excavation of shallow surface soil contaminated with PCBs throughout the site is in the final stages. All soil excavation is planned to be completed by the end of September 2016. Street soil sampling and storm drain sediment sampling indicated that concentrations of PCBs spiked this past winter, and storm water sediment samples have been historically elevated over the past 15 years. EPA intends to investigate these off-site PCB releases to determine if any additional remedial actions need to be conducted.

Most of the RAOs for the Site have been achieved. The groundwater extraction and treatment system appears to contain contaminants within their capture zones. None of the perimeter compliance wells showed ROD exceedances (all are mostly below analytical reporting limits or non-detect). In compliance with ARARs, the following action have been completed: discharge of the treated groundwater to the

storm sewer, by historic soils removal actions, and by maintenance of an asphalt cap over much of the Site. In addition, access controls through fencing and guarded gates reduce the potential for human exposure to contaminated soils. Deed restrictions should be completed shortly to ensure there is no exposure to contaminated aquifers.

Performance-based well redevelopment should be conducted on all extraction and monitoring wells within the monitoring program. Well development completed in 2014 applied the least amount of tangential force into the well screen and filter pack, and did not improve COC recovery rates.

Operating procedures, as implemented, have maintained the effectiveness of the remedial action and all equipment has maintained its performance condition. There were no large variances in O&M costs reported since implementation of the upgrades to the extraction and treatment system in 2001.

The selected remedy requires ICs, such as land use restrictions, to prevent well construction (for water supply purposes) in source areas that remain contaminated. Excavation below the 8 ft where soil has not been removed should also be restricted. Restrictions will also preclude excavation, other than temporary subsurface work, in the upper 8 ft and will require complete restoration of any disturbed fill or the asphalt cap once any such temporary work was completed in accordance with the EPA approved soil management plan.

ICs are not yet in place at the Site. NGSC is working with EPA and the State of California on deed restrictions for the Site that would include meeting all applicable requirements; two more LUCs are needed to complete this. Access controls are in place and effectively prevent exposures. The entire plant is fenced and the only access to affected areas is via guarded gates. The asphalt cap is in good condition, maintained regularly, and effectively prevents exposure to contaminated soils.

5.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of Remedy Selection Still Valid?

Yes, these assumptions are still valid. There have been no major changes to any ARARs. There have been a number of changes to the toxicity values for specific COCs in groundwater at the Site since the ROD was signed in 1991. The changes do not affect protectiveness.

There was a vapor intrusion study completed within the last 5 years. The investigation included the collection of sub-slab samples and indoor air samples. Results from the sampling events indicates that the vapor intrusion pathway is not complete under existing conditions and does not pose a risk under the current building configuration. However, if Building 21 is ever subdivided into smaller areas or altered by installing self-contained office spaces with minimal ventilation, it is recommended that the potential for vapor intrusion should be reevaluated. There have been no other changes in exposure pathways in the last 5 years.

The groundwater restoration and containment goals in the ROD are being met (refer to Section 4.2). The ROD goals are to: 1) to restore groundwater to health-based standards for all contaminated groundwater outside the two DNAPL source areas, and 2) to maintain permanent hydraulic containment of the source

area to prevent migration of COCs. COC reduction within the theoretical capture zones appears to be asymptotic, and will likely show little change without alternative source area remedies and/or performance-based well redevelopment.

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

No other information has come to light that could call into question the protectiveness of the remedy.

6 Issues/Recommendations

Table 5. Issues and Recommendations Identified in the Five-Year Review

OU(s): Westinghouse Site	**Issue Category: Institutional Controls**			
	Issue: Deed restrictions have not been implemented completely to restrict residential use, well construction, and/or excavation in source areas that remain contaminated. Two Land Use Covenants remain to be completed.			
	Recommendation: Record the Land Use Covenants			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	12/31/2016
OU(s): Westinghouse Site	**Issue Category: Monitoring**			
	Issue: The GETS may have reached its maximum effectiveness for restoration, as recovery of contaminants may have reached asymptotic levels.			
	Recommendation: Conduct a remediation system evaluation study.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	12/21/2017
OU(s):	**Issue Category: Other**			
Westinghouse Site	**Issue: Elevated PCB concentrations have been detected in street sediment and stormwater sediment adjacent to the Westinghouse property.**			
	Recommendation: Determine source of elevated concentrations, and implement appropriate actions to mitigate.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	12/21/2018

Note: PRP = Potentially Responsible Party

6.1 Other findings

The FYR identified the following recommendations that may improve performance of the remedy and reduce its O&M costs, but do not affect current protectiveness:

1. PCB Analytical Surrogate Exceedances. Investigate and document bias direction for the surrogate exceedances (low or high?), bias direction changes between events, and determine if these surrogate failures are a systemic problem of the laboratory (evaluate the surrogate recoveries of the batch QC samples (MB and LCS) as acceptable or exceeding), and documented in the annual reports and the FYR. If possible, identify which well or wells may be causing issues with the analytical results, assess possible remedies, and implement corrective action for the 2015 PCB analytical surrogate exceedances. Adjust and report historic data and recalculate PCB volumes removed and their trends.
2. Potential Well E8 Rebound. Assess potential COC rebound in well E8 by including it in the annual monitoring program for at least 3 years. Evaluate results and optimize GETS accordingly.
3. Residential/Commercial Well Survey. Review local well record repositories to verify conclusions regarding offsite groundwater use have not changed since the RI/FS.
4. Chlorobenzene Natural Degradation. If adopted as part of any future remedy, add full field water quality suite to the GETS and annual monitoring programs to help assess this remedy's effectiveness at this site.

The FYR identified as an issue to conduct a remediation system evaluation study (see Table 5). The study should include the following analysis:

1. Current DNAPL Boundaries. None of the 2014 redevelopment field observations or 4th FYR well sampling field forms noted any DNAPL-like fluids or sheen. Evaluate all lines of evidence to revise the 1991-era boundary. Consider adding W22 to the annual monitoring program.
2. Positional Data. Review of the types of surveying methods used, Google Earth vs. CSM cross section topographic profiles, and the age of the site strongly suggest potential error in theoretical capture zone calculations, vertical gradient analysis, and depiction of the site hydrogeology. Establish a minimum of two registered benchmarks be established at the eastern end of the Site. Resurvey the location and elevation of all wells in the monitoring and extraction program. Include one or both benchmarks in each data collection loop to quantitatively assess precision and accuracy.
3. Conceptual Site Model. Redraw the CSM cross section presented in the annual report, recalculate theoretical capture zone and vertical gradients. Assess remedy performance changes based on the results. This model must be tied to the same project vertical datum as the resurveyed wells tied to elevation, not depth, showing:
    - Sources (Building 21, historic DNAPL areas, current estimated DNAPL extent), pathways, and potential receptors (boundary monitor wells)
    - The A- and B-aquifers, their interpreted geology, and their current head conditions (currently show 2005 era data)
    - Potential DNAPL smear zone thickness based on water level changes
    - Estimated plume top and bottom boundaries

4. Incomplete Well Re-Development. Conduct performance-based well redevelopment in spring 2017 under high water level conditions to improve contaminant extraction and verify that results below analytical reporting limits represent aquifer conditions outside and downgradient from the theoretical capture zones, and not conditions within the filter pack. Appropriate well redevelopment could increase recovered volume while reducing electricity used, and improve sample quality.
5. GETS Operations. Verify extraction pumps performance curves match site head conditions for high and low water conditions and above grade plumbing. Monitor water levels for the extraction wells (automated) and up to three pairs of ambient A-aquifer monitoring locations (monthly manual measurements), and assess seasonal changes to theoretical capture zone extent. Monitor extraction well specific capacity and gallons pumped per kilowatt-hour usage by well, assess and report data trends, and optimize GETS operations.
6. Inappropriate Monitoring Locations. Wells not monitoring the A-aquifer (e.g., W26R), should be evaluated for re-drilling in a different location that represents the aquifer instead of a local fine-grained zone, using a different well construction approach (filter pack and screen slots sized to the formation), or abandoned.

7 Protectiveness Statement

Table 6. Protectiveness Statement

Sitewide Protectiveness Statement
Protectiveness Determination: *Protective*
Protectiveness Statement: The remedy at the Westinghouse Electric Corporation Superfund Site currently protects human health and the environment because exposure pathways that could result in unacceptable risks are being controlled. However, in order for the remedy to be protective in the long term, the following actions need to be taken: Record the Land Use Covenants, investigate the source of elevated PCBs levels outside the Westinghouse property, and conduct a groundwater remediation system evaluation study.

8 Next Review

The next FYR report for the Westinghouse Electric Corporation Superfund Site is required 5 years from the completion date of this review.

Errata Sheet – October 4, 2016

Corrections to Westinghouse Five Year Review dated September 2016

The following corrections were identified after the Five Year Review was signed.

Page 3: Delete: "The remedy remains protective, but questions regarding hydraulic containment system effectiveness limit its assessment and possible optimization." Insert: "Current sampling indicates that the remedy remains protective. However, this report recommends that hydraulic containment system effectiveness and possible optimization be addressed in a remediation system evaluation study."

Page 4: After: Street soil sampling and storm drain sediment sampling indicated that concentrations of PCBs spiked this past winter, and storm water sediment samples have been historically elevated over the past 15 years. Insert: This report recommends that EPA investigate this issue further and implement appropriate actions to mitigate if required.

Page 18: After: The GETS (groundwater extraction and treatment system) PCB samples for March, April, August, September, and December 2015 had analytical surrogate exceedances, but no follow-up investigation was done to assess potential causes, effects on the data (bias high or low, under/over reporting recovered PCB amounts), or implement corrective actions. Insert: This report recommends that these exceedances be addressed in a remediation system evaluation study.

Appendix A: List of Documents Reviewed

ALTA (2015). *Extraction and Monitoring Well Redevelopment Report. Westinghouse Superfund Site, Sunnyvale, California*. January 8.

ASTM (2005). *Standard Guide for Development of Groundwater Wells in Granular Aquifers*.

ASTM (2011*). Standard Guide 5978-96 Maintenance and Rehabilitation of Groundwater Monitoring Wells.* Reapproved 2011.

Borchers, G.W., Grabert, V.K., Carpenter, M., Dalgish, B., Cannon, D. (2014). *Land Subsidence from Groundwater Use in California.* Full Report of Findings prepared by Luhdorff & Scalmanni Consulting Engineers April, 2014, 1`93 p.

EMCON (1991). *Remedial Investigation and Feasibility Study Report, Westinghouse, Sunnyvale Facility, Sunnyvale, California*.

EPA (1991). *Record of Decision: Westinghouse Superfund Site, Sunnyvale, California*. EPA ID CAD981436363. September.

EPA (1993). *Subsurface Characterization and Monitoring Techniques - A Desk Reference Guide*, Volume I, *Solids and Ground Water Appendices A and B*. EPA 625/R-90-003a, Prepared by the Office of Research and Development.

EPA (1997). *Explanation of Significant Differences: Westinghouse Superfund Site, Sunnyvale, California, EPA ID CAD981436363*. February 1997.

EPA (2001a). *First Five Year Review Report for Westinghouse Superfund Site. Sunnyvale, CA.* September 2001.

EPA (2001b). *Comprehensive Five-Year Review Guidance*. OSWER Directive 9355.7-03B-P. 2001.

EPA (2002). *Draft Generic Groundwater Screening Levels for the Vapor Intrusion Pathway.* November 2002.

EPA (2005). *Polychlorinated Biphenyl (PCB) Site Revitalization Guidance under the Toxic Substances Control Act (TSCA).* EPA-HQ- OPPT-2004-0123. November 2005.

EPA (2006). *Second Five Year Review for Westinghouse Superfund Site. Sunnyvale, CA.* September 2006.

EPA (2008*). Explanation of Significant Differences: Westinghouse Superfund Site, Sunnyvale, California.* EPA ID CAD001864081. September 2008.

EPA (2011). *Third Five Year Review for Westinghouse Superfund Site. Sunnyvale, CA.* September 2011.

EPA (2014). MEMORANDUM from Enrique Manzanilla, Director Region 9 Superfund Division, to Region 9 Superfund Division Staff and Management. SUBJECT: EPA Region 9 Response Action Levels and Recommendations to Address Near-Term Inhalation Exposures to TCE in Air from Subsurface Vapor Intrusion. July 2014.

EPA (2015a). *Regional Screening Table – User's Guide.* http://www.epa.gov/risk/regional-screening-table-users-guide-november-2015

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Appendix B: ARAR Assessment

Section 121(d)(1)(A) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires that remedial actions at CERCLA sites attain (or justify the waiver of) any Federal or State environmental standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). Federal ARARs may include requirements promulgated under any Federal environmental laws. State ARARs may only include promulgated, enforceable environmental or facility-siting laws of general application that are more stringent or broader in scope than Federal requirements and that are identified by the State in a timely manner. ARARs are identified on a site-specific basis from information about the chemicals at the site, the remedial actions contemplated, the physical characteristics of the site, and other appropriate factors. ARARs include only substantive, not administrative, requirements and pertain only to onsite activities. There are three general categories of ARARs: chemical-specific, location-specific, and action-specific.

Chemical-specific ARARs identified in the selected remedy within the Record of Decision (ROD) and subsequent ROD Amendments for the groundwater at the Westinghouse Electric Corporation Superfund Site (Site) that were considered for this FYR for continued groundwater treatment, are shown in Table C-1. Contaminants with cleanup goals that exceed their current maximum contaminant levels (MCLs) are highlighted in light orange in Table C-1.

Table C-1. Summary of Groundwater ARAR Changes

Contaminants of Concern	1996 ROD cleanup goals (µg/L)	2015 State MCL (µg/L)	2015 Federal MCL (µg/L)	Is the cleanup goal above the current MCL?
Benzene	1	1	5	No
Chlorobenzene (CB) or Monochlorobenzene	30	70	100	No
1,2-Dichlorobenze (1,2-DCB)	600	600	600	No
1,3-Dichlorobenze (1,3-DCB)	130	-	-	No
1,4-Dichlorobenze (1,4-DCB)	5	5	75	No
1,2,4-Trichlorobenze (1,2,4_TCB)	5	5	70	No
Polychlorinated biphenyls (PCBs)	0.5	0.5	0.5	No
1,1-Dichhloroethane (1,1-DCA)	5	5	7	No
1,2-Dichloroethane (1,2-DCA)	0.5	0.5	5	No
1,1-Dichloroethene (1,1-DCE)	6	6	7	No
cis-1,2-Dichloroethene (*cis*-1,2-DCE)	6	6	70	No
1,1,1-Trichloroethane (1,1,1-TCA)	200	200	200	No
Ethylbenzene	680	300	700	Yes
Toluene	1,000	150	1,000	Yes
Trichloroethene (TCE)	5	5	5	No
Xylene (s)	1,750	1,750	10,000	No

Note: µg/L = micrograms per liter.

Two compounds have cleanup levels that are above their respective current MCL, ethylbenzene and toluene. No MCLs have changed in the last 5 years. Over the last 5 years of sampling, these two analytes were non-detect or detected below the respective reporting limit for each well and each sampling event, therefore protectiveness is not affected.

There have been no Federal or State laws and regulations other than chemical-specific ARARs that have been promulgated or changed over the past 5 years. The following ARARs have not changed since the last Five Year Review; and therefore, do not affect protectiveness:

- Porter-Cologne, California Water Code, Clean Water Act, Division 7 (40 Code of Federal Regulations (CFR) Section 13000)
- United States Code Title 15, Toxic Substances Control Act (Subpart D)
- Porter-Cologne, Clean Water Act (40 CFR, Basin Plan Resolution 6816)
- Endangered Species Act (16 United States Code 1531 et seq.) (50 CFR parts 200 and 402)
- Div. 20, Chapter 6.5, Health and Safety Code (Section 25232 (a)(1) and (2) and California Code of Regulations Title 22, Section 66001)
- California Civil Code Section 1471 (a)
- California Code of Regulations Title 22 (section 67391.1 (a), (b), (d), (g) and (i)

Appendix C: Institutional Control Assessment

Institutional controls (ICs) are non-engineered mechanisms used to implement land use restrictions to prevent human exposures to hazardous materials, hazardous wastes or constituents, or hazardous substances remaining on the property; to ensure the integrity of the remedial action; and to allow the U.S. Environmental Protection Agency (EPA, lead agency for the Comprehensive Environmental Response, Compensation, and Liability Act) and the State of California and their authorized agents, employees, and contractors access to a specified property to maintain and ensure the effectiveness of the remedial action, as necessary. Since hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the Westinghouse Electric Corporation Superfund Site (Site) at levels which are not suitable for unrestricted use of the land, land use restrictions are required and will be implemented through land use covenant/environmental restrictions pursuant to California Civil Code section 1471 and California Code of Regulations Title 22, section 67391.1.

The remedy selected in the 1991 Record of Decision requires the following institutional controls:

- Institutional controls, such as land use restrictions, to prevent well construction (for water supply purposes) in source areas that remain contaminated.
- Excavation below the 8 feet where contaminated soil has not been removed will be restricted. Restrictions will also preclude excavation, other than temporary subsurface work, in the upper 8 feet and will require complete restoration of any disturbed fill or the asphalt cap once such temporary work was completed.

In 2008, an Explanation of Significant Differences was published to clarify and add further detail to the requirement for ICs and required the following:

- To ensure long-term protectiveness, ICs should be put in place to prohibit sensitive uses (i.e., non-industrial/non-commercial including a portion of the North Parking Lot sold to Valin Corp.) where polychlorinated biphenyl (PCB) contamination in soils remains above levels suitable to remain uncapped on site (25 milligrams per kilogram).
- The land use covenant (LUC) shall be entered into by the owner(s) with the California Department of Toxic Substances Control (DTSC), naming EPA as a third-party beneficiary, and recorded in the County records.
- The LUC would require a soils management plan approved by EPA - to guide protocol for any subsurface excavation work at the Site.

Institutional Controls Status

ICs are not yet fully in place. Northrop Grumman Systems Corporation (NGSC), the current property owner, is working with EPA and the State of California on deed restrictions for the Site. NGSC submitted a draft deed restriction to EPA and DTSC dated April 10, 2003, to satisfy the Administrative Order requirement for ICs. EPA has subsequently indicated that a revised document

will be issued; this document will incorporate EPA and the State of California in the current agreed-upon language.

LUCs for the main Site have been drafted and are awaiting signature pending the completion of the remaining soil removal work. However, the sold portion of the North Parking Lot does have an LUC with deed restrictions.

Access controls are in place and effectively prevent exposures (Appendix G, Site Inspection Checklist). The entire plant is fenced, and the only access to affected areas is via guarded gates. The fence is currently in good condition. Unauthorized persons are not allowed in the plant. The asphalt cap is in good condition and effectively prevents exposure to contaminated soils. The system is fenced off from the rest of the plant and kept locked when not undergoing maintenance inspection.

Evaluation of Institutional Controls

Based on the results of the most recent Five-Year Review Site Inspection, which is summarized in Appendix G, there is no evidence of well construction for water supply purposes in source areas that remain contaminated. The Site remains in use for industrial purposes. Portions of the Site where PCB contaminated soils remain are generally capped with asphalt pavement.

Recommendations

The deed restriction should be completed for the Site. The deed restrictions should be entered into by the property owners and the State of California, naming EPA as a third-party beneficiary. The deed restrictions should be filed with the Santa Clara County Recorder's Office and should be consistent with all current LUC guidance and regulations issued by the State of California. The LUC will carry restrictions such as are necessary to ensure the protectiveness of and prevent damage to or interference with the remedial action. Additionally, monitoring, inspections, and reporting (such as the soils management plan) will be conducted to ensure compliance with the land use restrictions. The LUC shall run with the land and bind all successive owners and occupants.

Areas of the Site where PCBs remain at levels above those suitable for direct contact should be capped with pavement. The cap should be annually inspected and repaired on an as-needed basis.

Appendix D. Human Health and the Environment Risk Assessment

A risk assessment for the Westinghouse Electric Corporation Superfund Site (Site) was performed in July 2006, and was incorporated as part of the second Five-Year Review (FYR). Ingestion, dermal contact, and inhalation were all exposure pathways considered in this risk assessment for both contaminated soil and groundwater on the Site. Except for a potential exposure pathway through the storm drains just outside the Westinghouse property, there is no new information that indicates a new pathway that was not previously considered in the 2006 risk assessment and the 2014 vapor intrusion evaluation.

The 2006 risk assessment found that the risks presented by both groundwater and soil contamination are within or above the U.S. Environmental Protection Agency (EPA) acceptable risk range of 10^{-4} and 10^{-6} and still warrant action. The groundwater is being treated and there is no current use of the shallow contaminated groundwater. The soil remedy was to remove contaminated soils with concentrations of polychlorinated biphenyl (PCB) above 25 parts per million down to 8 feet (ft). However, due to the presence of utilities, this depth goal was not fully achieved. Soil contaminated with PCBs is present below ground surface above levels of concern. Exposure to these contaminated soils, in areas where 8 ft depth excavation was not completed, is limited by pavement and structures over the contaminated areas, and, therefore, there are no complete exposure pathways to these soils. However, institutional controls should be put in place to prevent excavation into and exposure of contaminated soil. Under usual Site operations there is limited exposure to contaminated soils. The risk assessment discusses the possibility that Inerteen (PCB material created by Westinghouse) may have been released and crossed the Site boundary and into the railroad right-of-way, that the area has not been investigated, and remains a data gap. However, since the initial risk assessment, this sampling effort was complete and resulted in a non-issue.

This evaluation of the 2006 risk assessment concluded that there currently is no risk to human health to the contaminated soils or groundwater, even though there are still contaminant of concern (COC) concentrations above action levels. The contaminated soils are capped with pavement, and there is no current use for the contaminated shallow groundwater. However, the risk assessment stated that ICs must be put into place to ensure that future contact with contaminated soil and groundwater would not take place.

Since the 2006 risk assessment was written, significant progress has been made in putting ICs in place and is almost completed; however, this step is not completely finished. There is no other new information or methodology with respect to the soil, groundwater, or any other aspects of the Site, which would affect the protectiveness of the remedy.

Vapor Intrusion

There is a potential for vapor intrusion (VI) at the Site. The potential is predicated on the presence of volatile organic compounds (VOCs) in the Site groundwater at concentrations exceeding EPA draft generic groundwater screening levels for the vapor intrusion pathway (EPA, 2002). The 2011 FYR

determined that there were contaminants in wells in the shallow water within 100 ft of two buildings; therefore, a potential for vapor intrusion exists at those buildings. Building 12 is used for storage only; and therefore, there is no exposure risk associated with VI. Building 21, however, is a multi-use building used for storage, manufacturing, and administrative/office space. Site employees occupy this building full time (40 hours per week). In addition, the 2011 FYR assessed the potential for vapor intrusion to nearby residences and determined there was no potential for vapor intrusion in this offsite residential area. The residential area east of the Site is not within 100 ft of wells where VOCs concentrations exceeded the draft generic screening levels.

In July 2014, EPA completed a review of the literature on trichloroethene (TCE) toxicity for both cancer and non-cancer toxicity effects which resulted in lower regional screening levels (RSLs) for TCE. For industrial exposures, assuming an 8-hour workday, the screening level for chronic exposure for cancer excess risk level of $l \times 10^{-6}$ is 3.0 micrograms per cubic meter (µg/m^3). In February 2012, EPA also reassessed the literature on tetrachloroethylene (also known as perchloroethylene or PCE) toxicity for both cancer and non-cancer toxicity effects. The reassessment determined that risk for cancer in excess of
$l \times 10^{-6}$ under industrial exposures was less stringent than originally assumed. However, in California, EPA uses the California-modified PCE indoor air screening levels that are more stringent than EPA's RSLs for PCE. California's Office of Health Hazard Assessment's PCE indoor air toxicity values of 2 µg/m3 for commercial/industrial exposures will be used for all National Priority List sites within California.

The first sampling event for the vapor intrusion pathway was done in September 2012. All samples collected were sub-slab gas probes in Building 21. Samples that had detections were at least an order of magnitude less than the Site-specific screening levels, with the exception of one sample beneath Building 21, which had a TCE concentration of 180 µg/m^3 (the Site specific screening level for TCE is 100 µg/m^3). This exceedance indicated a need for continued sampling to confirm if a completed vapor intrusion pathway exists.

The next sampling event was in April 2013 to collect indoor air samples. Table E-1 lists the results of the 2013 indoor sampling and includes the results from the outdoor air samples collected concurrently. TCE and 1,2,4-trichlorobenzene (1,2,4-TCB) were not detected in any of the indoor air samples collected from this area of the building, which is consistent with the relatively low concentration of these VOCs in the sub-slab soil gas. Concentrations of the xylenes in indoor air were relatively low (at least an order of magnitude below the screening levels). These data provide evidence that the vapor intrusion pathway is not significant for the current building configuration.

Finally, Building 21 is large and includes open areas with significant ventilation. Future uses of this building may involve subdividing into smaller areas or installing of self-contained office spaces with minimal ventilation. Although sub-slab soil gas TCE, 1,2,4-TCB, and xylene concentrations exceed conservative screening levels by less than a factor of four, the potential for vapor intrusion could become significant if building alterations involved subdividing into smaller areas, installing self-contained office spaces with minimal ventilation, or if there were modifications to the floor slab causing openings (such as sumps, floor drains, utility trenches etc.) to the sub-slab soil gas. Further, the Record of Decision requires Northrop Grumman Systems Corporation (NGSC) to notify EPA

Region IX "of any future intention to cease operations in, abandon, demolish, or perform construction (including partial demolition or construction) in Building 21." It is recommended that NGSC include an evaluation of vapor intrusion potential with these notifications.

All of this information is also consistent with the 2015 vapor intrusion guide, *OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air*, OSWER Publication 9200.2-154, as well as the numerical screening levels derived in the 2015 vapor intrusion Screening Level calculator made by EPA.

There are no issues that affect protectiveness. However, NGSC should evaluate the potential for vapor intrusion during any future renovation of Building 21.

Table E-1: 2013 Indoor and Outdoor Air Analytical Results

Location ID **Sample ID** **QA/QC Type**	**2015 Industrial Regional Indoor Air Screening Level**	**IA-3** **4/21/2013** **P1301691-019** **--**	**IA-5** **4/21/2013** **P1301691-021** **--**	**IA-7** **4/21/2013** **P1301691-020** **--**	**OA-1** **4/21/2013** **P1301691-022** **--**	**OA-2** **4/21/2013** **P1301691-023** **--**
	Parameters (µg/m3)					
1,1,1-trichloroethane	4.4	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
1,1,2,2-tetrachloroethane	0.21	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
1, 1,2-trichloroethane	0.77	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
1, 1-dichloroethane	7.7	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
1 ,1-dichloroethene	880	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
1,2,4-trichlorobenzene	8.8	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
1,2-dichlorobenzene	880	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
1,2-dichloroethane	0.47	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
1,2-dichloropropane	1.2	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
1,3-dichlorobenzene	--	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
1,4-dichlorobenzene	1.1	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
Allyl chloride	2.0	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
Bromodichloro-methane	0.33	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
cis-1,2-dichloroethene	--	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
Carbon tetrachloride	0.29	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
Chlorobenzene	220	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
Chloroethane	44,000	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
Chloroform	0.53	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
Chloromethane	390	**1.2**	**1.3**	**1.2**	**0.92**	**1.3**
cis-1,3-dichloropropene	0.77	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
Dibromochloro-methane	--	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
Dichloromethane (methylene chloride)	1,200	**0.69**	**0.83**	**1.0**	0.8 U	0.8 U
Methyl isobutyl ketone (4-methyl-2-)	13,000	**1.8**	0.76 U	**6.1**	0.8 U	0.8 U
m&p-xylene	440	**5.7**	1.5 U	**16**	**2.0**	1.6 U
o-xylene	440	**2.1**	0.76 U	**6.1**	0.8 U	0.8 U
Tetrachloroethene	2.1	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
trans-1,2-dichloroethene	--	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
trans-1,3-dichloropropene	0.77	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U
Trichloroethene	3.0	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U

Vinyl chloride	0.16	0.68 U	0.76 U	0.75 U	0.8 U	0.8 U

Notes: Results are in µg/m3; **Bold** value-= analyte was detected; -- No current screening level;
QA/QC = quality assurance/quality control; U = below Method Detection Limit

Toxicity values: EPA's Integrated Risk Information System (IRIS) has a program to update toxicity values used by the agency in risk assessment when newer scientific information becomes available. In the past 5 years, there have been a number of changes to the toxicity values for many COCs at the Site.

To evaluate the protectiveness of the cleanup standards for this FYR, those standards were compared to EPA's current RSLs and California DTSC's Human Health risk Note 3, Jan 2016. The RSLs for cancer are chemical-specific concentrations for individual contaminants that correspond to an excess cancer risk level of 1×10^{-6} (or a Hazard Quotient [HQ] of 1 for non-carcinogens), and they have been developed for a variety of exposures scenarios (e.g., residential, commercial/industrial). RSLs are not de facto cleanup standards for a Superfund site, but they do provide a good indication of whether actions may be needed to address potential human health exposures. The EPA risk range is between 1×10^{-6} and 1×10^{-4}. Cleanup levels values that fall within this range were determined to be acceptable from a risk standpoint. The non-cancer RSLs correspond to a hazard index of 1.

Table E-2 and Table E-3 below present this comparison.

Table E-2: Comparison of Tap Water Regional Screening Levels to ROD Cleanup Standards

Contaminant of Concern	2016 Tap Water RSL for cancer risk (µg/L)	Protective Cancer Risk Range (µg/L)	2016 Tap Water RSL for non-cancer hazard (µg/L)	Cleanup Standard (µg/L)	Is the Cleanup Standard still protective?
Benzene	0.15	0.46-46	33	1	Yes
Chlorobenzene	-	-	78	30	Yes
1,2-Dichlorobenzene	-	-	300	600	No
1,3-Dichlorobenzene	-	-	-	130	N/A
1,4-Dichlorobenzene	0.48	0.48-48	570	5	Yes
1,1-Dichloroethane	2.8	2.8-280	3,800	5	Yes
1,2-Dichloroethane	0.17	0.17-17	13	0.5	Yes
1,1-Dichloroethene	-	-	280	6	Yes
cis-1,2-Dichloroethene	-	-	36	6	Yes
Ethylbenzene	1.5	1.5-150	810	680	No
Polychlorinated biphenyls	0.0078	0.0078-0.78	-	0.5	Yes
Toluene	-	-	1,100	1,000	Yes
1,2,4-Trichlorobenzene	1.2	1.2-120	4	5	Yes
1,1,1-Trichloroethane	-	-	8,000	200	Yes
Trichloroethene (TCE)	0.49	0.49-49	2.8	5	No
Xylene(s)	-	-	190	1,750	No

Note: µg/L = micrograms per liter

Table E-3. Comparison of Soil Regional Screening Levels to ROD Cleanup Standards

Contaminant of Concern	2016 Industrial Soil RSL for cancer risk (µg/L)	Protective Cancer Risk Range (µg/L)	2016 Industrial Soil RSL for non-cancer hazard (µg/L)	Cleanup Standard (µg/L)	Is the Cleanup Standard still protective?
Polychlorinated biphenyls (Aroclor 1260)	0.99	0.99-99	-	25	Yes

Any concentration below the cancer RSL indicates that cancer risk is low, while concentrations significantly above the cancer RSL may indicate an increase in cancer risk. For several COCs, the tap water RSLs for cancer risk are less than the cleanup standards as noted above. Of these COCs, the cleanup standards values are within the acceptable cancer risk range of 1×10^{-6} to 1×10^{-4} – with the exception of ethylbenzene – and are therefore considered protective with respect to cancer risks.

For ethylbenzene, the cancer RSL (1.5 µg/L) is less than the cleanup standard (680 µg/L). Recent (2014) groundwater monitoring reported all results for ethylbenzene as non-detect. Therefore, the potential exposure from ethylbenzene is protective with respect to cancer risks.

For non-cancer risk, four COCs (1,2-dichlorobenzene, 1,2,4-trichlorobenzene, trichloroethene (TCE) and xylenes) have values greater than the non-cancer RSL. Any concentration below the non-cancer RSL indicates that no adverse health effect from exposure is expected, while concentrations significantly above the non-cancer RSL may indicate an increased potential for non-cancer effects.

For 1,2-dichlorobenzene, the non-cancer RSL (300 µg/L) is less than the cleanup standard (600 µg/L). Recent (2014) groundwater monitoring results showed results that range from non-detect to 113 µg/L. These are levels that are significantly below the non-cancer RSL, therefore the cleanup standard still remains protective with respect to non-cancer risk for 1,2-dichlorobenzene.

For 1,2,4-trichlorobenzene, the non-cancer RSL (4 µg/L) is slightly less than the cleanup standard (5 µg/L), and therefore is considered protective for excessive non-cancer risks. Recent (2014) groundwater monitoring reports showed results that range from non-detect to 2,380 µg/L, with some results being above the non-cancer RSL of 4 µg/L. These values are also above the State and Federal MCLs.

For TCE, the non-cancer RSL (2.8 µg/L) is less than the cleanup standard (5 µg/L). Recent (2014) groundwater monitoring reports showed results that range from non-detect to 2.9 µg/L. For TCE, however, the cleanup standard was based on either the State or Federal MCL, which are both 5.0 µg/L, and the detected concentrations are all below the MCLs. MCLs are set at levels that EPA deems protective of human health. The cleanup standard for TCE is considered protective for non-cancer risks.

For xylenes, the non-cancer RSL (190 µg/L) is less than the cleanup standard (1,750 µg/L). Recent (2014) groundwater monitoring reports showed all results for xylenes were non-detect. These are

levels that are significantly below the non-cancer RSL, therefore the measured concentrations of xylenes are protective with respect to non-cancer risk.

Ecological Review

No ecological assessment has been done for the Site. Ecological risk was not initially evaluated within the ROD because the Site is covered with pavement or structures, access to the Site is restricted by a fence, sources of food are essentially nonexistent, and direct-contact exposures to COCs in soil on the Site by wildlife are unlikely. Recently however, elevated PCB concentrations have been detected in street sediment and stormwater sediment adjacent to the Westinghouse property. EPA and Northrop Grumman will be investigating this issue further with additional sampling to determine the source of these elevated concentrations, and implement appropriate actions to mitigate if required.

Appendix E: Press Notice

THE U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) BEGINS FOURTH FIVE-YEAR REVIEW OF CLEANUP AT THE WESTINGHOUSE (SUNNYVALE PLANT) SUPERFUND SITE

The EPA has been conducting cleanup operations of the Westinghouse Sunnyvale Superfund Site (Site) since 1994. As cleanup continues, EPA is required by law to review the constructed remedies, measure progress, and determine the Site's current protectiveness of human health and the environment. In 2016, a Five Year Review report will be completed and placed on the EPA website and Site Repository listed below.

Figure 1: Current Site Location

SITE LOCATION & HISTORY

The Westinghouse Site is approximately 75 acres and is currently operating as a Northrop Grumman Systems Corporation (Northrop) manufacturing facility. The Site occupies a 75-acre lot, located at 401 East Hendy Avenue in Sunnyvale, CA. During the mid-1950s, Westinghouse manufactured transformers that contained the chemical Inerteen – a Polychlorinated Biphenyl (PCB) – and a chlorinated benzene mixture with mineral oil added as an insulating fluid. Large scale storage and use of these chemicals resulted in extensive contamination of both soils and groundwater beneath the Site. PCBs were also applied as an herbicide along fence lines and railroad tracks, which also resulted in soil contamination.

CLEANUP ACTIONS

The EPA selected the following remedies to cleanup the groundwater and soil: extracting and treating groundwater; conducting removal of soil contaminants; and implementing land-use restrictions at the site. Northrop, under EPA supervision, began construction of the remedies in late 1994. Deep soil contamination in the main plant areas and the underground storage tank area were removed in late 1994. Complete treatment of the contaminated groundwater began in early 1995 and will continue until set cleanup goals are met. Finally, the removal of nearly all shallow soil contamination (6,038 tons) will be completed by the end of 2016.

FOR MORE INFORMATION

Please visit EPA's website for the Westinghouse Sunnyvale Site: www.epa.gov/superfund/westinghouse, visit the information repositories to review the administrative record, or contact:

Mark Samolis, EPA Project Manager
75 Hawthorne St. (SFD-9-4), San Francisco, CA 94105
(415) 947-4273
Samolis.mark@epa.gov

Information Repository:
Sunnyvale Public Library
665 West Olive Ave.
Sunnyvale, CA 94088

Appendix F: Interview Forms

Five-Year Review Interview Record

Site:	Westinghouse, Sunnyvale, CA	EPA ID No:	CAD008164081

Interview Type: [e.g. Visit, Teleconference, etc.]
Location of Visit: Sunnyvale, CA
Date: 1/28/16
Time: 10:00 am

Interviewers

Name	Title	Organization
Mark Samolis	Scientist	EPA

Interviewees

Name	Organization	Title	Telephone	Email
Jay Tolle	Northrop Grumman	EHS Manager	(410)765-0408	jay.tolle@ngc.com

Summary of Conversation

1) What is your overall impression of the project?
Project has been operating for some time now with no recent difficulties.

2) Is the remedy functioning as expected? How well is the remedy performing?
The system is containing COCs with dwindling removal efficiency. System containment is good.

3) What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?
Annual GW monitoring data shows containment with less and less decreases in contaminant levels.

4) Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.
There is an onsite presence for the GW treatment system.

5) Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect protectiveness of the remedy? Please describe changes and impacts.
No

6) What are the annual operating costs for your organization's involvement with the site?
See O&M attachment

7) Have there been unexpected O&M difficulties or costs at the site in the last five years? If so, please give details.
None

8) Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.
Nothing significant

9) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy? No

10) Do you have any comments, suggestions, or recommendations regarding the project?
The GW pump and treat system is removing COCs but at a very high cost/lb level...

Additional Site-Specific Questions

[If needed]

O+M Attachment

Annual O&M Costs

Task	2011	2012	2013	2014	2015	Comment
Accutest - Analytical associated with GETS opeartion	$11,220.00	$11,220.00	$11,220.00	$12,879.25	$11,825.50	2011- 2013 Analytical Costs Estimated
Utilties	$40,876.38	$28,460.80	$42,647.58	$43,142.79	$46,500.00	
Locus O&M	$60,000.00	$61,198.53	$47,764.62	$73,567.90	$45,692.65	2011 O&M Costs Estimated
Disposal Associated with GETS system	$8,000.00	$8,389.45	$7,758.29	$10,673.75	$8,459.85	2011 Disposal Costs Estimated
Site Groundwater Monitoring (Field Sampling, Laboratory, Data Evaluation & Reporting Costs)	$66,193.00	$35,705.00	$33,560.00	$76,459.00	$66,625.00	
Total	**$188,300.38**	**$146,985.78**	**$144,963.49**	**$218,736.69**	**$181,118.00**	

→ Well Work

Additional Mon.

Includes on-site plant maintenance staff, parts and supplies, disposal costs, water extraction fees, sampling, and utilities.

Appendix G: Site Inspection Checklist

Five-Year Review Site Inspection Checklist Instructions

Purpose of the Checklist

The site inspection checklist provides a useful method for collecting important information during the site inspection portion of the five-year review. The checklist serves as a reminder of what information should to be gathered and provides the means of checking off information obtained and reviewed, or information not available or applicable. The checklist is divided into sections as follows:

I. Site Information
II. Interviews
III. On-site Documents & Records Verified
IV. O&M Costs
V. Access and Institutional Controls
VI. General Site Conditions
VII. Landfill Covers
VIII. Vertical Barrier Walls
IX. Groundwater/Surface Water Remedies
X. Other Remedies
XI. Overall Observations

Some data and information identified in the checklist may or may not be available at the site depending on how the site is managed. Sampling results, costs, and maintenance reports may be kept on site or may be kept in the offices of the contractor or at State offices. In cases where the information is not kept at the site, the item should not be checked as "not applicable," but rather it should be obtained from the office or agency where it is maintained. If this is known in advance, it may be possible to obtain the information before the site inspection.

This checklist was developed by EPA and the U.S. Army Corps of Engineers (USACE). It focuses on the two most common types of remedies that are subject to five-year reviews: landfill covers, and groundwater pump and treat remedies. Sections of the checklist are also provided for some other remedies. The sections on general site conditions would be applicable to a wider variety of remedies. The checklist should be modified to suit your needs when inspecting other types of remedies, as appropriate.

The checklist may be completed and attached to the Five-Year Review report to document site status. Please note that the checklist is not meant to be completely definitive or restrictive; additional information may be supplemented if the reviewer deems necessary. Also note that actual site conditions should be documented with photographs whenever possible.

Using the Checklist for Types of Remedies

The checklist has sections designed to capture information concerning the main types of remedies which are found at sites requiring five-year reviews. These remedies are landfill covers (Section VII of the checklist) and groundwater and surface water remedies (Section IX of the checklist). The primary elements and appurtenances for these remedies are listed in sections which can be checked off as the facility is inspected. The opportunity is also provided to note site conditions, write comments on the facilities, and attach any additional pertinent information. If a site includes remedies beyond these, such as soil vapor extraction or soil landfarming, the information should be gathered in a similar manner and attached to the checklist.

Considering Operation and Maintenance Costs

Unexpectedly widely varying or unexpectedly high O&M costs may be early indicators of remedy problems. For this reason, it is important to obtain a record of the original O&M cost estimate and of annual O&M costs during the years for which costs incurred are available. Section IV of the checklist provides a place for documenting annual costs and for commenting on unanticipated or unusually high O&M costs. A more detailed categorization of costs may be attached to the checklist if available. Examples of categories of O&M costs are listed below.

Operating Labor - This includes all wages, salaries, training, overhead, and fringe benefits associated with the labor needed for operation of the facilities and equipment associated with the remedial actions.

Maintenance Equipment and Materials - This includes the costs for equipment, parts, and other materials required to perform routine maintenance of facilities and equipment associated with a remedial action.

Maintenance Labor - This includes the costs for labor required to perform routine maintenance of facilities and for equipment associated with a remedial action.

Auxiliary Materials and Energy - This includes items such as chemicals and utilities which can include electricity, telephone, natural gas, water, and fuel. Auxiliary materials include other expendable materials such as chemicals used during plant operations.

Purchased Services - This includes items such as sampling costs, laboratory fees, and other professional services for which the need can be predicted.

Administrative Costs - This includes all costs associated with administration of O&M not included under other categories, such as labor overhead.

Insurance, Taxes and Licenses - This includes items such as liability and sudden and accidental insurance, real estate taxes on purchased land or right-of-way, licensing fees for certain technologies, and permit renewal and reporting costs.

Other Costs - This includes all other items which do not fit into any of the above categories.

Additional Notes

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Note: Information in the checklist may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable."

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Westinghouse	**Date of inspection:** 1/28/16
Location: Sunnyvale, CA	**EPA ID:** CAD001864081
Agency, office, or company leading the five-year review: EPA	**Weather/temperature**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☑ Access controls
- ☑ Institutional controls
- ☑ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☑ Other: *e.g. Groundwater monitoring* Soil Removal and Some Capping
- ☐ Monitored natural attenuation
- ☑ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☑ Site map attached ☑ O+M Costs Attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Jay Tolle (Name) EH+S Manager (Title) 1/28/16 (Date)
   Interviewed ☑ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☑ Report attached _____

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

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

Agency:
Contact: Mark Samolis EPA RPM
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached

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

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

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

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

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☑ O&M manual	☑ Readily available	☑ Up to date	☐ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☐ N/A
☐ Maintenance logs	☑ Readily available	☑ Up to date	☐ N/A

Remarks

2. **Site-Specific Health and Safety Plan** ☑ Readily available ☑ Up to date ☐ N/A
G Contingency plan/emergency response plan ☑ Readily available ☑ Up to date ☐ N/A
Remarks

3.	**O&M and OSHA Training Records**	☑ Readily available	☑ Up to date	☐ N/A
	Remarks			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☑ N/A
	☐ Effluent discharge	☑ Readily available	☑ Up to date	☐ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☑ N/A
	☐ Other permits	☐ Readily available	☐ Up to date	☑ N/A
	Remarks			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☑ N/A
	Remarks			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☑ N/A
	Remarks			
7.	**Groundwater Monitoring Records**	☑ Readily available	☑ Up to date	☐ N/A
	Remarks			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☑ N/A
	Remarks			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☑ N/A
	☐ Water (effluent)	☑ Readily available	☑ Up to date	☐ N/A
	Remarks			
10.	**Daily Access/Security Logs**	☑ Readily available	☑ Up to date	☐ N/A
	Remarks			

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☑ PRP in-house ☑ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other _____

2. **O&M Cost Records** (See O&M Attachment)

☑ Readily available ☑ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost

From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost

From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost

From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost

From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost

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

Describe costs and reasons: There were no significantly high O&M costs during the last 5 years.

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 Security personnel patrol the site 24 hours.

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) On site by RP of access.
Frequency Daily
Responsible party/agency Northrop Grumman
Contact Jay Tolle
Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☑ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☑ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☐ N/A
Other problems or suggestions: ☐ Report attached
No LUCs in place at this time for the main site. LUCs however have been drafted and are awaiting signature pending remaining soil removal work.

2. **Adequacy** ☐ ICs are adequate ☑ ICs are inadequate ☐ N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☑ No vandalism evident
Remarks

2. **Land use changes on site** ☑ N/A
Remarks

3. **Land use changes off site** ☑ N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☑ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☑ Roads adequate ☐ N/A
Remarks

B. Other Site Conditions

Remarks Site is generally well maintained.

Soil / Pavement

VII. ~~LANDFILL COVERS~~ ☑ Applicable ☐ N/A

A. ~~Landfill Surface~~ Westinghouse Property - Main Site

1. **Settlement** (Low spots) ☐ Location shown on site map ☑ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** ☐ Location shown on site map ☑ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☑ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** ☐ Location shown on site map ☑ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☑ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** ☑ N/A
   Remarks_____

7. **Bulges** ☐ Location shown on site map ☑ Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** ☑ Wet areas/water damage not evident

☐ Wet areas ☐ Location shown on site map Areal extent_____

☐ Ponding ☐ Location shown on site map Areal extent_____

☐ Seeps ☐ Location shown on site map Areal extent_____

☐ Soft subgrade ☐ Location shown on site map Areal extent_____

Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☑ No evidence of slope instability

Areal extent_____

Remarks_____

B. Benches ☐ Applicable ☑ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay

Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay

Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay

Remarks_____

C. Letdown Channels ☐ Applicable ☑ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement

Areal extent_____ Depth_____

Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation

Material type_____ Areal extent_____

Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion

Areal extent_____ Depth_____

Remarks_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting

Areal extent_____ Depth_____

Remarks_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☐ Applicable ☑ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____

E. Gas Collection and Treatment ☐ Applicable ☑ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition G Needs Maintenance
Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs Maintenance
Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs Maintenance ☐ N/A
Remarks_____

F. Cover Drainage Layer ☐ Applicable ☑ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☑ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
☐ Siltation not evident
Remarks_____

2. **Erosion** Areal extent_____ Depth_____
☐ Erosion not evident
Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A
Remarks_____

4. **Dam** ☐ Functioning ☐ N/A
Remarks_____

H. Retaining Walls ☐ Applicable ☑ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☑ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☑ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
☐ Performance not monitored
Frequency_____ ☐ Evidence of breaching
Head differential_____
Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☑ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☑ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
☑ Good condition ☑ All required wells properly operating G Needs Maintenance G N/A
Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☑ Good condition ☐ Needs Maintenance
Remarks_____

3. **Spare Parts and Equipment**
☑ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks_____

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

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

C. Treatment System ☑ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers
☑ Filters 10μ, 2 in parallel, 2 GAC units in series with cleaner filter second in line; 2 5μ filters in series after GAC
☐ Additive (*e.g.*, chelation agent, flocculent)
☑ Others pH control as needed, flow control
☑ Good condition ☐ Needs Maintenance
☑ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☑ Equipment properly identified
☑ Quantity of groundwater treated annually See annual reports
☐ Quantity of surface water treated annually N/A
Remarks Daily routine O+M performed by Northrop Grumman system operator

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☑ Good condition G Needs Maintenance
Remarks

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☑ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks

4. **Discharge Structure and Appurtenances**
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks

5. **Treatment Building(s)**
☐ N/A ☑ Good condition (esp. roof and doorways) ☐ Needs repair
☑ Chemicals and equipment properly stored
Remarks Roof only outdoor enclosure, chain link fence around GETS, locked nightly and closed to prevent use as shortcut.

6. **Monitoring Wells** (pump and treatment remedy)
☑ Properly secured/locked ☑ Functioning ☑ Routinely sampled ☑ Good condition
☑ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks

D. Monitoring Data

1. Monitoring Data
☑ Is routinely submitted on time ☑ Is of acceptable quality

2. Monitoring data suggests:
☑ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☑ N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

- GW remedy is effective and functioning as designed
- Remaining soil removal work for PCB contamination should be completed in early 2016.

B.	Adequacy of O&M
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. • No significant O&M problems observed • LUCs for the main site have been drafted and awaiting signature pending completion of remaining soil removal work. Sold portion of the North Parking lot does have a LUC with deed restrictions however.

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.

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

Appendix H: Photographs from Site Inspection Visit

Photograph 1: Entrance to Northrop Grumman (formerly Westinghouse) Site in Sunnyvale

Photograph 2: Building 61 with Soil in Bottom Right Showing Soil Remaining to be Excavated;

Photograph 3: Groundwater Extraction and Treatment System

Photograph 4: Sample Points in Building 21 Used for the Vapor Intrusion Study

Photograph 5: Reservoir 2 – Pictured behind Reservoir is the GETS

Appendix I: Summary information regarding Polychlorinated Biphenyls (PCBs) in stormwater and sediment.

MEMORANDUM

Santa Clara Valley
Urban Runoff
Pollution Prevention Program

Campbell •Cupertino• Los Altos • Los Altos Hills• Los Gatos • Milpitas • Monte Sereno • Mountain View • Palo Alto
San Jose• Santa Clara • Saratoga • Sunnyvale • Santa Clara County • Santa Clara Valley Water District

TO: Melody Tovar and Elaine Marshall, City of Sunnyvale

FROM: SCVURPPP Program Staff

DATE: Revised DRAFT - July 27, 2016

SUBJECT: **Summary information regarding Polychlorinated Biphenyls (PCBs) in stormwater and sediment adjacent to 401 East Hendy Avenue, Sunnyvale, CA 94086 (APNs: 204-47-001, 204-47-002, 204-48-028, 204-46-008)**

Summary

Since the early 2000's the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), in coordination with the City of Sunnyvale and other Santa Clara Valley municipalities and the San Francisco Estuary Institute (via the SF Bay Regional Monitoring Program for Water Quality), has conducted stormwater and sediment monitoring in public right-of-way locations (i.e., roadways, storm drain inlets and creeks/channels) to identify potential sources of Polychlorinated Biphenyls (PCBs) to municipal stormwater conveyance systems. Elevated concentrations of PCBs have been observed at a number of sites in the Santa Clara Valley. Elevated PCB concentrations in sediments and stormwater collected adjacent to or downstream of, 401 East Hendy Avenue, Sunnyvale, CA (i.e., APNs 204-47-001, 204-47-002, 204-48-028, 204-46-008) appear to have originated from these properties that have a history of PCB-related contamination in soils and groundwater and are currently owned by Northrop Grumman Corporation (Corporation). This memorandum provides a brief history of the properties and summarizes the PCB data collected to-date.

Summary of Adjacent Public Right-of-Way Sampling

At least 17 sediment samples have been collected and analyzed[1] for PCBs from the public right-of-way adjacent to the properties of interest at 401 East Hendy Avenue, Sunnyvale, CA. These samples were collected from 2001- 2015 as part of three PCB source identification and characterization studies (KLI and EOA, 2002; Yee and McKee, 2010; SCVURPPP, 2015), and via a US EPA grant-funded street sweeping study along East California Avenue. Concentrations of PCBs observed in sediments via these studies are listed in Table 1 and illustrated in Figure 1.

PCB concentrations at levels considered elevated for the purpose of addressing mandated TMDL reductions (i.e., > 0.5 mg/kg) were observed in 6 of the 17 sediment samples collected. The most recent sampling conducted on January 26, 2015 via the *SCVURPPP PCBs and Mercury Source Identification Project* (SCVURPPP 2016) yielded two samples with the highest concentrations measured out of the 200+ samples collected in Santa Clara Valley during the project (Figure 2). One of these samples (SC-SNV-10-C) was collected near the main entryway to the property from California Avenue. The other

[1] PCBs were analyzed using either EPA 8082 or EPA method 1668 and a total of 40 congeners are reported. All data are presented as the sum of all 40 congenors.

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elevated sample (SC-SNV-10-A) was collected from a stormwater conveyance manhole that receives stormwater flow from a public storm drain inlet on the north side of the property and from the property itself. During sampling, vehicle sediment tracking onto the public roadway (i.e. East California Avenue) from the property of interest was also observed. Based on field crew observations, it is highly likely that the sediment with elevated PCB concentrations originated from the Northrop Grumman property.

Table 1. PCB concentrations in sediments collected from public right-of-ways adjacent to Northrop Grumman properties located at 401 East Hendy Avenue, Sunnyvale, CA. Concentrations > 0.5 mg/kg are highlighted.

Sample ID	Sample Date	Latitude[1]	Longitude[1]	Sample Location	Total PCBs (mg/kg)	Reference
SCV035	9/25/2001	37.37628	-122.02338	SD Inlet	0.34	KLI and EOA, 2002
SVA06	7/5/2007	37.37708	-122.02448	Street dirt	0.25	Yee and McKee, 2010
SVA07	7/5/2007	37.37811	-122.02802	Street dirt	0.35	Yee and McKee, 2010
SVA08	7/5/2007	37.3811	-122.02472	SD Inlet	1.37	Yee and McKee, 2010
SVA09	9/11/2008	37.37988	-122.02039	SD Inlet	0.82	Yee and McKee, 2010
CAL-S-PRE-01	12/4/2013	--	--	Street dirt	0.26	Geosyntec, 2015
CAL-S-PRE-02	1/15/2014	--	--	Street dirt	0.31	Geosyntec, 2015
CAL-S-PRE-03	1/22/2014	--	--	Street dirt	0.37	Geosyntec, 2015
CAL-S-PRE-04	2/5/2014	--	--	Street dirt	0.36	Geosyntec, 2015
CAL-S-PRE-05	2/19/2014	--	--	Street dirt	0.42	Geosyntec, 2015
CAL-S-PRE-07	3/19/2014	--	--	Street dirt	0.32	Geosyntec, 2015
CAL-S-PRE-08	4/9/2014	--	--	Street dirt	0.62	Geosyntec, 2015
CAL-S-PRE-09	4/16/2014	--	--	Street dirt	0.55	Geosyntec, 2015
CAL-S-PRE-10	4/23/2014	--	--	Street dirt	0.31	Geosyntec, 2015
SC-SNV-10-A	1/26/2015	37.38052	-122.02357	SD Manhole	4.84	SCVURPPP, 2016
SC-SNV-10-B	1/26/2015	37.37708	-122.02520	SD Inlet	0.08	SCVURPPP, 2016
SC-SNV-10-C	1/26/2015	37.38025	-122.02232	Street dirt	3.71	SCVURPPP, 2016

[1] Samples collected via the Street Sweeping Study (Geosyntec, 2015) are composite samples collected along East California Avenue.

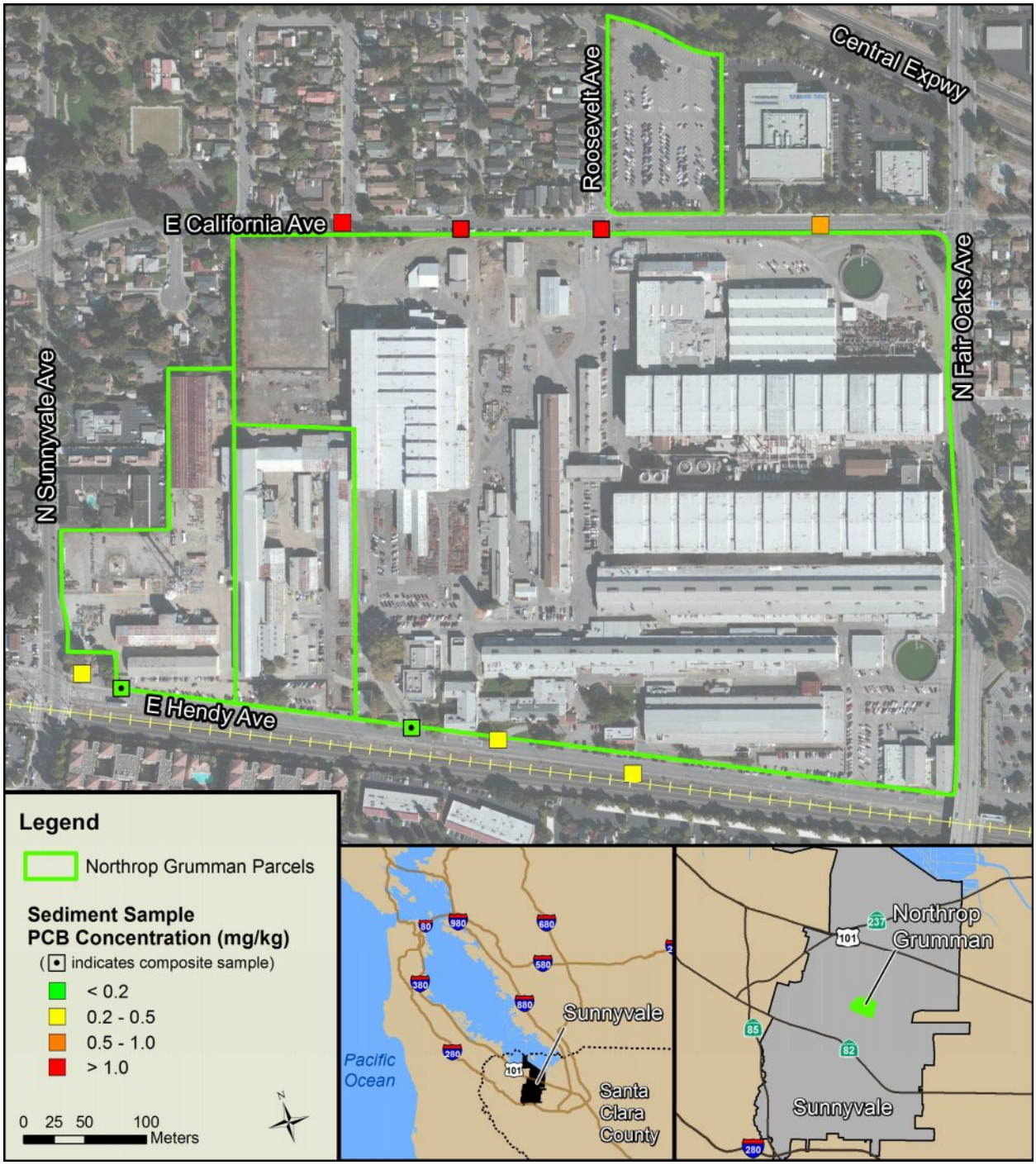

Figure 1. Sediment samples collected on public right-of-way locations near 401 East Hendy Avenue in the City of Sunnyvale, CA (KLI and EOA, 2002; Yee and McKee, 2010; SCVURPPP, 2016). Samples collected via the street sweeping study (Geosyntec 2015) are not illustrated but were collected along East California Avenue.

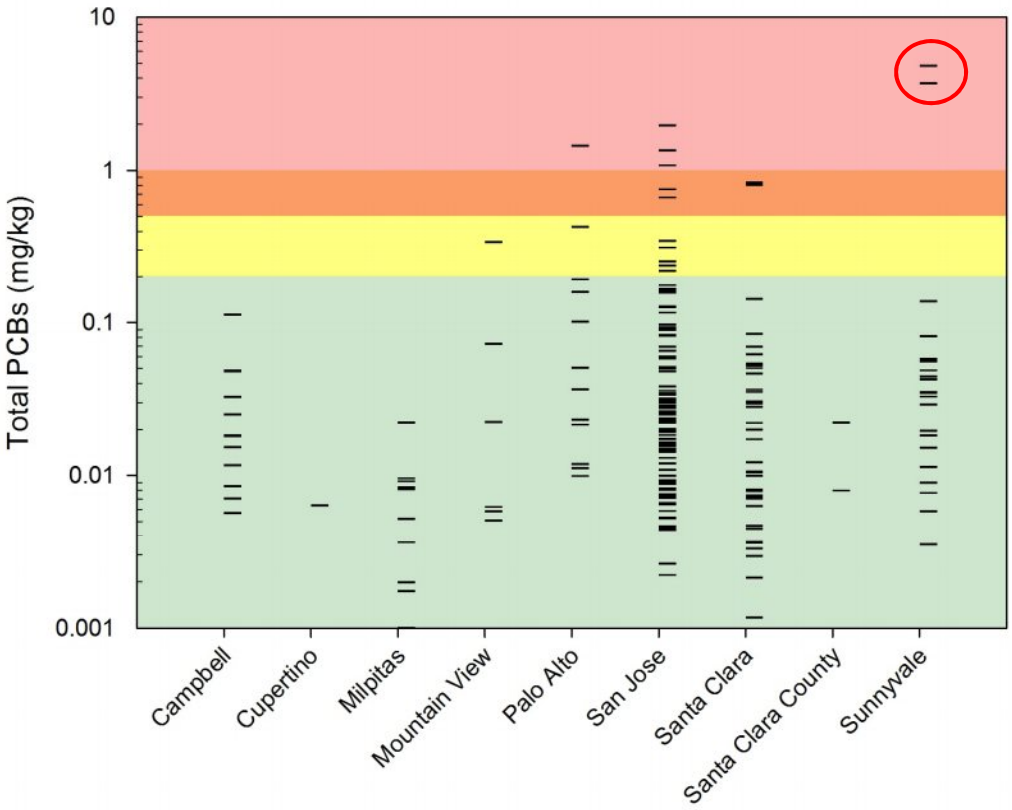

Figure 2. PCB concentrations in sediments collected from the municipal separate storm sewer system locations in 2015 and 2016. The highest concentrations observed (circled in red) are located in the vicinity of 401 East Hendy Avenue, Sunnyvale, CA. Note: four values less than 0.001 mg/kg and are not displayed in this figure.

Summary of Stormwater Sampling

In addition to sediment sampling on public right-of-ways, stormwater samples were also collected at locations throughout the San Francisco Bay Area via the San Francisco Bay Regional Monitoring Program for Water Quality (RMP) to better estimate PCB loading in to San Francisco Bay via stormwater conveyances. A monitoring site on Sunnyvale East Channel located downstream of Northrop Grumman was sampled 45 times between March 2011 to April 2014 (McKee et al. 2012; McKee et al. 2013). The location of the monitoring site in comparison to the properties of interest is illustrated in Figure 3.

PCB concentrations in stormwater collected during this effort averaged 96,600 pg/L (n=45) and 82% of the samples were greater than the Criterion Continuous Concentration Water Quality Criteria for PCBs in freshwaters (Table 2). Additionally, concentrations measured at the Sunnyvale East Channel are higher than those collected at the other 20+ stormwater monitoring stations sampled in the Bay Area, with the exception of sites downstream of known PCB hot spots in the cities of Oakland, San Carlos and Richmond. These hot spots are sites where PCBs were manufactured or heavily used in the past. All PCB data collected at the Sunnyvale East Channel monitoring station by the RMP are included in Appendix A.

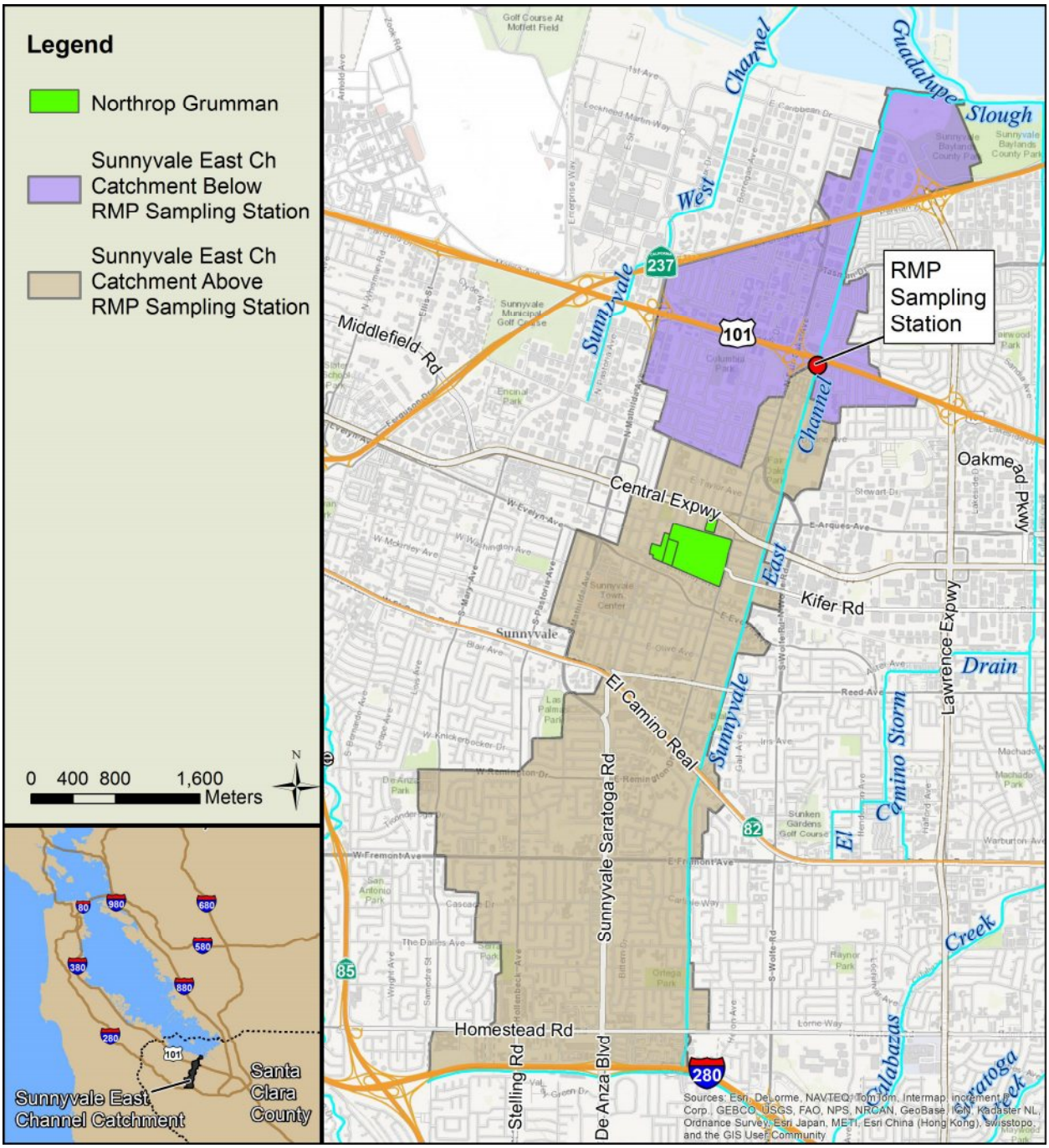

Figure 3. Location of RMP Pollutant of Concern Sampling Station and associated stormwater catchment.

Table 2. Descriptive statistics for PCB concentrations measured in stormwater sampled at the Sunnyvale East Channel monitoring location between 2011 and 2014.

Statistics	PCB Concentration (pg/L)
# of Samples	*45*
% Samples > Water Quality Criteria[2]	82%
Maximum	983,000
75 Percentile	103,000
Mean	96,600
Median	43,100
25th Percentile	19,000
Minimum	2,860

Historical and Current Site Uses and Ownership

The Hendy Iron Works plant was located on the properties of interest beginning in 1906.[3] A narrative of the plant in 1922 describes it as the largest foundry on the Pacific Coast, making equipment for irrigation, hydroelectric, construction, mining, and stamp mills. The plant was also vital to the production of large marine engines during both World Wars. The properties were bought by Westinghouse Electric Company in 1946 to make equipment for electrical utilities including turbines, transformers, switchgear, and motors.[4] From the mid-1950's through 1964, Westinghouse manufactured electrical equipment containing PCBs on the property, which resulted in PCB contamination of both the soil and groundwater. PCBs were also reportedly used as an herbicide on the property resulting in contamination in soils away from the main areas of PCB storage, transport and use.

Westinghouse Electric and the properties were purchased by Northrop Grumman in 1996, which currently manufactures steam generators, marine propulsion systems, and missile launching systems on the site.[5] Northrop Grumman currently owns and occupies four properties (70.1 acres), including a parking lot on the north side of California Avenue. An additional property (3.8 acres, APN 204-46-007) on the north side of California Avenue, formerly owned by Northrop Grumman, is currently owned by Sycamore Lake Partners LLC. These five properties and another small parcel (0.3 acres, APN 204-48-027) on the northwest corner of East Hendy Avenue and North Sunnyvale Avenue are within the boundary of the Federal "Superfund" National Priorities List Site.

Site Regulatory History and Remediation

Westinghouse Electric conducted initial studies into PCB contamination on the properties from 1981 to 1987. The properties were proposed for addition to the Federal "Superfund" National Priorities List in October 1984 and later added in June 1986. Since that time there have been ongoing efforts to remediate both the soil and the groundwater on the properties for PCBs and other constituents. The current remediation plan would remove or cap surface soils exceeding 25 mg/kg of PCBs and place deed restrictions on the properties. The cleanup goal is set to "protect human health and the environment" for industrial land uses. These levels are significantly higher than the PCBs levels of concern (i.e., 0.5 mg/kg)

[2] Criterion Continuous Concentration Water Quality Criteria for PCBs in freshwaters. US EPA, "The California Toxics Rule (CTR): Water Quality Criteria for Priority Toxic Pollutants for California Inland Surface Waters, Enclosed Bays and Estuaries," US Environmental Protection Agency Region 9, April 28 (2000).
[3] http://www.santaclararesearch.net/SCBIOS/hendyiron.html
[4] https://www.asme.org/about-asme/who-we-are/engineering-history/landmarks/34-joshua-hendy-iron-works
[5] http://www.northropgrumman.com

for municipal stormwater consistent with the San Francisco Bay PCB Total Maximum Daily Load (TMDL) adopted by the San Francisco Bay Water Quality Control Board in 2008.

Every five years the US Environmental Protection Agency (USEPA) reviews the site to determine if the remediation actions achieved the cleanup goals. The third review was completed in September 2011, and the fourth review is scheduled for 2016. Each of these reviews provides a summary of the site along with sampling results, remediation history, and a list of the actions that are needed at the site. These reviews along with other documents can be found on the USEPA's Superfund website.[6]

As described in the report from US EPA's third five-year review, surface or near surface soil samples were collected in the northeastern and northwestern portions of the properties at 401 East Hendy Avenue to characterize the extent and magnitude of PCB contamination. The sampling resulted in 46 of 151 samples exceeding the 25 mg/kg cleanup goal, with the highest concentration measuring 47,000 mg/kg (Figure 4, USEPA 2011). The majority of the samples with the highest concentrations were along the west side of the railroad tracks on the west side of building 61. The third five year review resulted in the following actions being needed at the site to ensure long-term protectiveness:

- *Remove or cap shallow surface soils determined to exceed 25 mg/kg PCBs.*
- *Implement Institutional Controls by placing deed restrictions on the site.*
- *Identify and characterize potential unaddressed source areas that may be contributing to groundwater contamination up gradient of known sources.*
- *Evaluate strategies to optimize the remedy, including implementation of active treatment technologies.*

Based on the results of the third five-year review, Northrop Grumman agreed to excavate to a depth of eight feet and dispose of all soil greater than 25 mg/kg by 2013.

The second and third reviews did not require the removal of soil with PCB concentrations from 1 -25 mg/kg. PCBs at this concentration range were observed throughout the property during the second and third reviews (USEPA 2006, USEPA 2011) and potentially could impact stormwater runoff or sediment/soils leaving the site.

[6] http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/vwsoalphabetic/Westinghouse+Electric+Corp.+%28Sunnyvale+Plant%29?OpenDocument

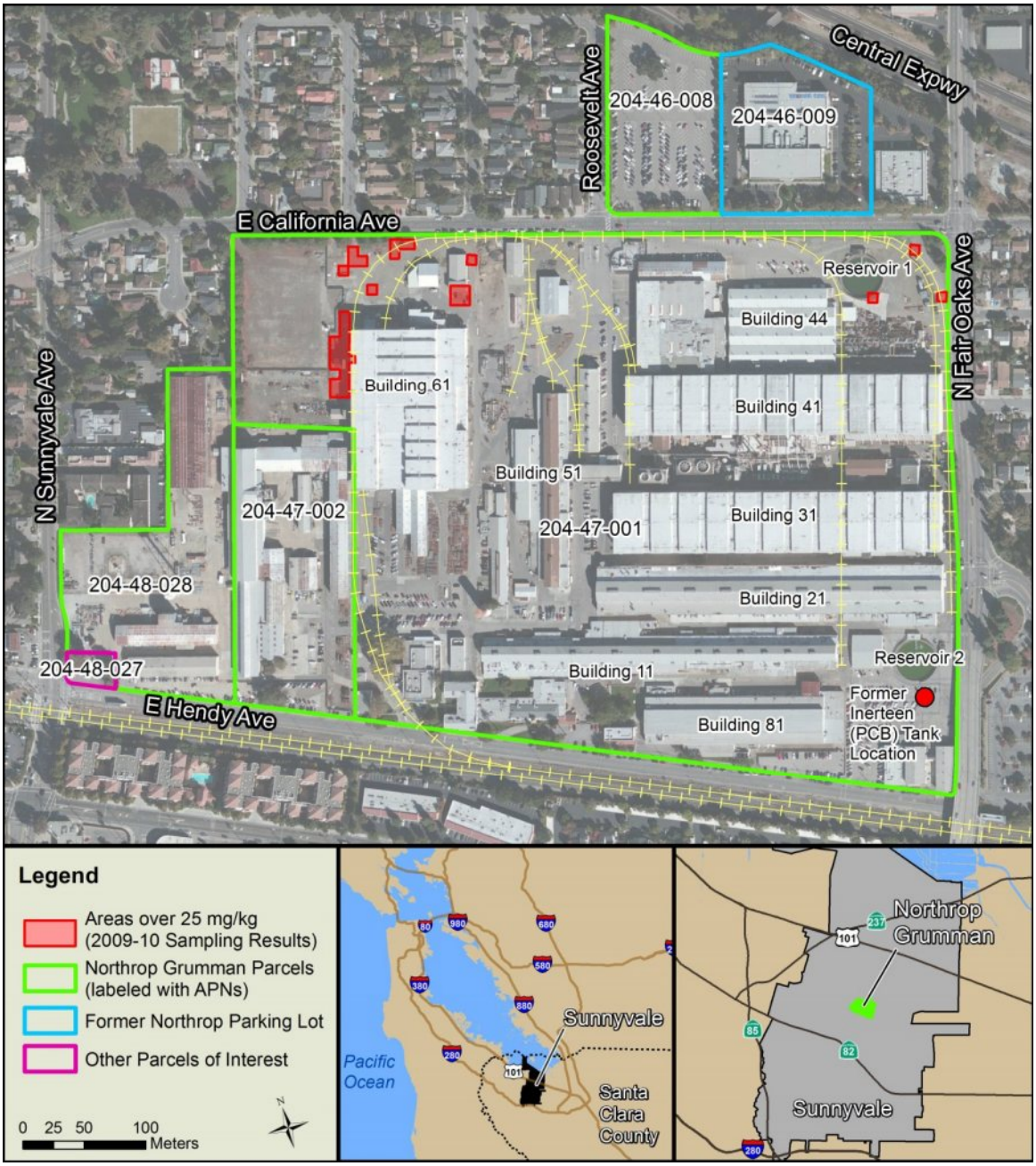

Figure 4. Northrop Grumman property with 2009-10 PCB sampling results (USEPA 2011).

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Appendix A: PCB and suspended sediment concentrations measured at the Sunnyvale East Channel stormwater monitoring station (McKee et al. 2012; McKee et al. 2013).

Date	Total PCBs (pg/L)	Suspended Sediment (mg/L)	PCBs to Suspended Sediment Ratio (mg/kg)
3/19/2011	23,820	234	0.10
3/19/2011	67,462	1106	0.06
3/19/2011	47,245	950	0.05
3/20/2011	48,253	162	0.30
3/20/2011	9,406	57	0.17
3/24/2012	5,227	17	0.31
3/24/2012	5,543	16	0.35
3/24/2012	3,269	13	0.26
3/25/2012	16,706	57	0.29
4/13/2012	119,497	363	0.33
4/13/2012	71,526	140	0.51
4/13/2012	58,453	77	0.76
4/13/2012	50,464	53	0.95
11/30/2012	25,316	325	0.08
11/30/2012	29,816	360	0.08
11/30/2012	171,869	418	0.41
11/30/2012	9,415	97	0.10
11/30/2012	9,158	76	0.12
12/2/2012	36,071	416	0.09
12/2/2012	175,622	2409	0.07
12/2/2012	87,693	792	0.11
12/2/2012	32,690	281	0.12
12/2/2012	14,919	138	0.11
2/6/2014	27,402	56	0.49
2/6/2014	33,670	189	0.18
2/6/2014	85,638	463	0.18
2/6/2014	23,457	182	0.13
2/6/2014	12,685	30	0.43
2/26/2014	133,808	392	0.34
2/26/2014	102,858	242	0.43
2/26/2014	95,758	136	0.70
2/28/2014	37,829	88	0.43
2/28/2014	40,545	157	0.26
2/28/2014	539,164	430	1.25
2/28/2014	982,772	274	3.58
2/28/2014	174,362	92	1.90
2/28/2014	43,145	142	0.30
2/28/2014	103,299	69	1.50
3/29/2014	2,861	39	0.07
3/29/2014	14,018	174	0.08
3/31/2014	18,992	194	0.10
3/31/2014	167,513	422	0.40
3/31/2014	169,911	124	1.37
3/31/2014	305,430	66	4.63
4/1/2014	111,181	140	0.79