

MFA Leasehold EIMP Appendix A - Part 2

3 March 2015

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Eler & Kalinowski, Inc. ("EKI") has provided a paper copy of the *Environmental Issues Management Plan* ("EIMP") for the MFA Leasehold on the Former Naval Air Station Moffett Field, California, dated 3 March 2015, prepared by EKI, to our CLIENT, Planetary Ventures, LLC.

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Sincerely,

ERLER & KALINOWSKI, INC.



Michelle K. King, Ph.D.
President

APPENDIX A

NASA EEC Statements

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EEC Table
(document order)

Site Name	Description	OU
Site 1	Runway Landfill	1
Site 2	Golf Course Landfill #1	1
Site 5	Fuel Farm	
Site 12	Firefighting Training Area	
Site 3	Marriage Road Ditch	2 East
Site 4	Former Industrial	2 East
Site 6	Runway Apron	2 East
Site 7	Hangars 2 & 3	2 East
Site 10	Airfields	2 East
Site 11	Engine Test Stands	2 East
Site 13	Equipment Parking Area	2 East
Site 15	Tanks & Sumps	
Site 19	Tanks 2, 14, 43, and 53	
Site 20	Zook Rd. Fuel Spill	
Site 22	Golf Course Landfill #2	
Site 23	Golf Course Fill Area	
Site 24	Active Petroleum Sites	
Site 25	Stormwater Retention Pond	6
Site 26	East Side Aquifer	5
Site 27/21	Northern Channel/Patrol Rd	
Site 28	West Side Aquifer	
Site 29	Hangar 1	
	Flux Ponds	
	Tanks Other USTs/ASTs	
	Potential New Sites	
	NFA Sites	
	AOI 15	
	Abandoned Navy Fuel System	

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SITE NAME:**Site 20: Zook Road Fuel Spill Site****SITE SUMMARY**

100,000 and 6,800 milligrams per kilogram (mg/kg) respectively. TPH-p as gasoline, BTEX, and naphthalene concentrations were not reported above reporting limits.

- From September 1994 to June 1996, the three monitoring wells were sampled four times and analyzed for TPH-e, TPH-g, and BTEX. TPH-e as diesel at a concentration 1,500 micrograms per liter ($\mu\text{g/L}$) was reported in the first quarterly sample from only one of the three wells. TPH-e characterized as other light components were reported in two wells, but decreased to below reporting limits by the last round of quarterly samples in one of these wells. TPH-p and BTEX were either reported as non-detect or were detected below the Environmental Screening levels (ESLs). The three wells were destroyed in 2005.
- In October 2009, six soil borings were advanced and soil samples were collected from 0 to 2 feet below ground surface (bgs) at the interval exhibiting the highest photoionization detector reading (PID) or at the water table, whichever was shallower. Grab groundwater samples were collected from each boring. Soil and groundwater samples were analyzed for TPH-e and polynuclear aromatic hydrocarbons (PAHs). TPH-e as JP-5 and kerosene were detected at concentrations greater than ESLs in one of the six borings greater than the cleanup level. Grab groundwater results were greater than ESLs for JP-5 and kerosene in two of the six borings.
- In March 2010, four borings were drilled to characterize the extent of JP-5/kerosene contamination and four borings were drilled to investigate a possible burn pit area. Soil samples from two 0 to 2 feet bgs and grab groundwater samples were collected. Soil and groundwater samples were analyzed for TPH-e (diesel range organics (DRO), JP-5, and kerosene) at all locations. Samples at the possible burn pit were also analyzed for PAHs. Soil results from all borings (ZR-SBHP-7 through ZR-SBHP-15) were below cleanup levels. Concentrations of JP-5/kerosene were reported in three groundwater samples. Based on investigation results, a source removal action for soil and the installation of a network of groundwater monitoring wells to characterize the extent of contamination were determined to be warranted at the site.
- In December 2010 five monitoring wells were installed within and downgradient of the excavation (Figure 3). Continuous soil cores were collected and examined for lithological interpretation and were field-screened for VOCs. Soil with the highest PID measurement was tested for TPH-e. All results were below reporting limits. Reporting limits were below ESLs except for JP-5, kerosene, and motor oil. These contaminants had a method detection limit of 110 $\mu\text{g/L}$, the ESL is 100 $\mu\text{g/L}$.

A source removal action was conducted at the site in November 2010. Approximately 150 cubic yards of soil were excavated; approximately 90 cubic yards were disposed of offsite and the remaining 60 cubic yards were used as backfill after sampling indicated concentrations were below cleanup levels. Approximately 4,500 gallons of groundwater that accumulated within the excavation was transported to the Navy's West-Side Aquifer Treatment System (WATS) for treatment. Approximately 225 pounds of oxygen releasing compound (ORC) were placed in the bottom of the excavation. Five monitoring wells were installed within and downgradient of the excavation for post-removal action groundwater monitoring.

SITE NAME:

Site 20: Zook Road Fuel Spill Site

SITE SUMMARY

Post-excavation confirmation soil samples collected from the excavation sidewalls and were analyzed for TPH-e. TPH-e was either not detected or was less than cleanup goals (the maximum observed concentration in these samples was 120 mg/kg of TPH-e as JP-5/kerosene) (Figure 4).

In a letter dated December 10, 2012, the RWQCB concurred that no further action was required at the Site 20 Zook Road Fuel Spill Site.

SITE NAME:	Site 20: Zook Road Fuel Spill Site
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REMEDIAL ACTION					
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Remedy	Source Control Measure	Begin Date	2010	End Date	2010
	<ul style="list-style-type: none"> • Excavation of 150 cubic yards of soil (cy) • 90 cy of soil disposed of off site • Confirmation sampling • 225 pounds of Oxygen Releasing Compound added to the excavation • Backfilling of the site with the remaining 60 cy of excavated soil and clean import • 4500 gallons of groundwater treated and disposed of 				

Land Use Restrictions	Development Issues
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<ul style="list-style-type: none"> • Under the NASA Programmatic Environmental Impact Statement and ROD, Mitigated Alternative 5, the proposed use of the airfield is to remain as an airfield. Site 20 is located within the airfield boundary and is subject to clearance restrictions as provided in 14 CFR Part 77, especially § 77.17 and § 77.19. This also prohibits residential use at the site. • The RWQCB NFA for Site 20 is based on the following restrictions: <ul style="list-style-type: none"> ○ No residential land use, ○ No grading, excavation, or subsurface activities without a soil management plan, ○ And notify the RWQCB of any land use change. 	<ul style="list-style-type: none"> • Possible contact with chemicals left in place during subsurface work • EIMP must be followed
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SITE NAME:	Site 20: Zook Road Fuel Spill Site
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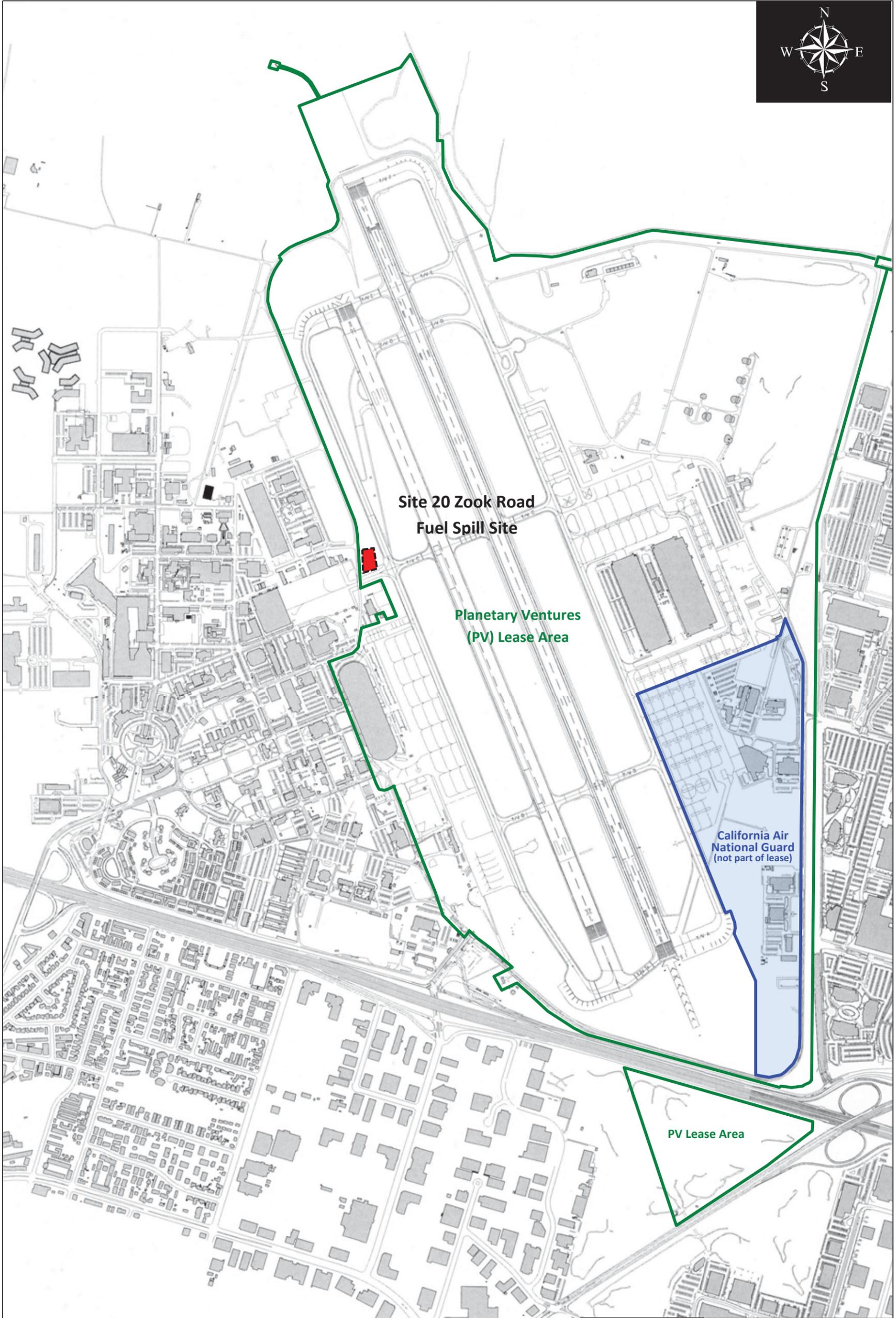
RESIDUAL CONTAMINATION		
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Compound	Residual Concentration (max)		Notes
	Soil (mg/kg)	Groundwater (µg/L)	
JP5/Kerosene	120		See Figures 3 & 4 for additional sites with residual contamination.

REFERENCES (Chronological Order)

- *Final Station-Wide Remedial Investigation Report, Moffett Federal Airfield, CA.* PRC Environmental Management, San Francisco, CA. May 21, 1996.
- *Base-Wide Petroleum Site Evaluation Methodology Technical Memorandum, Draft Appendix I, Site 20 Petroleum Evaluation, Moffett Federal Airfield, CA.* Tetra Tech EM Inc., San Francisco, CA. July 14, 2000.
- *Final Completion Report and Request for Closure or No Further Action for Moffett Petroleum Sites Former Naval Air Station Moffett Field, CA.* Tetra Tech EC Inc., San Diego, CA. June 2011.
- *Final Completion Report and Request for Closure or No Further Action for Moffett Petroleum Sites, Revision 1.* Tetra Tech EC Inc., San Diego, CA. August 2012.
- *No Further Action for Zook Road Fuel Spill Site, Former Naval Air Station Moffett Field, Santa Clara County. Letter from San Francisco Bay Regional Water Quality Control Board, Oakland, CA. December 10, 2012.*

FIGURES



Site 20 Zook Road
Fuel Spill Site

Planetary Ventures
(PV) Lease Area

California Air
National Guard
(not part of lease)

PV Lease Area

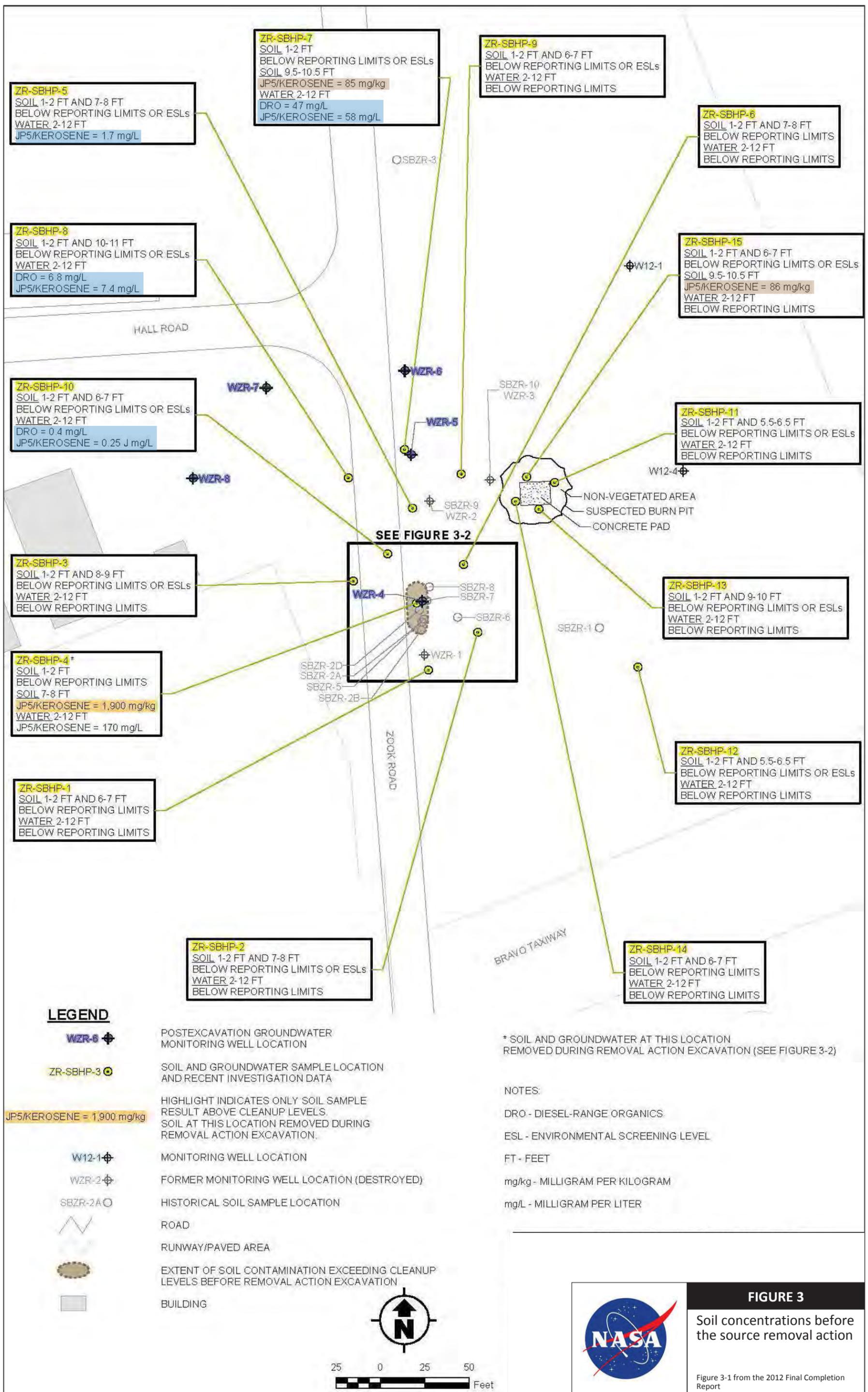


FIGURE 1

Location of Site 20 Zook Road Fuel Spill Site. The boundaries are approximate and not meant to represent legal property descriptions.



FIGURE 2
 Site 20 Zook Road Spill Site and Location of Possible AST
 Google Earth Photograph 9/26/2011



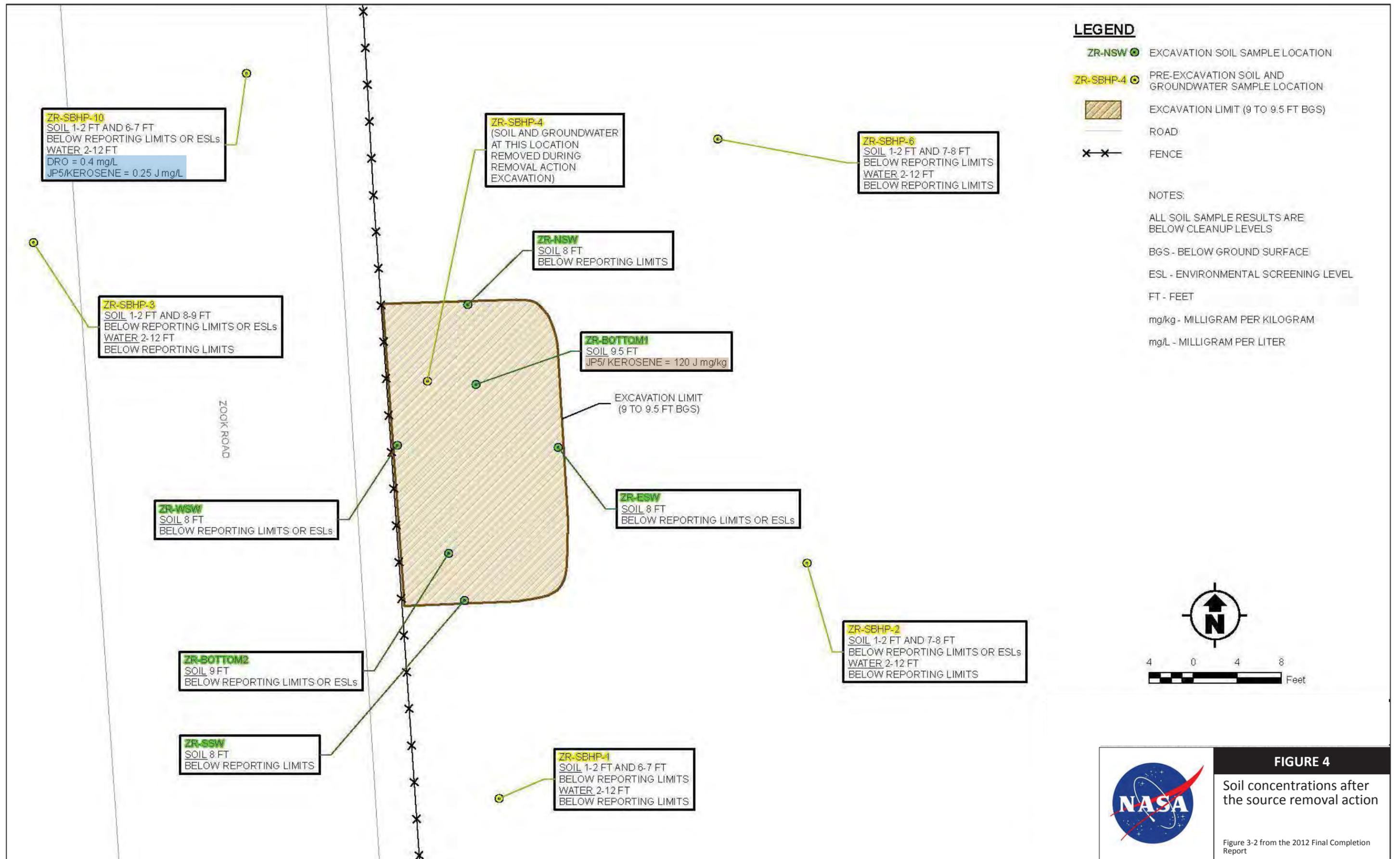


FIGURE 4
Soil concentrations after the source removal action

Figure 3-2 from the 2012 Final Completion Report

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SITE NAME:	Site 22 – Golf Course Landfill				
Version:	Final	Date:	2/25/2015		
RESPONSIBLE PARTY					
Organization	Department of the Navy, BRAC				
Address	1455 Frazee Rd., Suite 900 San Diego, CA 92108				
Contact	Scott Anderson				
	scott.d.anderson@navy.mil				
	619-532-0938				
LOCATION					
Facility Name	Moffett Federal Airfield	Site Location			
Facility Address	Mountain View, CA	Latitude	37.426153° N		
	Santa Clara County	Longitude	122.037726° W		
Regulatory Program	Lead Agency(ies)	Site Status			
		Open	Closed	ROD	Current Phase
CERCLA	EPA/RWQCB	X		Site 22 June 22, 2005	O&M
SITE SUMMARY					
<p>Site 22 is located at the northeast corner of Moffett Federal Airfield (MFA) (Figure 1). It is 9.4 acres in size and lies below golf course holes 3, 6, and 7 (Figure 2). The waste is buried about three feet below the surface. Approximately one-third of the refuse is located below the groundwater table.</p> <p>The landfill operated from about 1950 to 1967 (Figure 3). The landfill was used for the disposal of domestic wastes. Other wastes disposed of at the landfill were scrap equipment, paint, paint thinners, solvents, oil, fuel filters, and sawdust contaminated with polychlorinated biphenyls (PCBs).</p> <p>The Navy conducted soil and groundwater studies between 1994 and 1999. Investigation activities at Site 22 included ground-penetrating radar, a soil gas survey, soil sampling, groundwater sampling, aquifer testing (slug tests), and exploratory trenching.</p> <p>Soil and groundwater samples were collected from 17 boreholes, 7 monitoring wells, and five HydroPunch locations. Soil samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, PCBs, total petroleum hydrocarbons (TPH), and metals. Groundwater samples were analyzed for VOCs, SVOCs, pesticides, PCBs, TPH, and total and dissolved solids. HydroPunch samples were analyzed for VOCs and metals.</p> <p>The soil investigations indicated that concentrations of contaminants detected were higher within the landfill than samples from outside. Samples from within the landfill revealed the presence of VOCs, SVOCs, pesticides, PCBs, and TPH. Samples outside of the landfill detected sporadic and low concentrations of the VOCs 2-butanone, acetone, and carbon disulfide. For SVOCs, pyrene, flouranthene, and bis(2-ethylhexyl)phthalate were the only contaminants detected. Motor oil was the only TPH detected. Pesticides were found in shallow samples at depths from 0 – 1.5 feet below ground surface (bgs). Only one PCB detection was found in one borehole. Figures 4 and 5 illustrate the sampling locations and detections for VOCs, SVOCs, PCBs, and pesticides.</p>					

SITE NAME:**Site 22 – Golf Course Landfill****SITE SUMMARY**

Analyses of groundwater samples within the landfill areas indicated the presence of VOCs, SVOCs, TPH, and pesticides/PCBs. VOCs included chlorobenzene, benzene, ethylbenzene, and xylene detected above federal and state ambient water quality criteria (AWQC) for the protection of aquatic life. AWQCs were used as screening levels in the Site 22 Feasibility Study (FS). Groundwater in the area of Site 22 has Total Dissolved Solids (TDS) concentrations above both the 3,000 mg/L State Water Resources Control Board Resolution 88-63 and 10,000 mg/L EPA thresholds for a potential drinking water source. Maximum Contamination Levels (MCLs) would not apply since the groundwater is not a potential drinking water source. The only SVOC detected above AWQC was diethylphthalate. Other frequently detected SVOCs included 1,4-dichlorobenzene, 2-methylnaphthalene. Two pesticides, Aldrin and Gamma-BHC (Lindane), were detected in the landfill groundwater.

In the perimeter wells there were no detections of PCBs or pesticides. No detections of fuel-related compounds were detected more than once. There were infrequent detections of VOCs and SVOCs.

An air solid waste assessment test (SWAT) was conducted from February 3 to March 3, 1994. The goal of the air SWAT was to determine whether air emissions from the landfill were present and migrating off-site. The air SWAT results did not find that non-methane organics were migrating to the atmosphere. Methane gas was not found to be migrating from the site.

Seventeen exploratory trenches were dug on the perimeter and within the landfill to characterize the waste and to determine the extent of the waste. The waste was made up of domestic refuse along with scrap material, tires, and aircraft parts.

The Navy conducted a FS to develop alternatives for remediation of the landfill. Five alternatives were evaluated:

- Alternative 1 – No Action
- Alternative 2 – Biotic Barrier
- Alternative 3A – Multilayer Cap (clay layer) and Biotic Barrier
- Alternative 3B – Multilayer Cap (geosynthetic clay layer) and Biotic Barrier
- Alternative 4 – Excavation and Off-Site Disposal

Based on the evaluation from the FS, the selected remedy in the Record of Decision (ROD) was Alternative 2. In addition to the biotic barrier, the remedy included management of surface water flows, enacting institutional controls, and monitoring of groundwater and gas in the vicinity of Site 22. The institutional controls included access restrictions and limiting excavations that could compromise the integrity of the biotic barrier and disturb the waste within the landfill.

Construction of the remedy began in January 2003 and was completed in August 2003. The implementation of the remedy is documented in the *Final Remedial Action Report for Installation Restoration Site 22 Landfill*.

The *Final Post-Construction Operations, Maintenance, and Monitoring Plan (OMMP)* and Addendum established the long-term management plan for Site 22. The Navy developed calculated concentration

SITE SUMMARY

Limits (CCLs) as the standards for monitoring of the groundwater. The CCLs were derived by taking AWQCs or other appropriate surface water screening levels. These surface water screening levels were then multiplied by attenuation factors to provide the CCL. The CCLs are listed in Table 1.

Groundwater monitoring and level measurements are taken quarterly from 10 wells. The samples are analyzed for VOCs, SVOCs, and pesticides. Methane monitoring is done quarterly from four landfill gas monitor wells, 15 tree well locations, and 13 monitoring locations around the site. Monitoring also includes quarterly inspections of the landfill cover, water management, and vegetation (Figure 8).

Table 1. Calculated Concentration Limits (CCLs)¹

COCs ²	CCL (µg/L)
VOCs³	
Benzene	1,318
Chlorobenzene	3,376
Chloroform	3.5
Cis-1,2-Dichloroethene	68
Ethylbenzene	4,300
Toluene	500,000
Trichloroethene	8.8
Vinyl chloride	66
Xylene (total)	13
Pesticides	
Aldrin	13
Gamma-BHC (Lindane)	1.6
SVOCs⁴	
1,4-Dichlorobenzene	12,900
2-Methylnaphthalene	3,000
4-Methylphenol	130
Bis(2-Ethylhexyl)phthalate	30
Carbazole	37
Dibenzofuran	37
Diethylphthalate	340
Fluorene	3,000
Naphthalene	23,500

Notes:

1. From Table 4-4 in the Draft Post-construction Operations, Maintenance, and Monitoring Plan.
2. COCs – Constituents of Concern
3. VOCs – Volatile Organic Compounds
4. SVOCs – Semi-volatile Organic Compounds

Site Name:

Site 22 – Golf Course Landfill

OPERATION AND MAINTENANCE REQUIREMENTS (Navy)

Maintenance		Monitoring	
Inspections/Activities	Frequency	Parameters	Frequency
Settlement Survey:		Groundwater	
Survey markers SM-1 through SM-4	Annually	Monitoring Parameters	
General Site Conditions:		Physical:	
Water drainage	Quarterly	Temperature	Semi-Annual
Culvert/trench drainage	Quarterly	Conductivity	Semi-Annual
Warning/instruction signs	Quarterly	Dissolved oxygen	Semi-Annual
Inspect for nesting owls	Quarterly	Salinity	Semi-Annual
Landfill Cover:		pH	Semi-Annual
Erosion	Quarterly	Turbidity	Semi-Annual
Cracking	Quarterly	Analytical:	
Rodent burrows	Quarterly	VOCs (EPA Method 8260B)	
Vegetation cover	Quarterly	Benzene	Semi-Annual
Tree wells	Quarterly	Chlorobenzene	Semi-Annual
Water drainage	Quarterly	Chloroform	Semi-Annual
Landfill Gas Monitoring Wells:		Cis-1,2-Dichlorobenzene	Semi-Annual
Well cap integrity	Quarterly	Ethylbenzene	Semi-Annual
Water drainage	Quarterly	Trichloroethene	Semi-Annual
Concrete collar conditions	Quarterly	Toluene	Semi-Annual
Locks	Quarterly	Vinyl Chloride	Semi-Annual
Groundwater Monitoring Wells:		Xylene	Semi-Annual
Well cap integrity	Quarterly	SVOCs (EPA Method 8270C)	
Water drainage	Quarterly	1,4-Dichlorobenzene	Semi-Annual
Concrete collar condition	Quarterly	2-Methylnaphthalene	Semi-Annual
Locks	Quarterly	bis(2-Ethylhexyl)phthalate	Semi-Annual
Stormwater Runoff Control:		Carbazole	Semi-Annual
Water drainage	Quarterly	Dibenzofuran	Semi-Annual
Culvert/trench drainage	Quarterly	Diethylphthalate	Semi-Annual
Settlement	Quarterly	Fluorene	Semi-Annual
Erosion	Quarterly	Naphthalene	Semi-Annual
NASA Maintenance Requirements (2008 MOA)		Pesticides (EPA Method 8081A)	
Maintain vegetation, topsoil layer, irrigation system, and drainage	As needed	Aldrin	Semi-Annual
Maintain operation of the Bldg. 191 Lift Station	As needed	Gamma BHC (Lindane)	Semi-Annual
Conduct regular inspections of the site for compliance and performance of ICs	Quarterly	Wells (Figure 6)	
Provide periodic updates to the Navy, EPA, and Water Board on status of ICs	Quarterly	WGC2-1 (cross-gradient well)	Semi-Annual
		WGC2-4 (upgradient well)	Semi-Annual
		WGC2-5 (cross-gradient well)	Semi-Annual
		WGC2-6 (reference well)	Semi-Annual
		WGC2-8 (downgradient well)	Semi-Annual
		WGC2-9 (downgradient well)	Semi-Annual
		WGC2-10 (downgradient well)	Semi-Annual
		WGC2-11 (downgradient well)	Semi-Annual
		WGC2-12 (reference well)	Semi-Annual
		WGC2-13 (upgradient well)	Semi-Annual
		Landfill Gas (Figure 6)	
		Analytes	
		Methane	Semi-Annual
		Monitoring Network	
		LGMW-1 (landfill gas monitoring well)	Semi-Annual
		LGMW-2 (landfill gas monitoring well)	Semi-Annual
		LGMW-3 (landfill gas monitoring well)	Semi-Annual
		LGMW-4 (landfill gas monitoring well)	Semi-Annual
		Perimeter Points P1 – P13	Semi-Annual
		Tree Wells:	
		TW-2, -5, -9, -13, -15, -19, -21, -26, -30, -38	Semi-Annual
		TW-40, -42, -52- -54	Semi-Annual

SITE NAME:	Site 22 – Golf Course Landfill
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REMEDIAL ACTION			
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Remedy	Biotic Barrier (Figures 6 & 7)	Begin Date	Jan 2003	End Date	Aug 2003
<p>Cover (from bottom to top):</p> <ul style="list-style-type: none"> • 6-inch foundation layer • 12-inch layer of 4- to 8-inch cobblestone cover with a concrete & sand slurry • 6-inch coarse granular 3/8-inch pea gravel drainage layer • 8-ounce geotextile fabric layer • 8-inch topsoil layer capped a four-inch layer of sand <p>Tree wells were installed to allow the planting of trees at the golf course while not disturbing the biotic barrier. The tree wells consisted of a six-foot diameter plastic liner extending from the ground surface to the foundation layer.</p> <p>A new drainage swale was installed to carry water from the drainage layer on the northern portion of Site 22. The swale directed water into the North Patrol Road ditch through 2 1-foot diameter culverts.</p> <p>The cover was graded to direct sheet-flow water away from the landfill.</p>		<p>The golf course holes were restored on the surface of the landfill.</p>			

Land Use Restrictions	Development Issues
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<p>Institutional Controls:</p> <ul style="list-style-type: none"> • Protection of the structural aspects of the landfill cap (biotic barrier), • Prohibition of alterations to the drainage patterns or modification of surface contours, • Establishment of specific boundaries for the extent of the landfill, • Prohibition of extraction of groundwater from the site, • Prohibition of residential use, • Requirement of regulatory approval for consideration of alternative land uses, • Must indicate parties responsible for ongoing operations, maintenance, and monitoring activities of the site, • Requirement of annual reporting to the EPA regarding the implementation, monitoring, and efficacy of the ICs, • Must describe how the MOA will be enforced with NASA and with its site-specific tenants, • Requirement that the transfer of the site to a non-federal entity includes a restrictive covenant conveying the property with ICs as provided the MOA in place. <p>A Memorandum of Agreement between NASA and the Navy was established to address the ICs. The MOA is included as Attachment 1.</p> <p>NASA will provide notice to lessees of restrictions on the property prior to lease.</p>	<p>Any development will require to adherence to the ICs established for the site.</p> <p>Excavation at the site is limited to prevent damage to the biotic barrier.</p> <p>Development must not alter the topography of the site without regulatory approval to keep the water management features functioning as designed, this includes any grading in the vicinity of the landfill.</p> <p>Site 22 is located adjacent to the US Fish and Wildlife Service tidal marsh restoration.</p>
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SITE NAME:		Site 22 – Golf Course Landfill	
RESIDUAL CONTAMINATION			
Compound	Residual Concentration (max)		Notes
	Soil (mg/kg)	Groundwater (µg/L)	
DDD (SBGC2-9)	0.0068		Soil sample results from <i>Site 22 Final Feasibility Study</i> . Results are for borings outside the landfill.
PCB 1260 (SBGC2-11)	38		
Endosulfan II (SBGC2-11)	1.3		
Endrin Aldehyde (SBGC2-11)	0.610		
Trichloroethene (TCE)		1.7	
			Groundwater results from October 2013 sampling event as provided in the 2013 Drat Annual Report for Sites 1 and 22.
REFERENCES (Chronological Order)			
<ul style="list-style-type: none"> • <i>Site 22 Final Feasibility Study Report</i>. Tetra Tech EM, Inc., San Francisco, CA. March 17, 1999. • <i>Final Record of Decision, Site 22 Landfill, Moffett Federal Airfield, Moffett Field, CA</i>. Foster Wheeler Environmental Corporation, San Diego, CA. June 25, 2002. • <i>Appendix F, Final Post-Construction Operations, Maintenance, and Monitoring Plan, Installation Restoration Landfill, Moffett Federal Airfield, Moffett Field, CA</i>. Foster Wheeler Environmental Corporation, San Diego, CA. September 16, 2003. • <i>Final Remedial Action Report for Installation Restoration Site 22 Landfill</i>. Tetra Tech FW, Inc., San Diego, CA. April 8, 2004. • <i>Draft Site 22 Post-Construction Operations. Maintenance, and Monitoring Plan Addendum, Rev. 0, Former Naval Air Station Moffett Field, Moffett Field, CA</i>. Tetra Tech EC Inc., San Diego, CA. August 12, 2005. • <i>Final Site 22 Post-Construction Operations. Maintenance, and Monitoring Plan Addendum, Rev. 0, Former Naval Air Station Moffett Field, Moffett Field, CA</i>. Tetra Tech EC Inc., San Diego, CA. November 30, 2007. • <i>Environmental Program Overview, Former NAS Moffett Field, Moffett Field, CA</i>. Department of the Navy, BRAC PMO West, San Diego, CA. Spring, 2005. • <i>Final Five-Year Review Report, Installation Restoration Sites 1, 22, 26, and 28, Former Naval Air Station Moffett Field, Moffett Field, CA</i>. ChaduxTt, San Diego, CA. • <i>Draft 2013 Annual Report, Site 1 and Site 22 Landfill, Former Naval Air Station Moffett Field, CA</i>. OTIE, Walnut Creek, CA. April 2014. 			

FIGURES

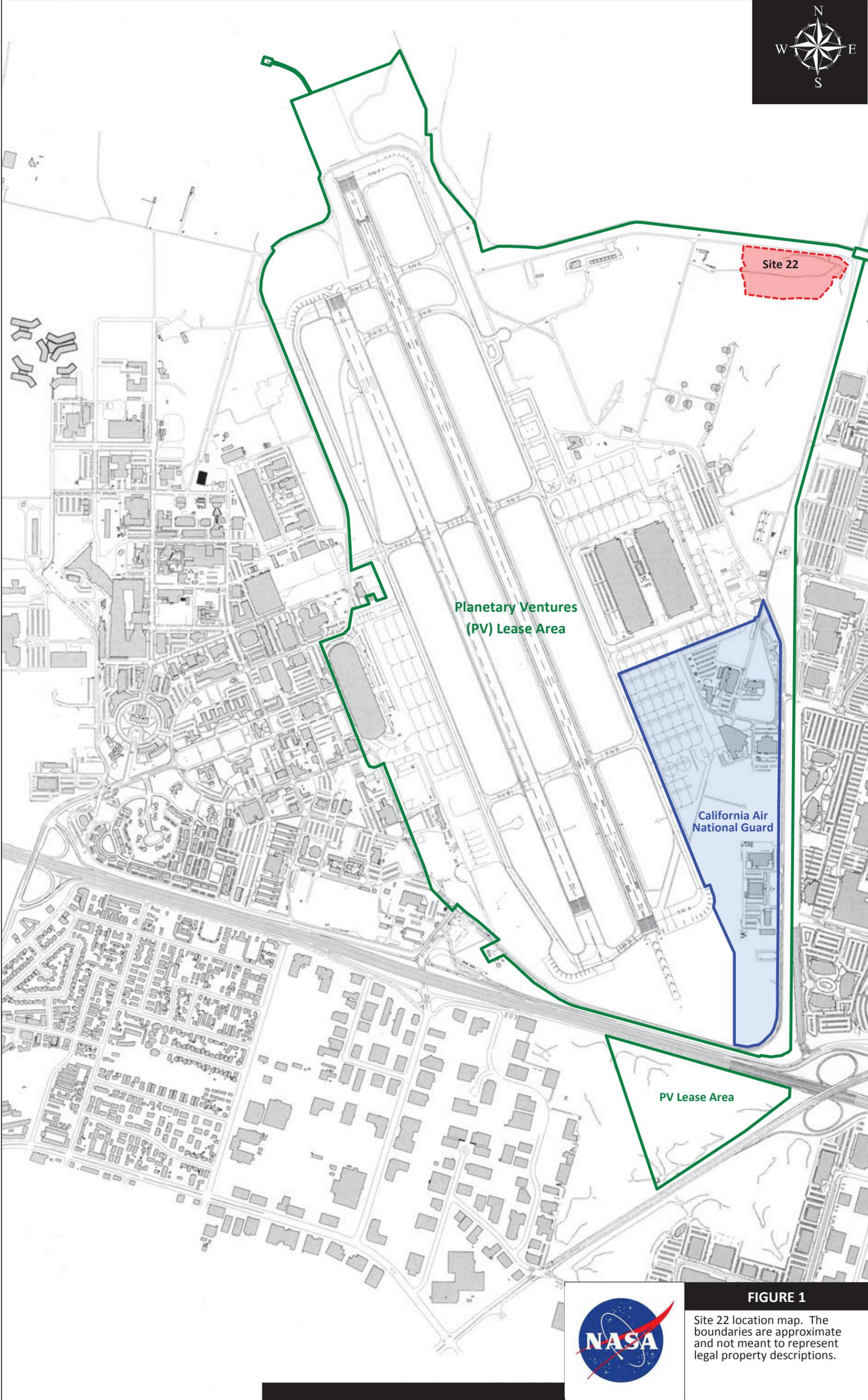
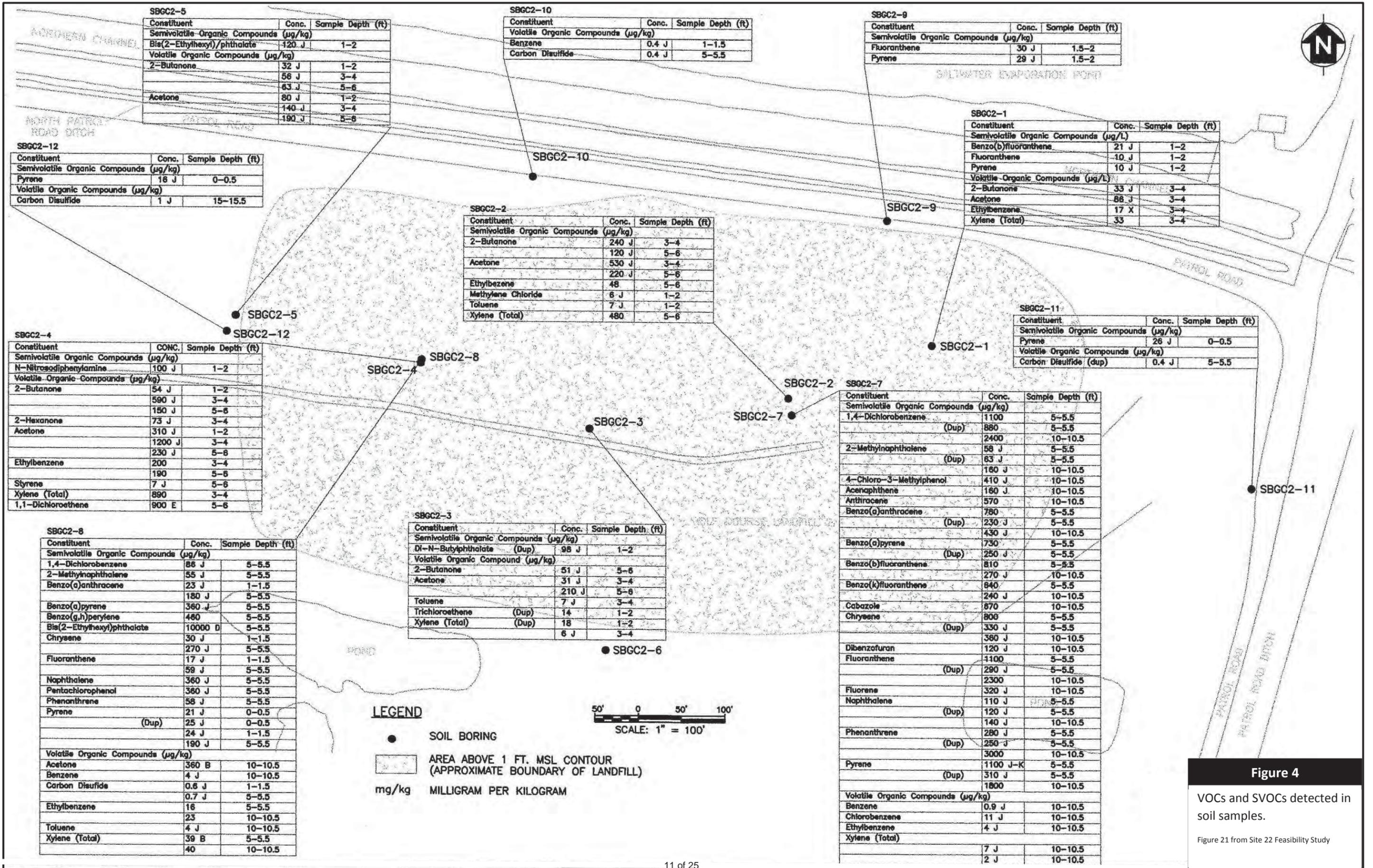


FIGURE 1

Site 22 location map. The boundaries are approximate and not meant to represent legal property descriptions.



Figure 2
Aerial View of Site 22 showing the edge of the biotic barrier and edge of refuse.
Google Earth photograph 9/26/2011



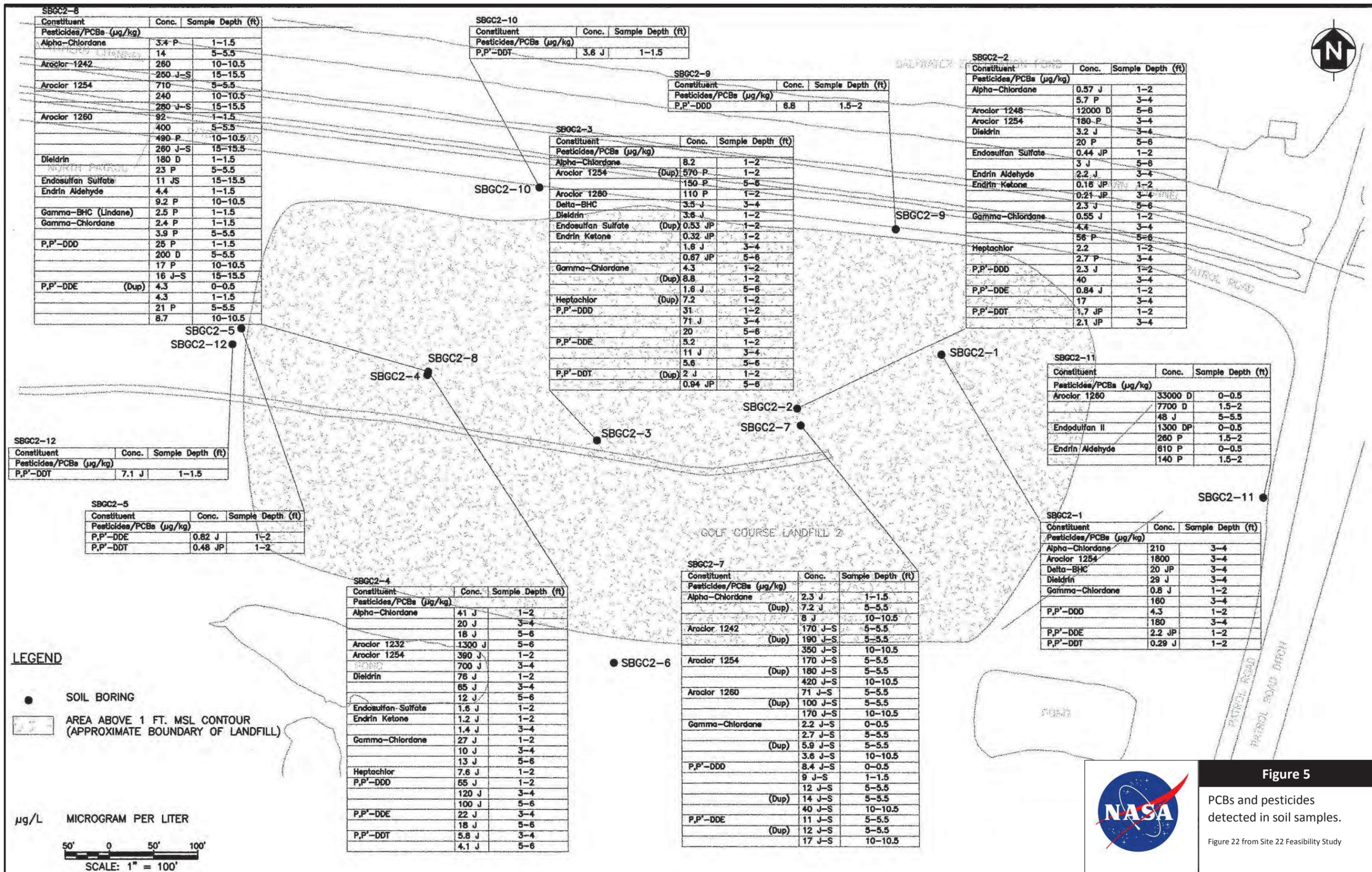
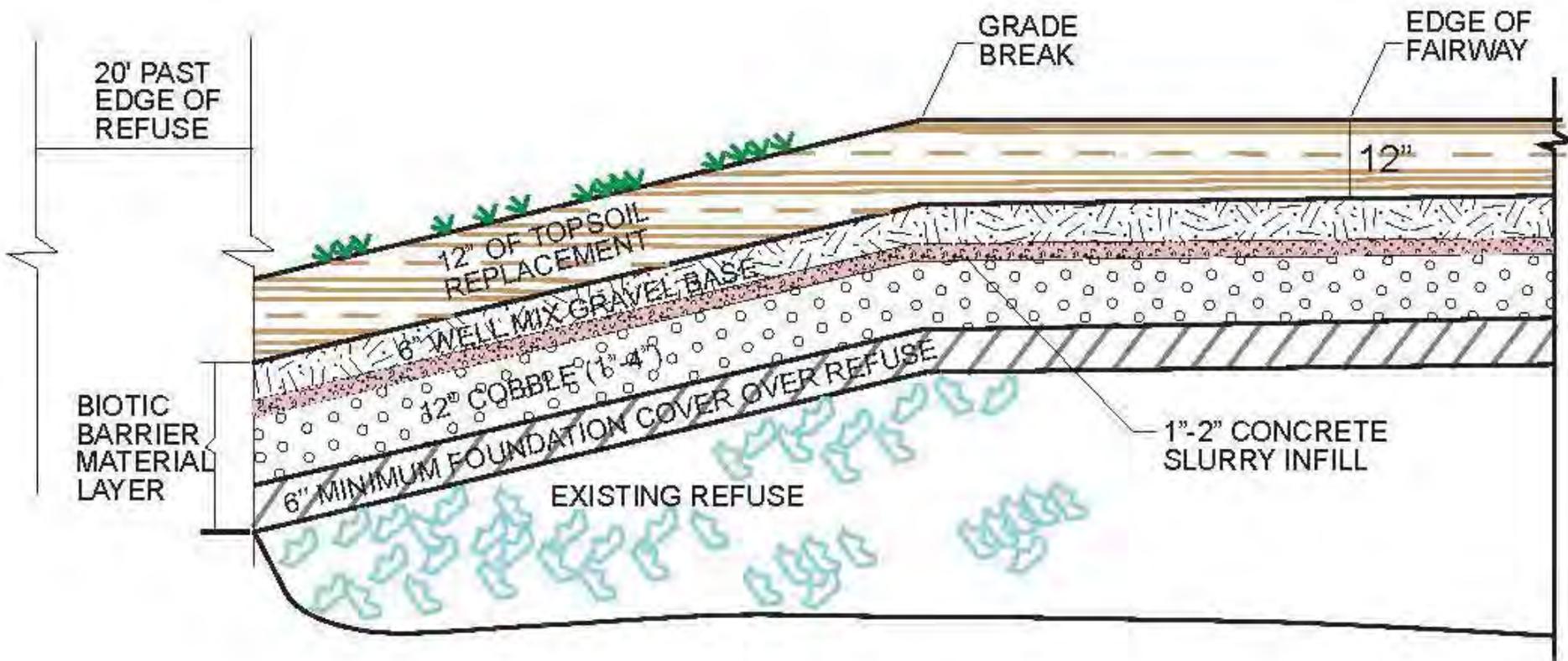


Figure 5

PCBs and pesticides detected in soil samples.

Figure 22 from Site 22 Feasibility Study



BIOTIC BARRIER COVER

FIGURE 6
 Schematic of Site 22 Biotic Barrier Cover.
 Source: Five-Year Review: IR Sites 1, 22, 26, and 28





Photograph showing foundation layer with cobblestone layer being installed



Cobblestone being placed on top of the foundation layer



Placement of concrete and sand slurry to top of cobble layer



Photograph showing pea gravel drainage layer, geotextile, and topsoil layer



Placement of imported sand layer



Completed tree well

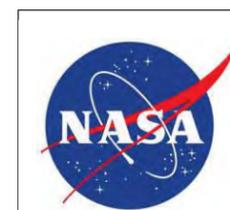


FIGURE 7

Photographs showing the various construction phases of the biotic barrier.

Sources: NASA photographs and Navy photographs from Remedial Action Report



Legend

- | | | | | | |
|---|-----------------------------------|---|--|---|-------------------------------------|
|  | IR Site 22 |  | LGMW-3 Landfill Gas Monitoring Well |  | WGC2-10 Groundwater Monitoring Well |
|  | Water |  | SM-4 Settlement Marker | | |
|  | Road |  | 11 Tree Well | | |
|  | Building |  | 2 Tree Well Methane Monitoring Point (Monitored Quarterly) | | |
|  | Former NAS Moffett Field Boundary |  | P12 Perimeter Methane Monitoring Point | | |
|  | Estimated Extent of Refuse | | | | |

Source: TN&A 2007a

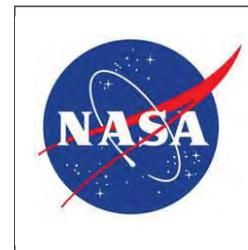


FIGURE 8

Settlement, groundwater, and soil gas monitoring points.

Source: Final Five-Year Review IR Sites 1, 22, 26, and 28

ATTACHMENT

**MEMORANDUM OF AGREEMENT
BETWEEN
U.S. DEPARTMENT OF THE NAVY
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
AND
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
AMES RESEARCH CENTER
FOR
INSTALLATION RESTORATION SITE 22 LANDFILL
FORMER NAVAL AIR STATION MOFFETT FIELD, CALIFORNIA**

The purpose of this Memorandum of Agreement (MOA) is to establish the roles and responsibilities of the United States Department of the Navy Base Realignment and Closure Program Management Office West (Navy) and the National Aeronautics and Space Administration Ames Research Center (NASA) in ensuring protectiveness of the remedy for the Site 22 landfill with regard to the monitoring and institutional controls for the site that are required pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Record of Decision (ROD) for the Moffett Federal Airfield (the former Naval Air Station [NAS] Moffett Field) Site 22 landfill, signed on June 25, 2002.

I. BACKGROUND

The Site 22 landfill is located in the northeastern corner of the former NAS Moffett Field (Moffett). The landfill covers approximately 10 acres and contains an estimated total waste volume of 92,000 cubic yards. Site 22 was an active Navy landfill from 1950 through 1967. Moffett Field was transferred from the Navy to NASA in 1994. Site 22 now underlies holes 3, 6, and 7 of the Moffett Field Golf Course.

The lead agency for the Moffett Field installation restoration program is the Navy. The lead regulatory agency is the United States Environmental Protection Agency (EPA), with the San Francisco Bay Regional Water Quality Control Board (RWQCB) and the California Department of Toxic Substances Control (DTSC) serving as supporting agencies. The RWQCB is currently acting on behalf of the DTSC as the California state regulatory agency for the Navy's Installation Restoration Program (IRP) at Moffett Field. The IRP was initiated in 1980 by the United States Department of Defense (DoD) to comply with federal guidelines to manage and control past waste disposal actions. IRP activities are performed under the authority of CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA), and in compliance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), also known as the "Superfund" program.

History of IRP at Moffett

The EPA proposed Moffett Field as a National Priorities List (NPL) site in June 1986 and placed it on the NPL in 1987. Placement on the NPL initiated the Remedial Investigation/Feasibility Study (RI/FS) process under CERCLA. Data collected during the initial studies were used to plan the RI/FS work. This work was coordinated through a Federal Facility Agreement (FFA) between the Navy, EPA, RWQCB, and DTSC, which was signed on September 14, 1990. The FFA is a cooperative agreement that:

- Ensures environmental impacts are investigated and appropriate response actions are taken to protect human health and the environment.
- Establishes a procedural framework and schedule for developing, implementing, and monitoring appropriate response actions.
- Facilitates cooperation, exchange of information, and participation of the parties.
- Ensures adequate assessment, prompt notification, and coordination between federal and state agencies.

Sites included in the RI/FS at Moffett Field were organized into operable units (OUs) in 1991. The Navy and NASA signed a Memorandum of Understanding (MOU) on December 22, 1992, concerning environmental activities at Moffett. Under the MOU, the Navy retained responsibility for remediating Navy-related contamination. NASA is responsible for their ongoing environmental compliance operations.

Investigations supporting various phases of the RI for Moffett Field identified several potentially contaminated sites, including the Site 22 landfill. The Site 22 landfill was characterized in the *Final Station-wide RI Report* and the *Additional Sites Investigation Phase II Draft Final Report* prepared by PRC Environmental Management, Inc. in 1996 and 1995, respectively.

Description of the Selected Remedy

The selected remedy described in the June 25, 2002 ROD for the Site 22 landfill entails construction of a biotic barrier, which is comprised of layers of soil, gravel, concrete slurry, and cobblestone to prevent animals from burrowing into the Site 22 landfill and exposing the debris. It also includes institutional controls and groundwater and landfill gas monitoring.

The selected CERCLA response addresses the remedial action objective (RAO) for the site by preventing animals from burrowing into the Site 22 landfill and exposing the refuse, thereby limiting direct contact with the waste by humans. The major components of the selected remedy are summarized below:

- Install a barrier to prevent burrowing animals from disturbing the subsurface contamination

- Manage surface water flows across the site
- Enact institutional controls to prevent excavation of waste materials
- Monitor groundwater and landfill gas in the vicinity of the site

For institutional control implementation, the ROD documents commitment to the following requirements as elements of the selected response action for the Site 22 landfill:

Access restrictions would be included in NASA's land use planning documents and would be designed to maintain the integrity of the biotic barrier and to limit surface excavation that could disturb the refuse. The restrictions would be implemented by NASA per a MOA to be entered into between the Navy and NASA after review and concurrence by EPA. The MOA will be adopted within 1 year of the Final ROD, and will include the following elements:

- *Protection of the structural aspects of the landfill cap (biotic barrier)*
- *Prohibition of alterations to the drainage patterns or modification of surface contours*
- *Establishment of specific boundaries for the extent of the landfill*
- *Prohibition of extraction of groundwater from the site*
- *Prohibition of residential land use*
- *Requirement of regulatory approval for consideration of alternative land uses*
- *Indication of the parties responsible for ongoing operations, maintenance, and monitoring activities for the site*
- *Requirement of annual reporting to EPA regarding the implementation, monitoring, and efficacy of the institutional controls*
- *Reference to how the MOA will be enforced with NASA and with their site-specific tenants*
- *Requirement that transfer of the site to a non-federal entity includes a restrictive covenant conveying the property with institutional controls as provided in the MOA in place.*

II. PURPOSE

The purpose of this MOA is to establish the roles and responsibilities of the Navy and NASA in ensuring protectiveness of the remedy for the Site 22 landfill with regard to the monitoring and institutional controls for the site. Once executed, the specific objectives of this MOA are to:

- Implement a process to ensure appropriate long-term maintenance of institutional controls. The process will elevate general awareness of institutional controls by NASA personnel, tenants, and contractors to ensure long-term protection.
- Implement a process for NASA to periodically update the Navy and the EPA concerning the status and continued efficacy of adopted institutional controls and any proposed changes in land use that may affect the site and protectiveness of the remedy.
- Integrate appropriate institutional controls into the required long-term operations and maintenance program for the site.
- Implement long-term groundwater and landfill gas monitoring and reporting for the site.
- Provide reasonable assurance that the pathway and exposure assumptions relied upon to establish the remedy will remain valid until different site controls or unrestricted use of the site is appropriate.

This MOA is intended only to govern the allocation of responsibility between the Navy and NASA and to improve internal management and is not intended to, nor does it, create any right or benefit, substantive or procedural, enforceable at law or equity by any party against the United States, its agencies, or its officers.

III. APPLICABILITY

This MOA will apply as long as NASA retains custody and/or control of the Site 22 property. Implementation of the institutional controls under this MOA will not have the effect of creating, disposing, or altering any real property rights for the site. Transfer of any portion of the site to a non-federal entity must include a restrictive covenant conveying the property with institutional controls in place as provided in this MOA.

NASA shall not transfer the Site 22 landfill or any portion thereof to another federal agency, unless (1) any such agency has entered into an interagency agreement with the Navy agreeing to assume any and all responsibilities assigned to NASA under this MOA, or (2) the head of any such federal agency or his or her delegatee has indicated, in writing and in a manner satisfactory to the Navy, that such agency is willing to enter into such an interagency agreement with the Navy.

Restrictive covenants and/or interagency agreements shall include the requirement for review and written approval of the Navy prior to any proposed construction activities, improvements, or alterations to such property that may impact the Site 22 landfill remedy. Construction or other work on or near such property may be subject to separate, non-Navy review and advance approval requirements pursuant to environmental restrictions.

IV. SITE INSPECTION/REVIEW/CERTIFICATION

Navy Responsibilities

The Navy, subject to authorization from the Secretary of the Navy, agrees to:

- Institute a Post-Construction Operations, Maintenance, and Monitoring Plan
- Conduct quarterly groundwater and landfill gas monitoring
- Complete and submit all annual groundwater and landfill gas monitoring reports to regulatory agencies
- Respond to subsequent release(s) of hazardous substances from the site that are not the result of any action taken by NASA, its tenants, contractors, or subcontractors, but rather are a result of the landfill's condition as of the signing of this MOA
- Establish specific boundaries for the extent of the landfill
- Conduct five-year reviews
- Complete and submit any necessary documentation concerning site closure, any "no further action" determination, or delisting of all or part of Site 22

NASA Responsibilities

NASA agrees to:

- As part of ongoing NASA operations and those of its tenants, contractors, and subcontractors, maintain vegetation, topsoil layer, irrigation system, and drainage components (drainage ditches, culverts, water drains, etc.) encompassed within and adjacent to the Site 22 landfill remedy boundary in a condition that ensures such operations do not otherwise impact the Site 22 landfill remedy
- Maintain and keep in operation the Building 191 pumping station, which affects groundwater flow at Site 22
- Be responsible for the remediation of any contamination at Site 22 resulting from NASA activities or activities of its tenants, contractors, or subcontractors
- Perform additional remediation and environmental analysis required as a result of any other use of Site 22 and the surrounding property by NASA and its employees, agents, tenants, and contractors

- Protect the structural aspects of the landfill cap (including but not limited to all components of the biotic barrier)
- Incorporate terms and conditions of this MOA into the Ames Procedural Requirements (APR)
- Prohibit and prevent any alteration to the drainage patterns, or modification of surface contours, existing at the site as of the date of execution of this MOA to minimize infiltration into the soil and groundwater at this location
- Prohibit and prevent any extraction of groundwater from the site for any purpose other than for groundwater monitoring purposes
- Prohibit and prevent any residential land use
- If necessary, include a restrictive covenant in the deed for conveyance of any portion of the Site 22 landfill and its remedy, requiring the review and written approval of the Navy prior to any proposed construction activities, improvements, or alterations to such property. (The Navy notes that construction or other work on such property may also be subject to separate non-Navy review and advance approval requirements pursuant to environmental restrictions.)
- Conduct regular (no less than quarterly or other agreed upon frequency) monitoring or visual inspections of the site to ensure compliance with, and proper maintenance of, the institutional controls
- Obtain prior written approval from Navy before altering, disturbing, or removing groundwater monitoring wells and associated equipment, including any equipment installed subsequent to the signing of this MOA
- Obtain prior written approval from the Navy before conducting any subsurface excavation, digging, drilling, or any other disturbance of the surface at Site 22
- Provide periodic updates to the Navy, EPA, and the Regional Water Quality Control Board describing status and continuing efficacy of institutional controls for which NASA is responsible
- Incorporate the ROD land use restrictions set forth in Section I of this MOA, and the surveyed coordinates of the site and boundaries of the landfill cover, into NASA's land use planning documents and any pertinent maps and plans, geographic information system (GIS), or other documents or materials related to the facility master planning process. Please see the final Remedial Action Report for Installation Restoration Site 22 Landfill for Site 22 landfill boundary and monitoring well locations.

- Require all current and prospective tenants, contractors, and subcontractors, and facility-wide departments to comply with the terms of this MOA, and provide any training necessary to ensure such compliance.
- Incorporate the institutional controls set forth herein into all current and prospective lease agreements for parcels including or adjacent to the site, and into all land use agreements or land use changes which might impact any aspect of the remedy for the site
- Incorporate by reference the terms of this MOA into any contract or subcontract involving any activity which might impact any aspect of the remedy for the site
- Obtain the written approval from the Navy, EPA, and San Francisco Bay Regional Water Quality Control Board at least 90 days prior to implementing any change to the Site 22 land use subsequent to the date of execution of this MOA
- Notify the Navy and the regulatory agencies as soon as, but no less than 90 days prior to, any major land use change is anticipated to allow sufficient time for regulatory review and amendments to remedy selection decision docs (i.e., RODs and RAPs). This notification should include:
 - 1) an evaluation of whether the anticipated land use change will pose unacceptable risks to human health and the environment or negatively impact the effectiveness of the remedy;
 - 2) an evaluation of the need for any additional remedial action resulting from the anticipated land use changes; and
 - 3) a proposal for any necessary changes in the selected remedial action.
- Major changes include any action that might disrupt the effectiveness of the remedial action; such as:
 - 1) a change in land use classification that is inconsistent with the exposure assumptions in the risk assessment that was the basis for the institutional controls (either human health or ecological risk assessments);
 - 2) any action that may disrupt the effectiveness of the remedial action; and
 - 3) any other action that might alter or negate the need for the institutional control.

V. MOA INTEGRATION

This MOA, once agreed to by NASA and the Navy, will be included as an addendum to the long-term Site 22 Post-Construction Operations, Maintenance, and Monitoring Plan and the Remedial Action Report. The Post-Construction Operations, Maintenance, and Monitoring Plan will include a strategy for monitoring the institutional controls and will describe the required monitoring activities and schedules, the responsibilities for

performing each task, the specific reporting requirements, and the process to be followed to address any potential issues concerning the land use controls.

VI. SITE ACCESS

NASA will allow the Navy, or its officers, agents, employees, contractors, and subcontractors, or appropriate regulatory agencies, access to the site at reasonable times consistent with the security and health and safety requirements, and upon presentation of proper credentials. Access is to be coordinated through NASA's official(s) responsible for environmental compliance at Moffett Field. If, in the judgment of the Navy, emergency circumstances exist which could compromise the effectiveness of the remedy for Site 22, the Navy shall have the right to access the site immediately in order to take action with respect to such circumstances.

VII. MODIFICATION

Amendments to this MOA must be in writing and be executed by all parties. In the event institutional controls must be modified for any reason, the Navy retains the right to amend this MOA to address those modifications.

VIII. TERMINATION

This MOA will terminate upon mutual concurrence by NASA and the Navy, upon transfer of the site to a federal or non-federal entity, or ten (10) workdays after one party to this MOA presents to the other party written notice of its intention to withdraw from such MOA. A party presenting such notice of intention to terminate this MOA shall provide copies of such notice of intention to the EPA and the Regional Water Quality Control Board.

IX. FUNDING

Any requirement for the payment or obligation of funds by the Navy or by NASA pursuant to this MOA shall be subject to the availability of appropriated funds, and no provision herein shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act, 31 U.S.C. 1341.

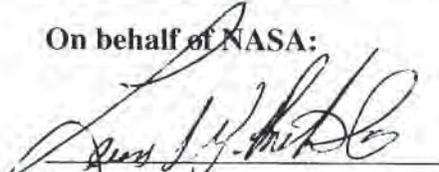
X. MISCELLANEOUS

In entering into this MOA, NASA and the Navy recognize that it is impracticable to make provisions for every contingency that may arise during the term of this MOA. NASA and the Navy agree that their relationship within the framework of this MOA shall be characterized by principles of fairness and shall be managed without detriment to the interest of any party. NASA and the Navy agree to engage in good-faith efforts to resolve any dispute(s) that may arise concerning any party's good-faith compliance with the terms of this MOA.

This MOA shall take effect on the later date appearing under the signatures below.

This MOA is executed by:

On behalf of NASA:



Lewis S. Braxton
Deputy Director
NASA Ames Research Center

Date

9/17/08

On behalf of Navy:



Darren Newton
BRAC Environmental Coordinator
BRAC PMO West
By direction of the Director

Date

04-SEPT-2008

SITE NAME:	Site 23 – Golf Course Landfill #3				
Version:	Final	Date:	02/26/2015		
RESPONSIBLE PARTY					
Organization	Department of the Navy, BRAC				
Address	1455 Frazee Rd., Suite 900 San Diego, CA 92108				
Contact	Scott Anderson				
	scott.d.anderson@navy.mil				
	619-532-0938				
LOCATION					
Facility Name	Moffett Federal Airfield	Site Location			
Facility Address	Mountain View, CA	Latitude	37.424430° N		
	Santa Clara County	Longitude	122.045218° W		
Regulatory Program	Lead Agency(ies)	Site Status			
		Open	Closed	ROD	Current Phase
CERCLA	EPA/RWQCB		X	Station-Wide No Action Sites	NFA
SITE SUMMARY					
<p>Golf Course Landfill 3 is approximately 2 acres in size and is located immediately south of the northern weapons bunkers (Figure 1 & 2). Site 23 was originally one of several water hazards (Figure 3). The water hazard was eventually allowed to dry out. The site was then used as a disposal area (Figure 4 & 5). While no information about the source of the material dumped in this area has been found, a site walk in March 1995 identified numerous small piles of soil, concrete, disaggregated asphalt, grass clippings, and mulch. In addition, some airplane parts (brought to Site 23 for disposal after a plane crash) and some electronics equipment were observed at the site. In 1995, a magnetometer survey of the area did not indicate that significant quantities of metallic materials were buried at the site. The observations and the magnetometer survey suggested that the area was never trenched and was used primarily for incidental disposal of excess soil and debris from the golf course.</p> <p>Two soil borings were advanced at Site 23. Two soil samples were taken from each soil boring for a total of four samples. The soil samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH): both purgeable (TPH-p) and extractable (TPH-e), pesticides, polychlorinated biphenyls (PCBs), and metals. Ten samples of surface debris were collected and analyzed for VOCs, SVOCs, TPH-e, TPH-p, pesticides, PCBs, and metals.</p> <p>No VOCs were detected in subsurface soils samples from IR Site 23. SVOCs including benzo(a)anthracene and chrysene were detected in subsurface soil samples at concentrations up to 34 µg/kg. TPH-e, characterized as motor oil was also detected at concentrations up to 21 mg/kg.</p> <p>Surface debris materials contained toluene at concentrations up to 11 µg/kg and elevated concentrations of SVOCs and petroleum hydrocarbons. These compounds are likely due to the presence of asphalt and other PAH-bearing materials within the disposed materials. Pesticides and PCBs were also infrequently detected in the surface debris samples. According to the Station-Wide Remedial Investigation Report, pesticides and PCBs were likely the result of golf course maintenance and not waste disposal.</p>					

SITE NAME:

Site 23 – Golf Course Landfill #3

SITE SUMMARY

Metals were detected in soil samples from Site 23, but at concentrations that are consistent with background levels.

Pesticides (dieldrin, DDE, DDT, and chlordane) were detected in at least one sample of surface debris. These detections were likely the result of golf course maintenance and not disposal.

VOCs were detected in groundwater data from surrounding monitor wells. Concentrations of Tetrachloroethene (PCE), Trichloroethene (TCE), cis-Dichloroethene, and vinyl chloride are found below cleanup levels beneath Site 23. Groundwater is addressed under OU-5 (Site 26) and not considered for Site 23.

Based on a risk assessment done by the Navy, Site 23 does not pose an unacceptable risk to human health.

The Navy produced *Final Station-Wide No Action Sites Record of Decision* in July 2002. In the ROD, the Navy selected no action for Site 23.

SITE NAME:	Site 23 – Golf Course Landfill #3
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REMEDIAL ACTION			
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Remedy	No Action	Begin Date	End Date

Land Use Restrictions	Development Issues
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<ul style="list-style-type: none"> ≠ Site 23 is located within the golf course. According to the NASA Ames Development Plan, Mitigated Alternative 5, the area of the golf course including Site 23 is restricted to open space. ≠ Site is not available for residential development in accordance with the Final Site-Wide No Actions Sites ROD. 	<ul style="list-style-type: none"> ≠ Contact with chemicals left in place may be encountered during subsurface work ≠ EIMP must be followed
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FIGURES



FIGURE 1
Approximate Site 23 location. The boundaries are approximate and not meant to represent legal property descriptions.



FIGURE 2

Aerial view of Site 23.



Google Earth Photograph 9/26/2011



Bldg. 191
Lift Station

Northern Channel

North Patrol Road

Small Arms
Range at Site 2

Macon Road

Site 23

Water Hazard

Marriage Road



FIGURE 3

Historical aerial view of the Site 23 area. Site 23 was originally a water hazard for the golf course.

NASA Photograph A75-1140-5, approx.. 1975

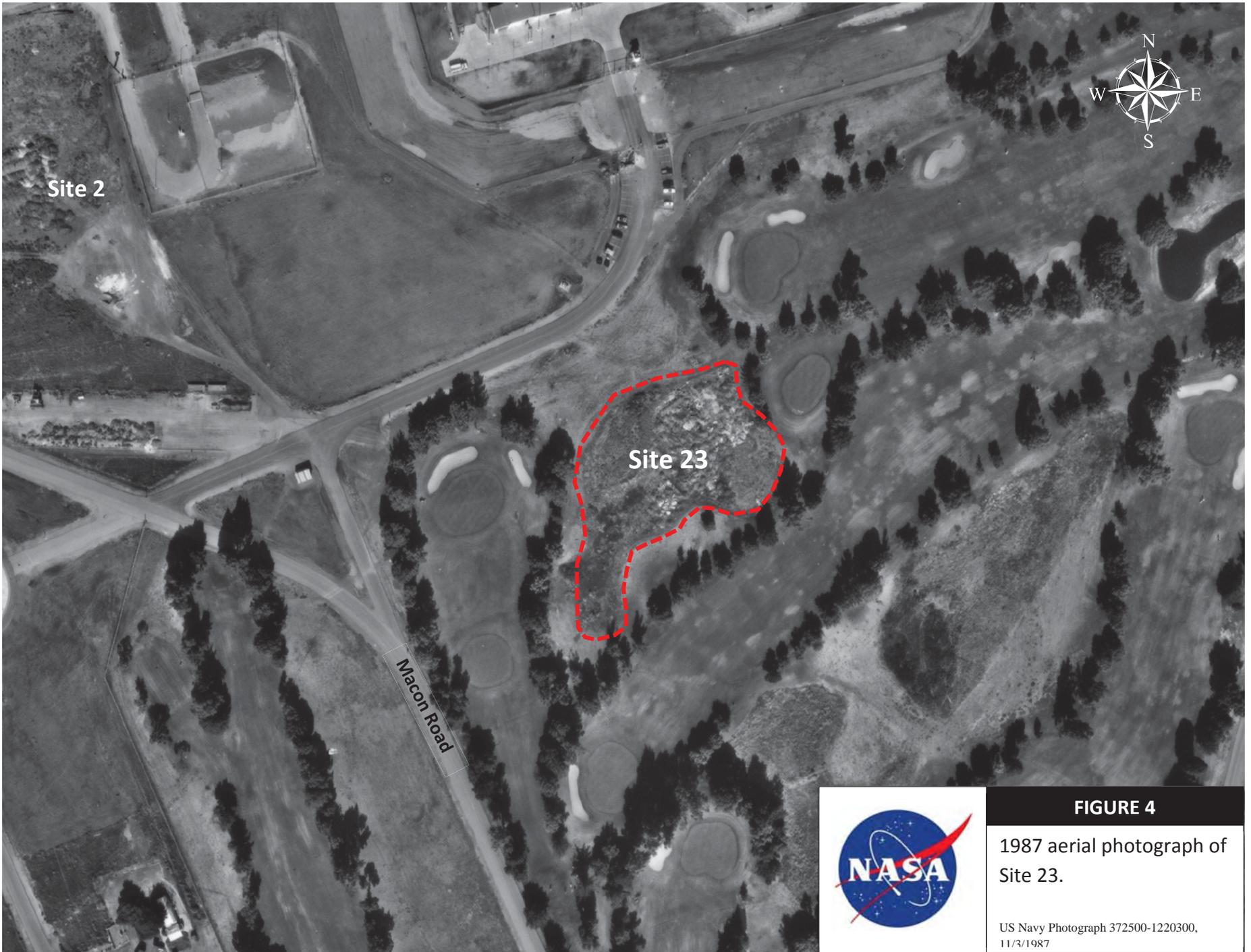
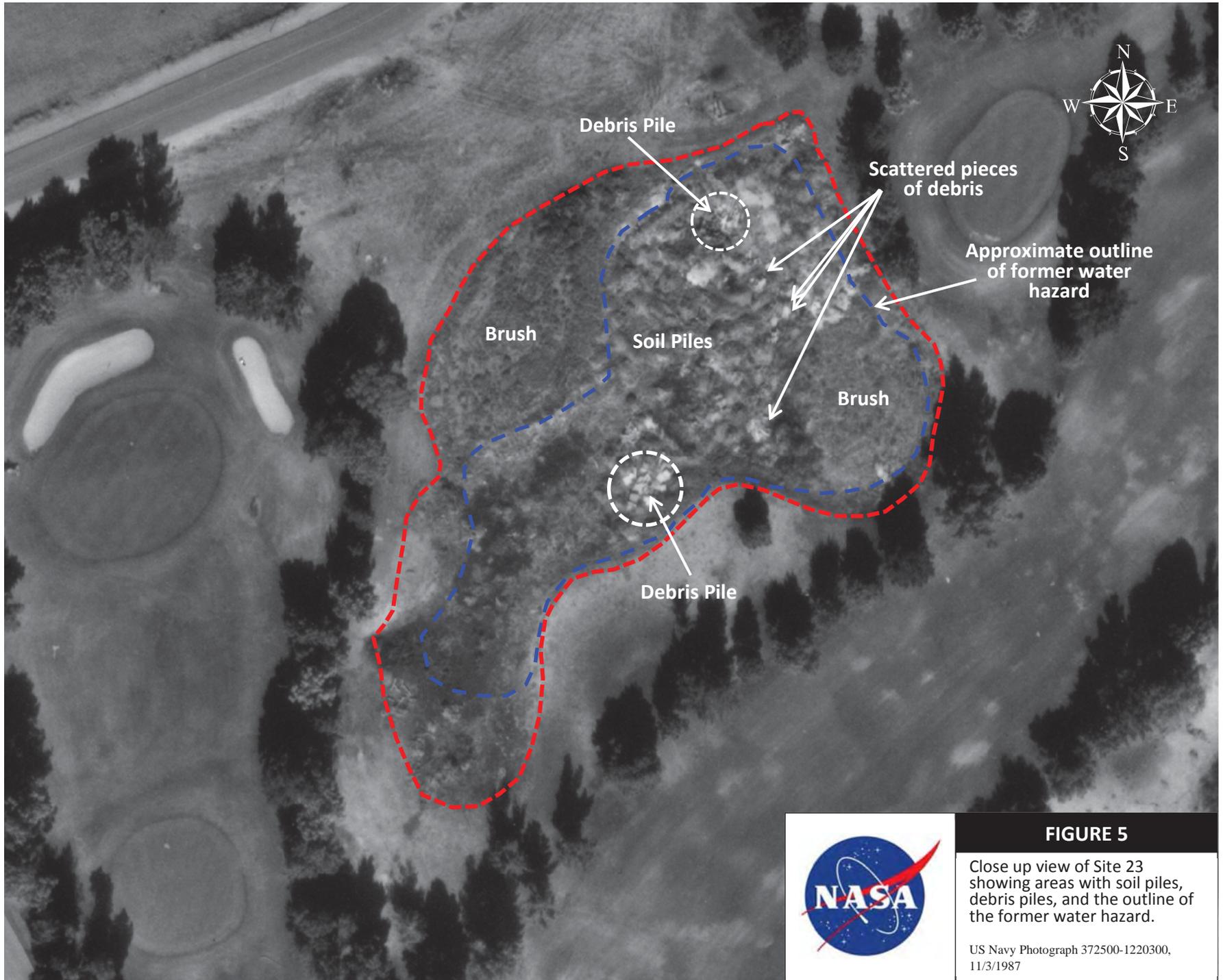


FIGURE 4
1987 aerial photograph of Site 23.
US Navy Photograph 372500-1220300,
11/3/1987



Debris Pile

Scattered pieces of debris

Approximate outline of former water hazard

Brush

Soil Piles

Brush

Debris Pile



FIGURE 5

Close up view of Site 23 showing areas with soil piles, debris piles, and the outline of the former water hazard.

US Navy Photograph 372500-1220300, 11/3/1987

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SITE NAME:	Site 24: Hangar 1 Fuel Pits & High Speed Fuel Area				
Version:	Final	Date:	02/26/2015		
RESPONSIBLE PARTY					
Organization	Department of the Navy, BRAC		Defense Logistics Agency Energy		
Address	1455 Frazee Rd., Suite 900 San Diego, CA 92108		8725 John J. Kingman Rd. Fort Belvoir, VA 22060		
Contact	Scott Anderson		Joseph E. Vogel		
	scott.d.anderson@navy.mil		Joseph.Vogel@dla.mil		
	619-532-0938		703-767-8781		
LOCATION					
Facility Name	Moffett Federal Airfield		Site Location		
Facility Address	Mountain View, CA Santa Clara County		Latitude	See site summaries	
			Longitude	See site summaries	
Regulatory Program	Lead Agency(ies)	Site Status			
		Open	Closed	ROD	Current Phase
Petroleum	RWQCB	X ¹			NFA ²
SITE SUMMARY					
<p>Notes:</p> <ol style="list-style-type: none"> High-speed fuel facility NFA – No further action for Hangar 1 fuel pits <p>Site 24 consists of three facilities: fueling pits in Hangar 1, High Speed Fuel Facility, and Fuel Wharf. The wharf is not within the lease area and will not be discussed here. The other two sites are within the lease area (Figure 1).</p> <p>Hangar 1 Fuel Pits (37.412968° N, 122.053960° W) The Navy built Hangar 1 in 1933 at the Naval Air Station (NAS) Sunnyvale (later to become NAS Moffett Field) as a base for the dirigible <i>USS Macon</i>. During the construction of Hangar 1, three aviation gasoline dispenser pits and three aviation gasoline valve pits were installed in the floor of the hangar to service the <i>Macon</i> and its airplanes. After the loss of the <i>Macon</i>, the fueling pits continued to be used to fuel aircraft inside Hangar 1. The Navy discontinued use of the fuel pits in 1964, in conjunction with the closure of the former fuel farm west of Hangar 1.</p> <p>Figure 2 depicts the locations of the fuel pits and valve pits. The locations of the northern and central pits were verified in the field by the Navy using historical drawings during the active petroleum sites investigation in September 1994. In 1987, the Navy installed a new concrete floor in the southern half of Hangar 1; as a result, the location of the third pit and its associated valve pit could not be identified and no investigation of these areas was conducted.</p> <p>Aviation gasoline (AVGAS) was delivered to the hangar through two pipelines. The fuel supply line from the fuel farm located next to Bldg. 29 was a 3" line. A parallel 2" line was used to return fuel to the fuel farm (Figure 2 & 3). The supply lines into the hangar were 2" piping. The return line was 1" piping. The valve pits were approximately 4.5 feet by 3.25 feet and 4.25 feet deep with 8-inch thick concrete walls. The dispenser pits in the center of the hangar were 4.25 feet by 4.25 feet and 3.25 feet deep with 8-inch thick concrete</p>					

SITE NAME:**Site 24: Hangar 1 Fuel Pits & High Speed Fuel Area****SITE SUMMARY**

walls. The dispenser pits had removable steel covers. There were no storage tanks associated with these facilities in the hangar.

Two soil borings were advanced through the northern and central fuel pits and soil and groundwater samples were collected. Soil samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX); total petroleum hydrocarbons purgeable (TPH-p) as gasoline; metals; and volatile organic compounds (VOC). Figure 4 provides the results of the soil sampling. A groundwater sample was also taken from each pit. Figure 5 provides the analytical results for groundwater.

In 2005, an investigation was conducted of the pipelines leading from the Building 29 Fuel Farm to the Hangar 1 Fuel Pits (IR Site 24). The Building 29 Fuel Farm was abandoned when the Navy constructed the North and South Fuel Farms (IR Site 5) on the eastern side of the airfield in the 1950s. The fuel pipeline that extended from Building 29 to the fuel pits in Hangar 1 was abandoned. While significant deterioration of the underground fuel lines from the Building 29 Fuel Farm to the Hangar 1 Fuel Pits was observed during the 2005 investigation and pressure testing indicated that the pipes may have leaked, sampling beneath the pipeline indicates that there is minimal subsurface contamination. Figure 6 illustrates the sampling points and results of detections from this investigation.

Based on the results of the investigations, the removal of the dispensing units, and the sealing of the piping, the Navy recommended closure for the Hangar 1 fuel pits. The RWQCB concurred in a letter dated 8/13/2003.

High Speed Fueling Facility (37.421108° N, 122.047179° W)

The High-Speed Fuel Facility was used to fuel and defuel aircraft at MFA. The HSFF consists of hydrants that are located on an asphalt-paved area next to the east parallel taxiway north of Hangars 2 and 3 (Figures 1, 7, and 8). The HSFF was constructed in two phases in 1976 and 1983 to replace the original above-ground skid-mounted hydrants. The HSFF includes four hydrants with above- and below-ground piping, valves, fuel/water separators, and flexible piping. The area around each hydrant is paved with asphalt and is graded to a storm sewer inlet which is surrounded by a concrete berm equipped with a gate valve. An above-ground emergency shutoff valve is located approximately 40 feet from each hydrant. The hydrants receive fuel from Tank 16, located in the Day Tank Area, via underground piping. The HSFF is no longer in use.

Two investigations were carried out at the HSFF. The first investigation was in 1994. During the 1994 investigation, eight borings were drilled. Four were drilled near the hydrants and four near the safety valves (Figure 9). Sixteen soil samples were collected and analyzed for BTEX compounds and extractable TPH. Eight groundwater grab samples were collected from the borings.

The second investigation occurred in 1995. The investigation focused on Hydrants 1 and 2. Twenty-six soil borings were completed using a Geoprobe. Eleven of the borings were completed near Hydrant 1 and fifteen borings near Hydrant 2 (Figure 10). Borings were placed in a radial pattern to evaluate the extent of petroleum contamination detected in the 1994 investigation. In general, soil samples were obtained from one interval in each boring for chemical analysis with the exception of borings GPFH-08, GPFH-10,

SITE NAME:**Site 24: Hangar 1 Fuel Pits & High Speed Fuel Area****SITE SUMMARY**

GPHF-24, and GPFH-26. After each boring was advanced to the saturated zone, a 0.75-inch diameter PVC pipe was inserted into the hole. The bottom three feet of each pipe was slotted to allow for the collection of groundwater samples using a peristaltic pump.

SOIL

Total petroleum hydrocarbons (TPH) was detected at Hydrants 1 and 2, Hydrant safety valves 1 and 2, and the Hydrant 3 safety valve during the 1994 investigation. JP-5 was detected at the boring adjacent to Hydrant 1 at 1,200 mg/kg and at 110 mg/kg at the Hydrant 1 safety valve. Motor oil was detected at 32 mg/kg adjacent to Hydrant 2.

During the 1995 investigation, extractable TPH was detected in four of the ten soil samples collected at Hydrant 1. JP-5 was detected at concentrations of 2,000 mg/kg and 22 mg/kg. Motor oil was detected at concentrations of 760 mg/kg and 150 mg/kg. Figure 9 shows extractable TPH results from both the 1994 and 1995 investigations at Hydrant 1.

At Hydrant 2 during the 1995 investigation, JP-5 was detected in soil at concentrations ranging from 130 mg/kg to 3,000 mg/kg. TPH as motor oil was detected at two locations ranging from 8.2 mg/kg to 29 mg/kg. Figure 10 shows TPH extractable detections for Hydrant 2 from both the 1994 and 1995 investigations.

GROUNDWATER

Groundwater contamination was present at Hydrants 1 and 2 in 1994. TPH as JP-5 was detected at 21,000 µg/L at Hydrant 1 and 1,800 µg/L at Hydrant 2.

During the 1995 investigation at Hydrant 1, TPH as JP-5 was detected at concentrations ranging from 100 µg/L to 11,000 µg/L. TPH as diesel was detected at 76 µg/L. TPH as kerosene was detected at 180 µg/L. TPH groundwater sample results for Hydrant 1 are shown in Figure 11.

At Hydrant 2, the 1995 investigation detected TPH as JP-5 at concentrations ranging from 62 µg/L to 910 µg/L. TPH as motor oil was detected at 130 µg/L. Figure 12 displays extractable TPH from both the 1994 and 1995 investigations at Hydrant 2.

During the installation of boring GPFH-17 at Hydrant 2, free product was encountered. The product was black. Later analysis of the free product indicated that it was degraded JP-5. To evaluate the extent of the free product, thirteen boreholes were installed to a depth of four feet. Each borehole was monitored for 48 hours. Free product was found to accumulate in only one of the boreholes located nearest to GPHF-17.

To date, the High Speed Fueling Facility has not been proposed for closure. The DLA is currently evaluating the removal of the old fuel supply system at the former NAS Moffett Field.

SITE NAME:	Site 24: Hangar 1 Fuel Pits & High Speed Fuel Area
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REMEDIAL ACTION			
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Remedy	None recommended	Begin Date	End Date

Land Use Restrictions	Development Issues
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<p>Hangar 1 is located over the regional VOC plume. Any controls listed in the MEW ROD and ROD amendment for vapor intrusion will apply.</p> <p>The High Speed Fueling Facility is within the OU-5 ROD (Site 26). The extraction of groundwater is prohibited.</p> <p>Land use must also conform to restrictions provided in the NASA 2002 Record of Decision for the Programmatic Environmental Impact Statement, Mitigated Alternative 5.</p> <p>The High Speed Fuel Facility is located next to the runway area and is subject to height restrictions as specified under 14 CFR Part 77, especially §77.17 and §77.19. In general, all buildings must be shorter than limits set by the FAA; the farther from the center of the runway, the taller the buildings can be. The height restrictions are reviewed as part of the building permit process.</p>	<ul style="list-style-type: none"> ≠ The piping for the fuel pits and to the former fuel farm are still in place. ≠ Contaminated soil, groundwater, and possible areas of free product are present below the site. ≠ Contact with chemicals left in place by workers is likely during subsurface activities. ≠ EIMP must be followed. ≠ Soil conditions under the Hangar 1 fuel pits has not been fully characterized.
--	---

SITE NAME:	Site 24: Hangar 1 Fuel Pits & High Speed Fuel Area
-------------------	---

RESIDUAL CONTAMINATION		
------------------------	--	--

Compound	Residual Concentration (max)		Notes
	Soil (mg/kg)	Groundwater (µg/L)	
			See attached figures for residual contamination

REFERENCES (Chronological Order)

- ≠ *Active Petroleum Sites Investigation Revised Draft Technical Memorandum, Moffett Federal Airfield, CA.* PRC Environmental Management, Inc., San Francisco, CA. March 29, 1996.

- ≠ *Base-Wide Petroleum Site Evaluation Methodology Technical Memorandum, Draft Appendix J, Site 24 Petroleum Evaluation, Moffett Federal Airfield, CA.* Tetra Tech EM Inc., San Diego, CA. April 23, 2003.

- ≠ *No Further Action (NFA) Concurrence on Appendix J of the Draft Final Base Wide Petroleum Site Evaluation Methodology Technical Memorandum, Site 24, Moffett Federal Airfield, Moffett Field, CA.* Regional Water Quality Control Board, SF Bay, Oakland, CA. August 13, 2003.

- ≠ *Investigation and Closure Report for Building 29 and Building 55 Pipelines, Former Naval Air Station Moffett Field, CA.* SulTech, San Diego, CA. November 5, 2008.

FIGURES

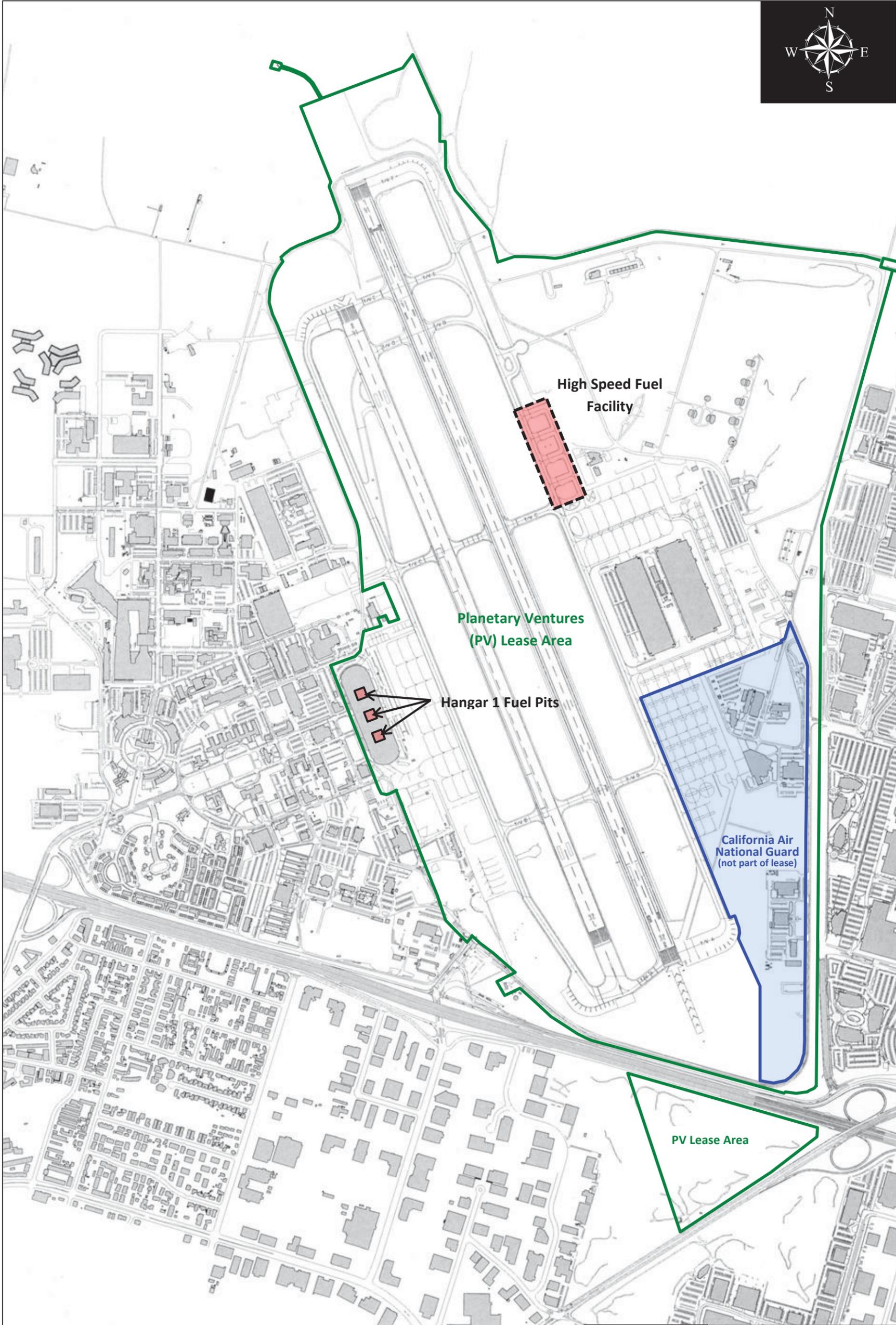


FIGURE 1
Location of Site 24 High Speed Fuel and Hangar 1 Fuel Pits.. The boundaries are approximate and not meant to represent legal property descriptions.

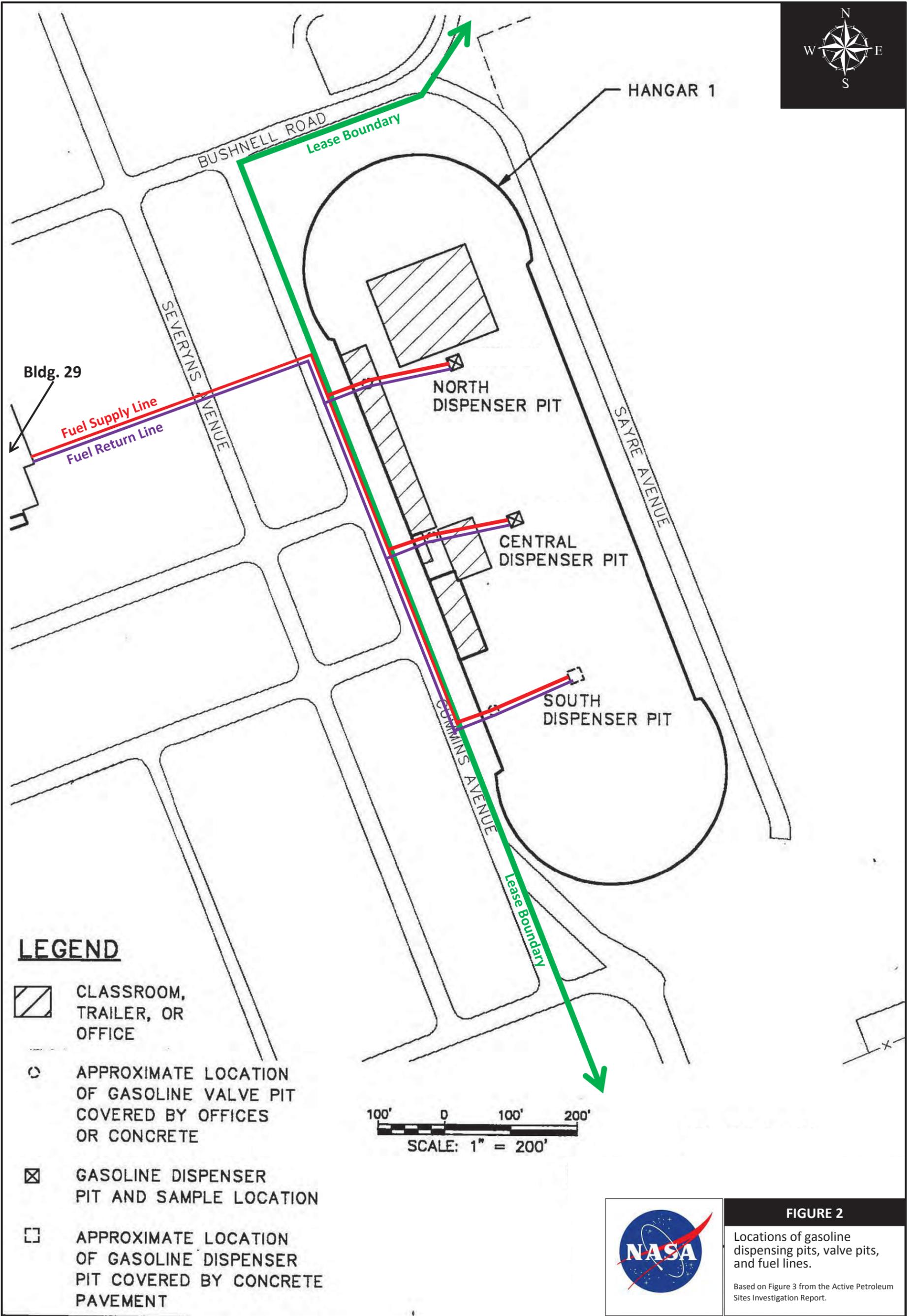


FIGURE 2
Locations of gasoline dispensing pits, valve pits, and fuel lines.
Based on Figure 3 from the Active Petroleum Sites Investigation Report.

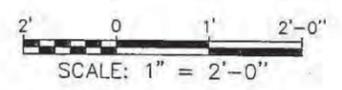
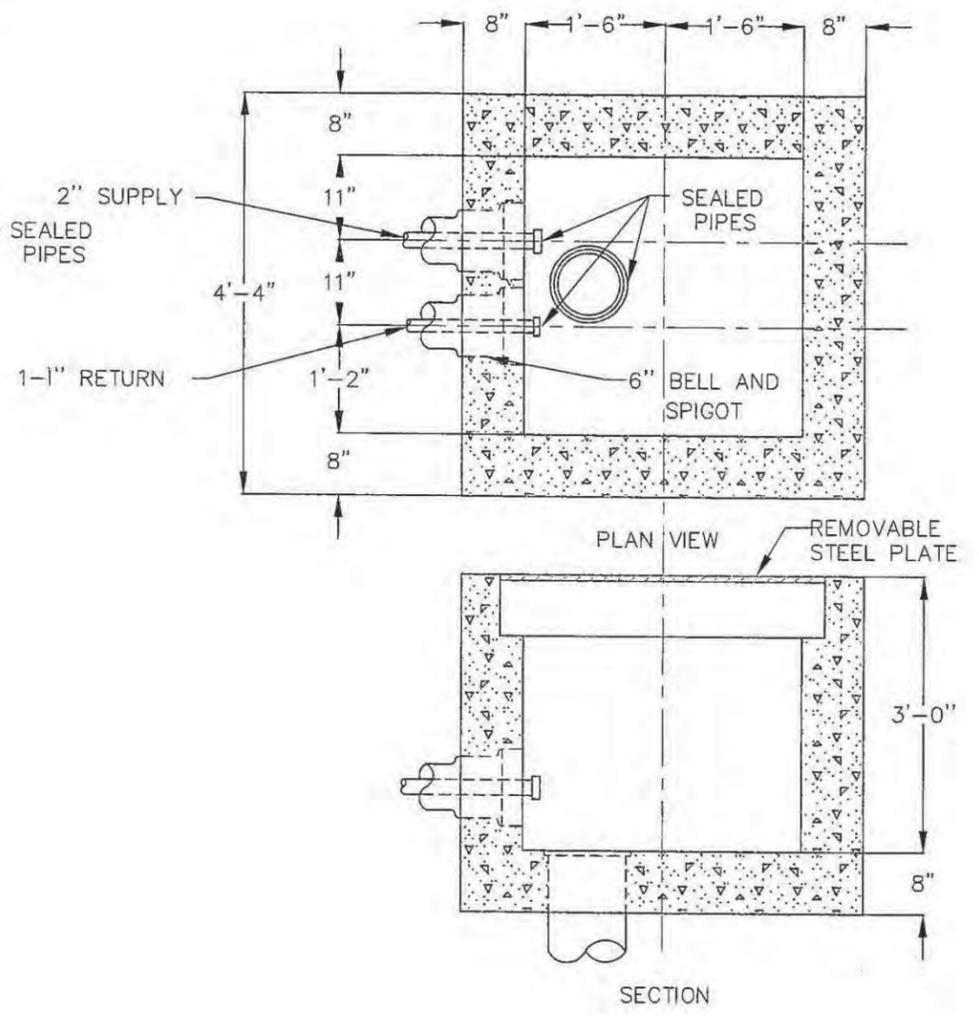
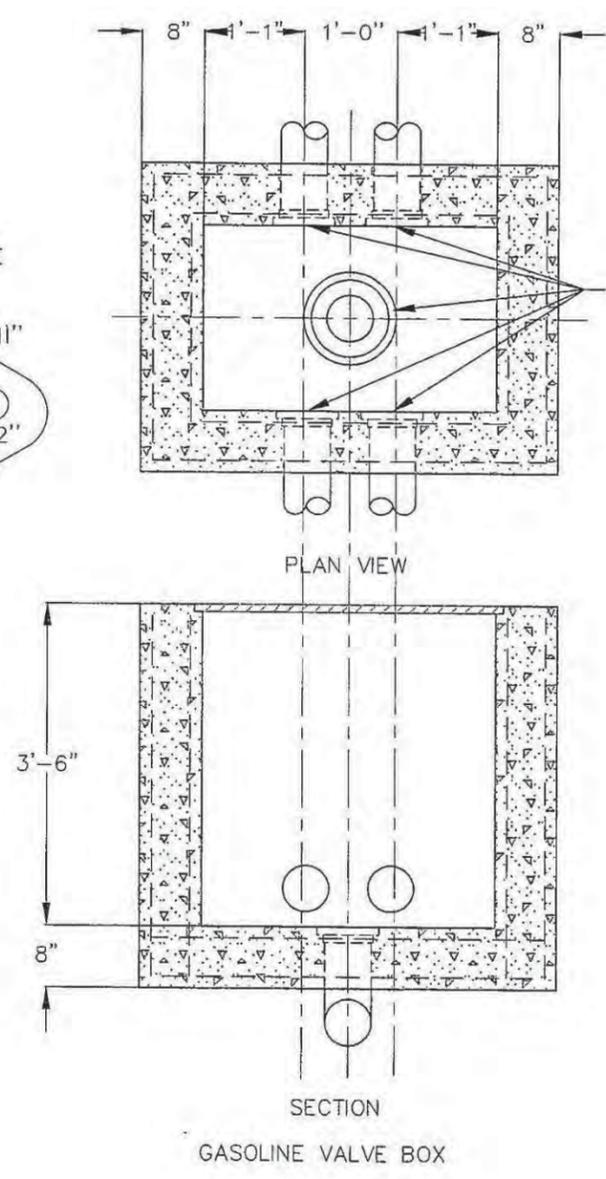
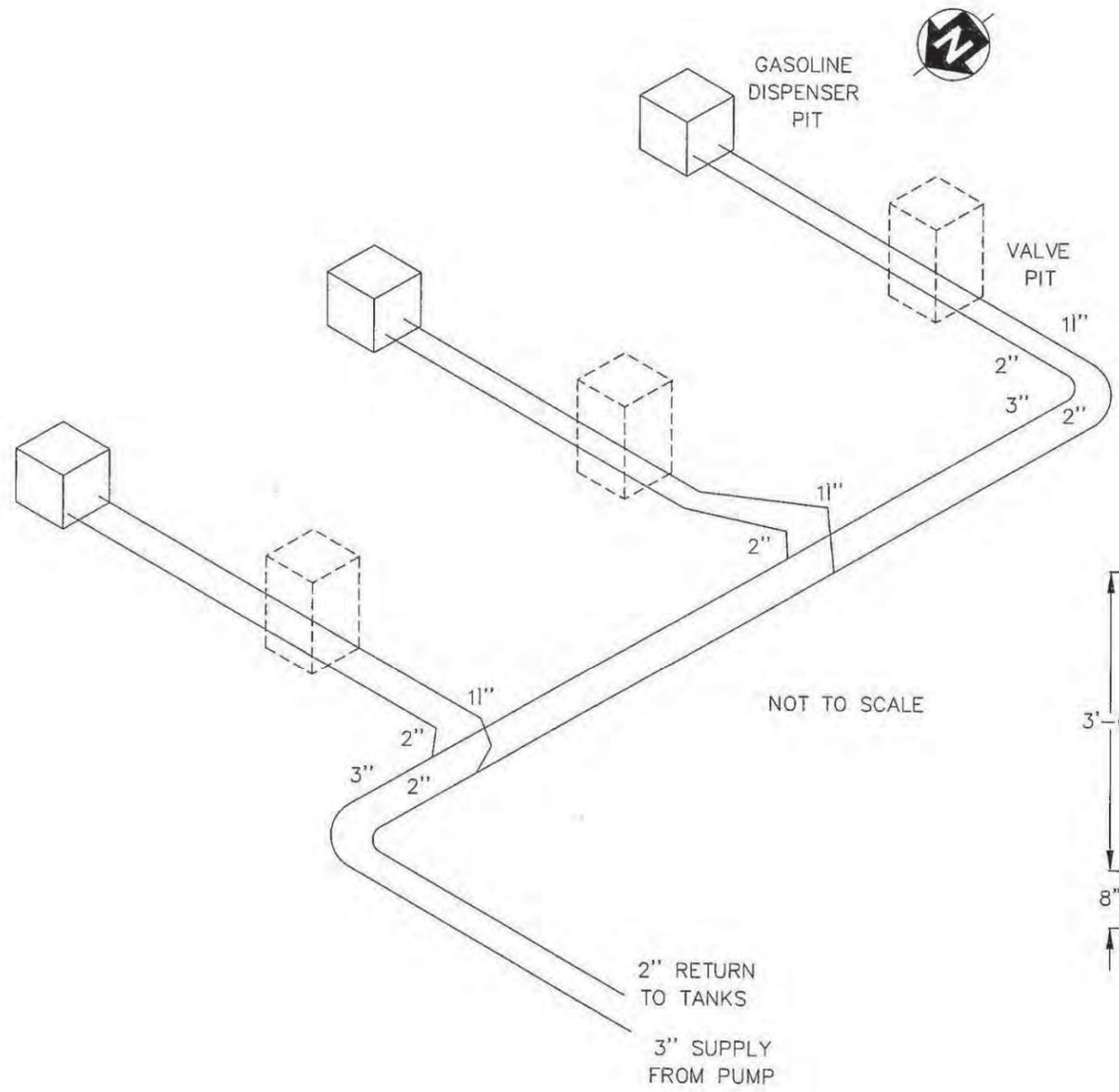
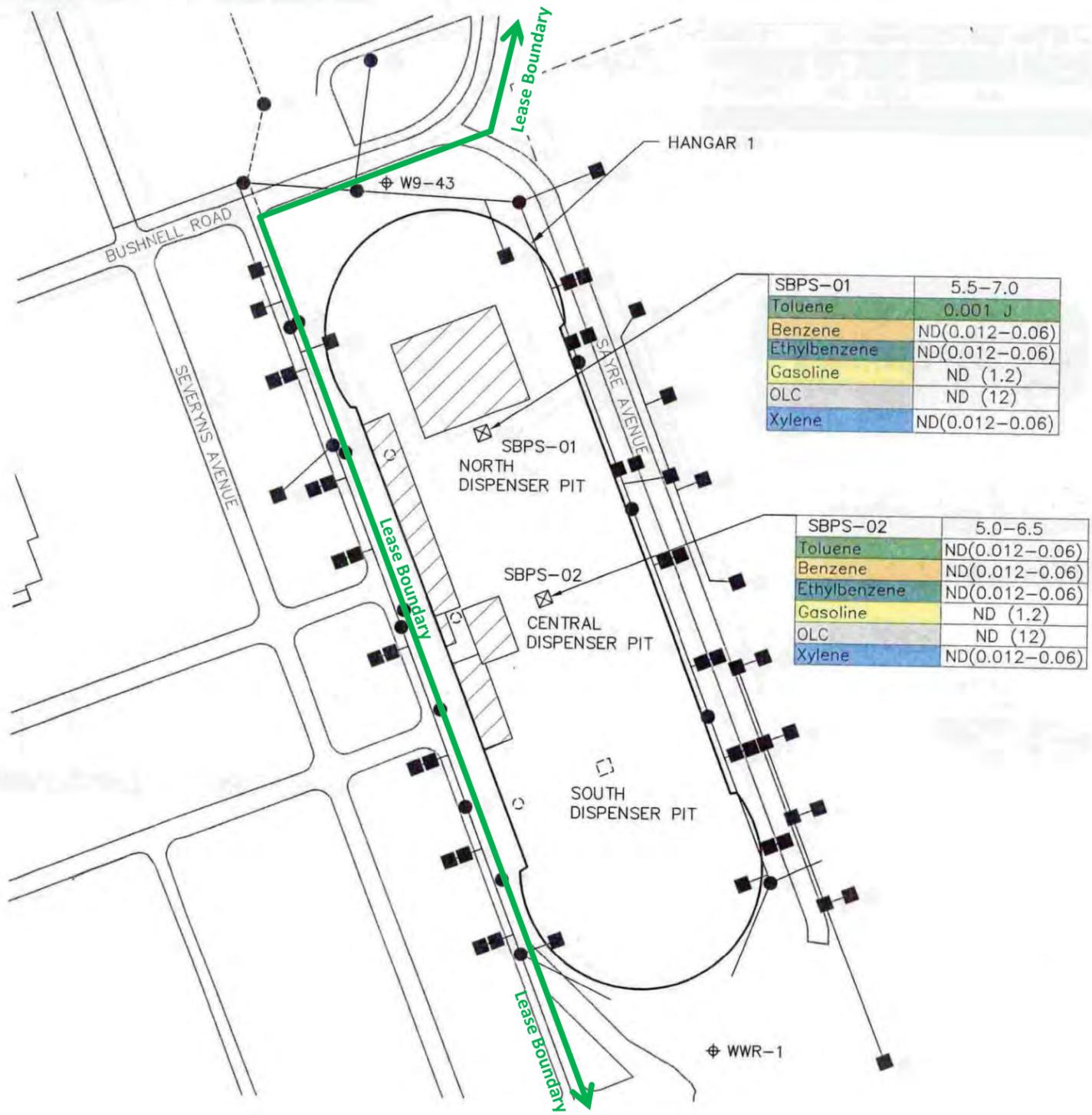


FIGURE 3

Typical construction details of the fuel pits and valve boxes and schematic of the pipelines.

From Figure J3 in Appendix J: Site 24 Petroleum Evaluation



LEGEND

- CLASSROOM, TRAILER, OR OFFICE
- APPROXIMATE LOCATION OF GASOLINE VALVE PIT COVERED BY OFFICES OR CONCRETE
- GASOLINE DISPENSER PIT SOIL AND GROUNDWATER SAMPLE LOCATION (ACTIVE PETROLEUM SITES INVESTIGATION)
- GROUNDWATER MONITORING WELL
- APPROXIMATE LOCATION OF GASOLINE DISPENSER PIT COVERED BY CONCRETE PAVEMENT
- OLC OTHER LIGHT COMPONENTS
- J THE ANALYTE WAS POSITIVELY IDENTIFIED. THE ASSOCIATED NUMERICAL VALUE IS AN APPROXIMATE CONCENTRATION.
- Z CHROMATOGRAPHIC PATTERN OF SAMPLE DID NOT RESEMBLE A TYPICAL FUEL PATTERN
- STORM DRAIN SYSTEM
- - - SEWER SYSTEM
- MANHOLE
- CATCH BASIN
- mg/kg MILLIGRAMS PER KILOGRAM
- ND NOT DETECTED
- (12) DETECTION LIMITS

SBPS-01	5.5-7.0	SAMPLE ID
Toluene	0.001 J	DEPTH
		CONCENTRATION (mg/kg)
		ANALYTE

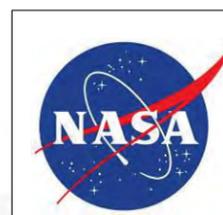
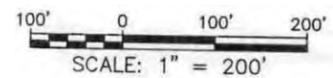


FIGURE 4

Selected petroleum results in soil samples.

Figure J8 from Appendix J

WU4-8	25-Feb-94	26-May-97	27-Nov-00
BENZENE	NA	1	1.6
GASOLINE	ND (50.0)	NA	NA
OLC	510	NA	NA

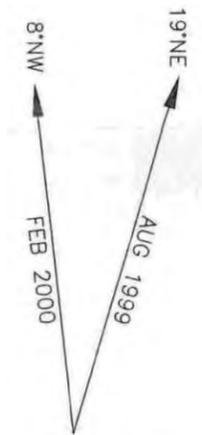
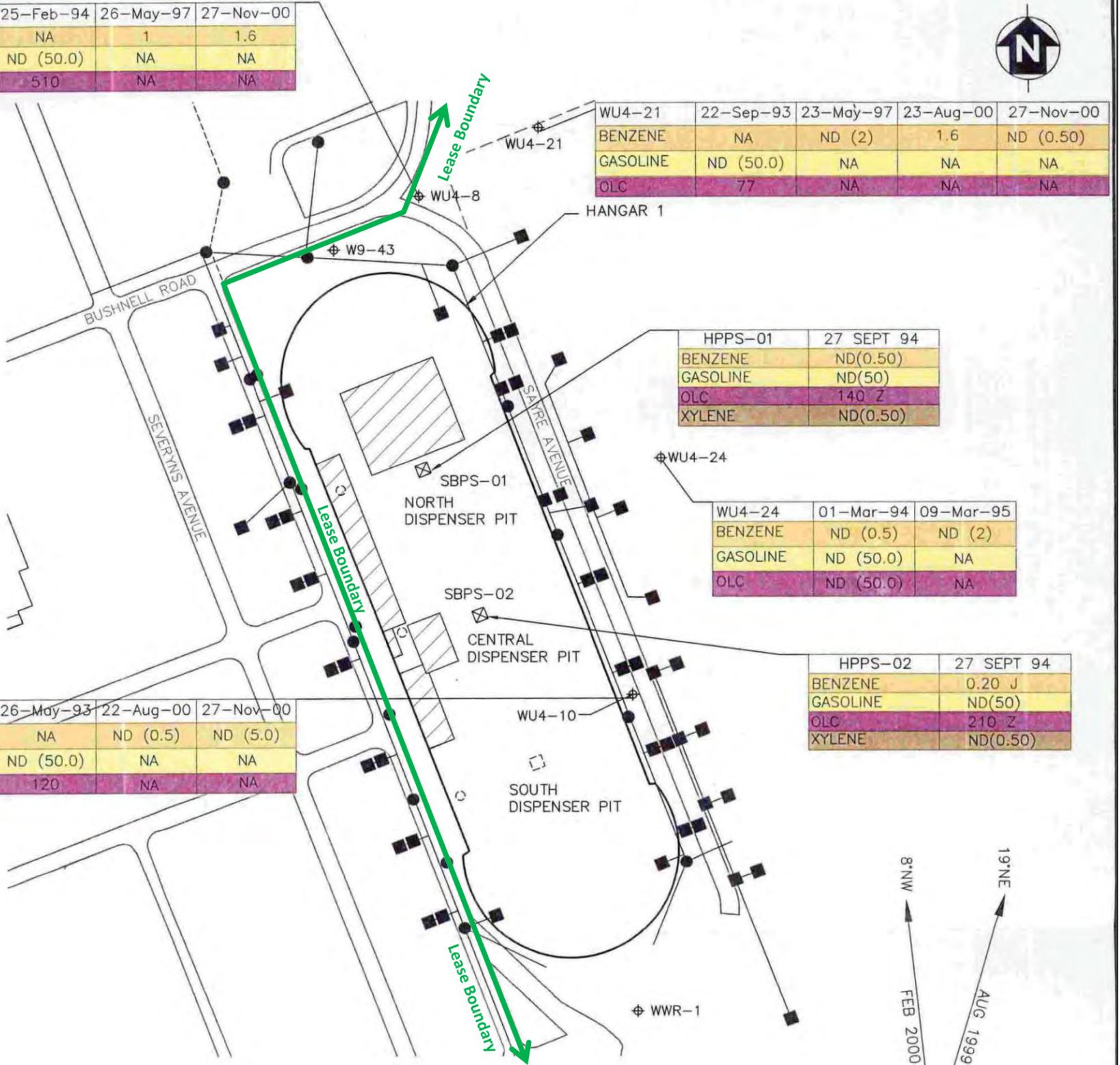
WU4-21	22-Sep-93	23-May-97	23-Aug-00	27-Nov-00
BENZENE	NA	ND (2)	1.6	ND (0.50)
GASOLINE	ND (50.0)	NA	NA	NA
OLC	77	NA	NA	NA

HPPS-01	27 SEPT 94
BENZENE	ND(0.50)
GASOLINE	ND(50)
OLC	140 Z
XYLENE	ND(0.50)

WU4-24	01-Mar-94	09-Mar-95
BENZENE	ND (0.5)	ND (2)
GASOLINE	ND (50.0)	NA
OLC	ND (50.0)	NA

HPPS-02	27 SEPT 94
BENZENE	0.20 J
GASOLINE	ND(50)
OLC	210 Z
XYLENE	ND(0.50)

WU4-10	26-May-93	22-Aug-00	27-Nov-00
BENZENE	NA	ND (0.5)	ND (5.0)
GASOLINE	ND (50.0)	NA	NA
OLC	120	NA	NA



LEGEND

- CLASSROOM, TRAILER, OR OFFICE
- APPROXIMATE LOCATION OF GASOLINE VALVE PIT COVERED BY OFFICES OR CONCRETE
- GASOLINE DISPENSER PIT SOIL AND GROUNDWATER SAMPLE LOCATION (ACTIVE PETROLEUM SITES INVESTIGATION)
- GROUNDWATER MONITORING WELL
- APPROXIMATE LOCATION OF GASOLINE DISPENSER PIT COVERED BY CONCRETE PAVEMENT
- HPPS HYDROPUNCH SAMPLING LOCATION
- OLC OTHER LIGHT COMPONENTS
- J THE ANALYTE WAS POSITIVELY IDENTIFIED. THE ASSOCIATED NUMERICAL VALUE IS AN APPROXIMATE CONCENTRATION.
- Z CHROMATOGRAPHIC PATTERN OF SAMPLE DID NOT RESEMBLE A TYPICAL FUEL PATTERN
- STORM DRAIN SYSTEM
- - - - SEWER SYSTEM
- MANHOLE
- CATCH BASIN
- μg/L (MICROGRAMS PER LITER)
- NA NOT ANALYZED
- ND NOT DETECTED
- (50) DETECTION LIMITS

HPPS-02	27 SEPT 94	0.20 J
BENZENE		

Labels: SAMPLE ID, DATE, CONCENTRATION (μg/L), ANALYTE

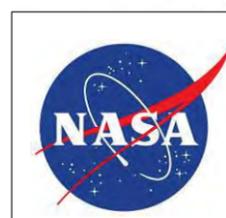
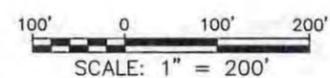
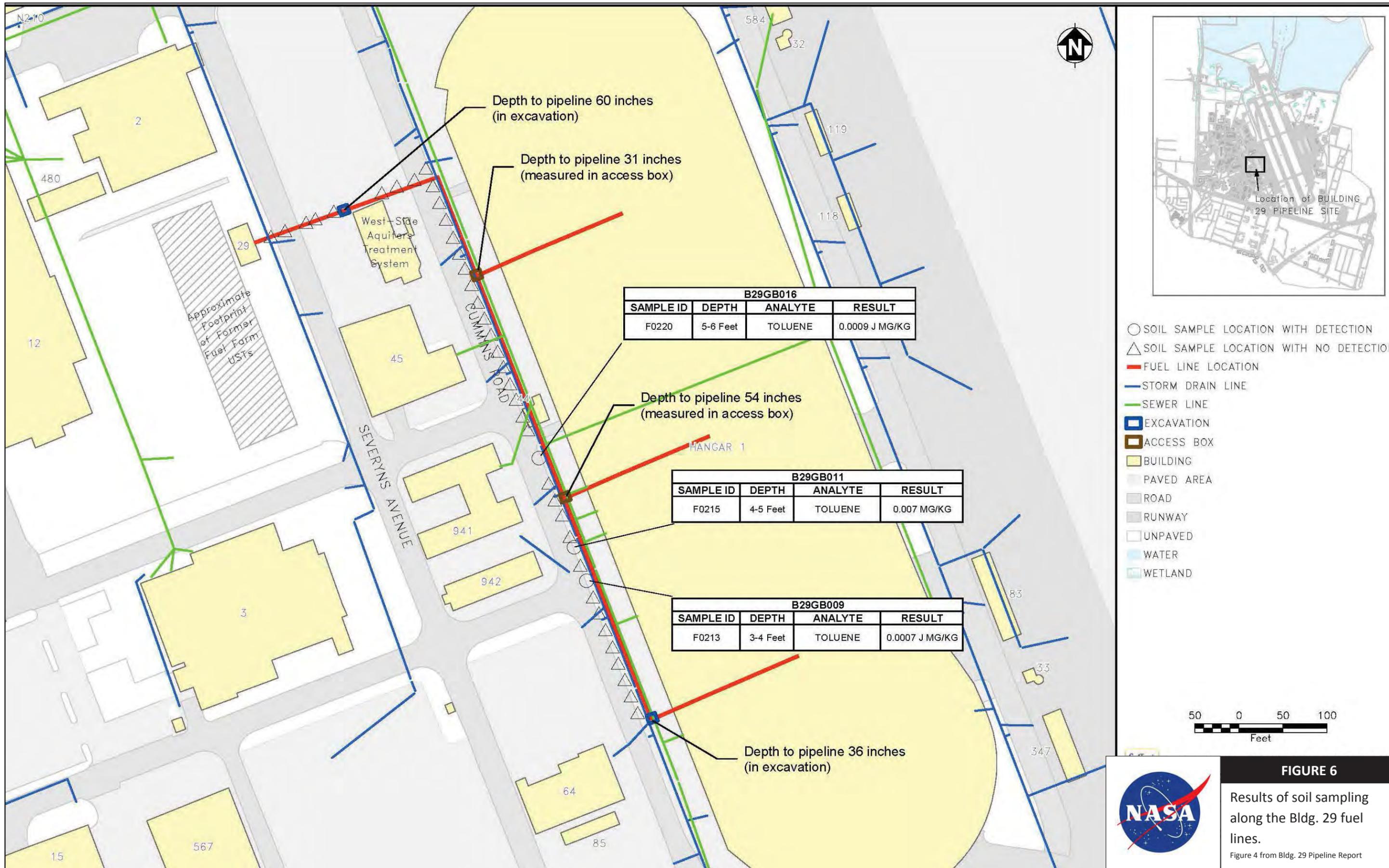


FIGURE 5
Selected petroleum constituents in groundwater
Figure J9 in Appendix J



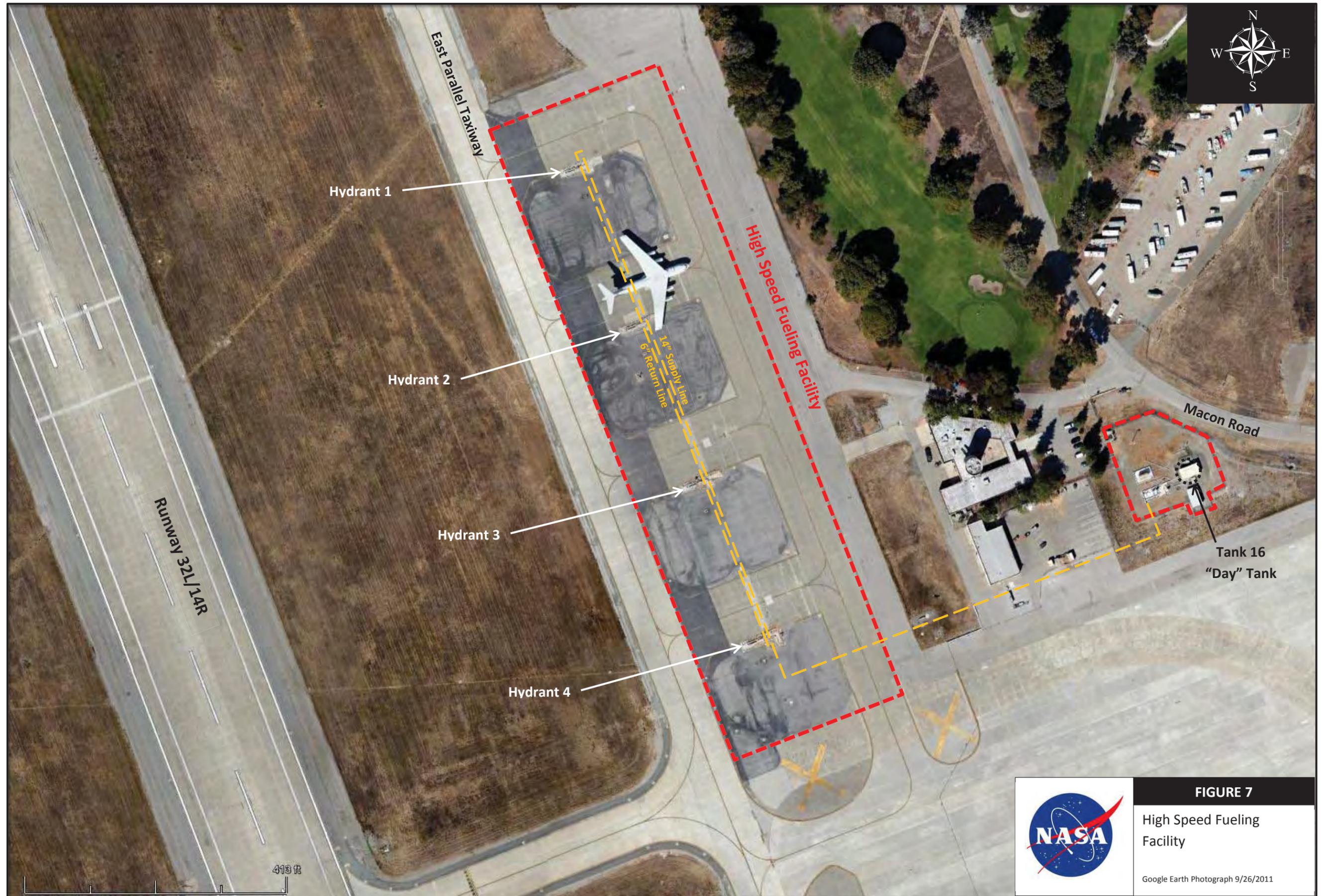
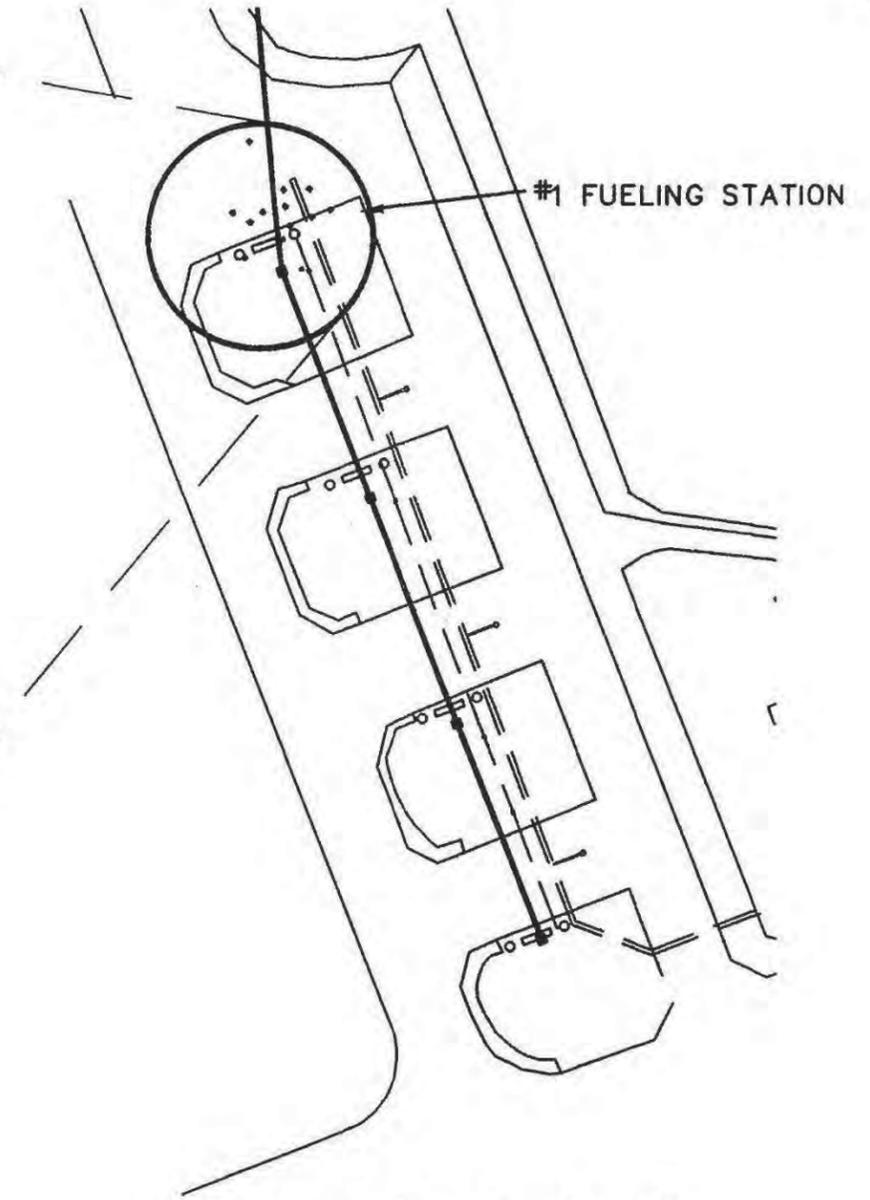
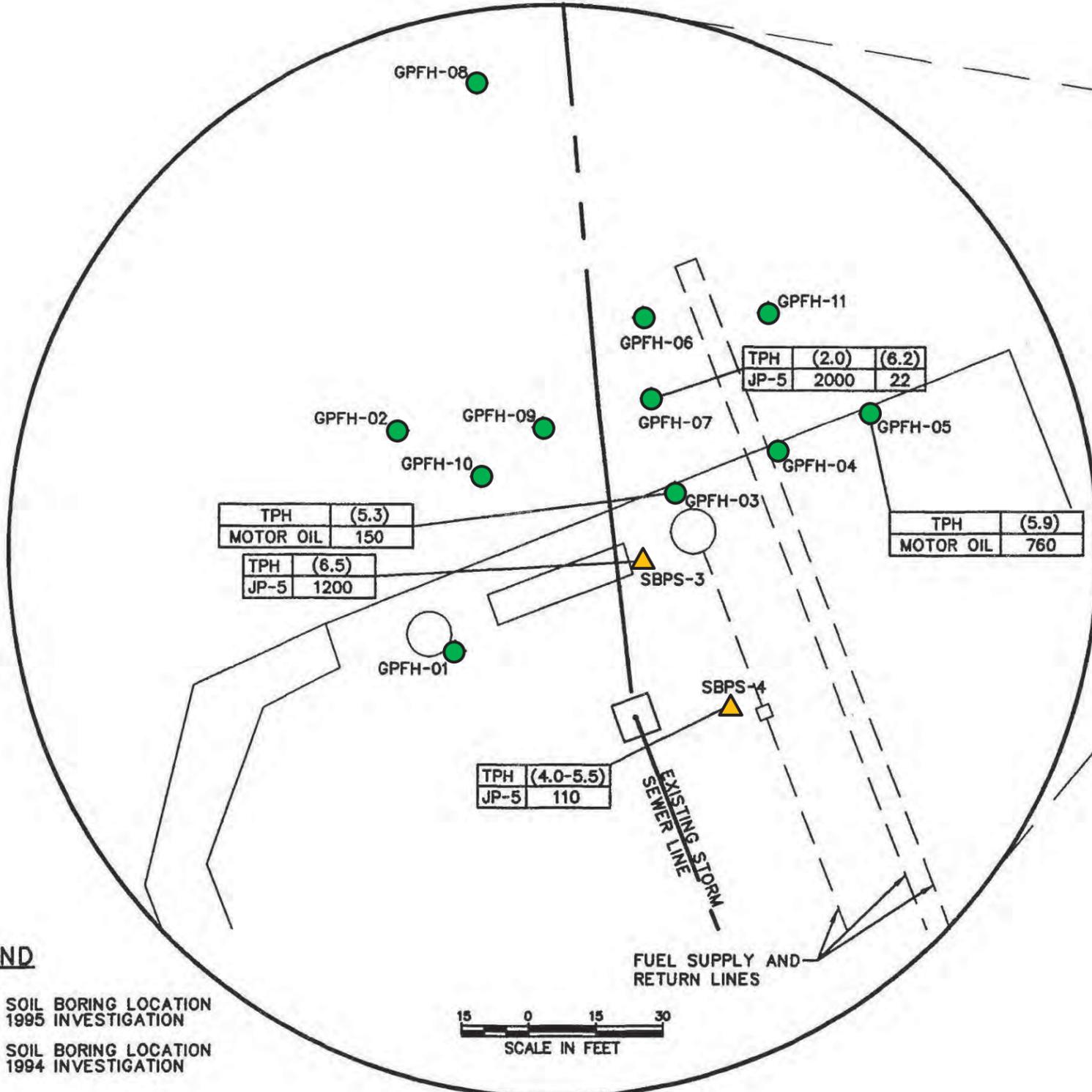




FIGURE 8

Close-up view of Hydrants 3 and 4 of the High Speed Fueling Facility.

Navy Photograph: 1994

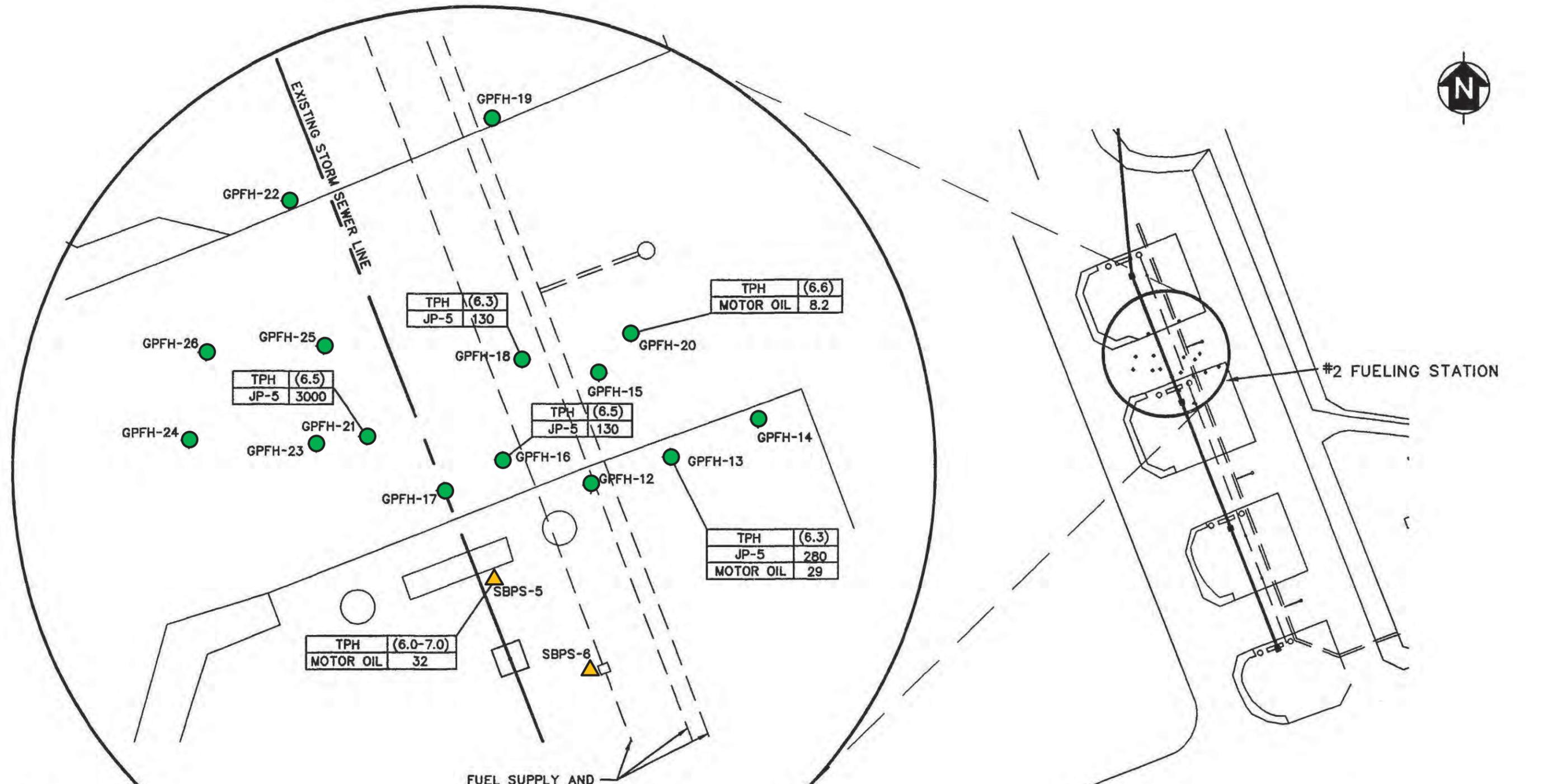


LEGEND

- SOIL BORING LOCATION 1995 INVESTIGATION
- ▲ SOIL BORING LOCATION 1994 INVESTIGATION



FIGURE 9
TPH-e sampling results in soil for Hydrant 1.
Figure 8 from Active Petroleum Sites Investigation



LEGEND

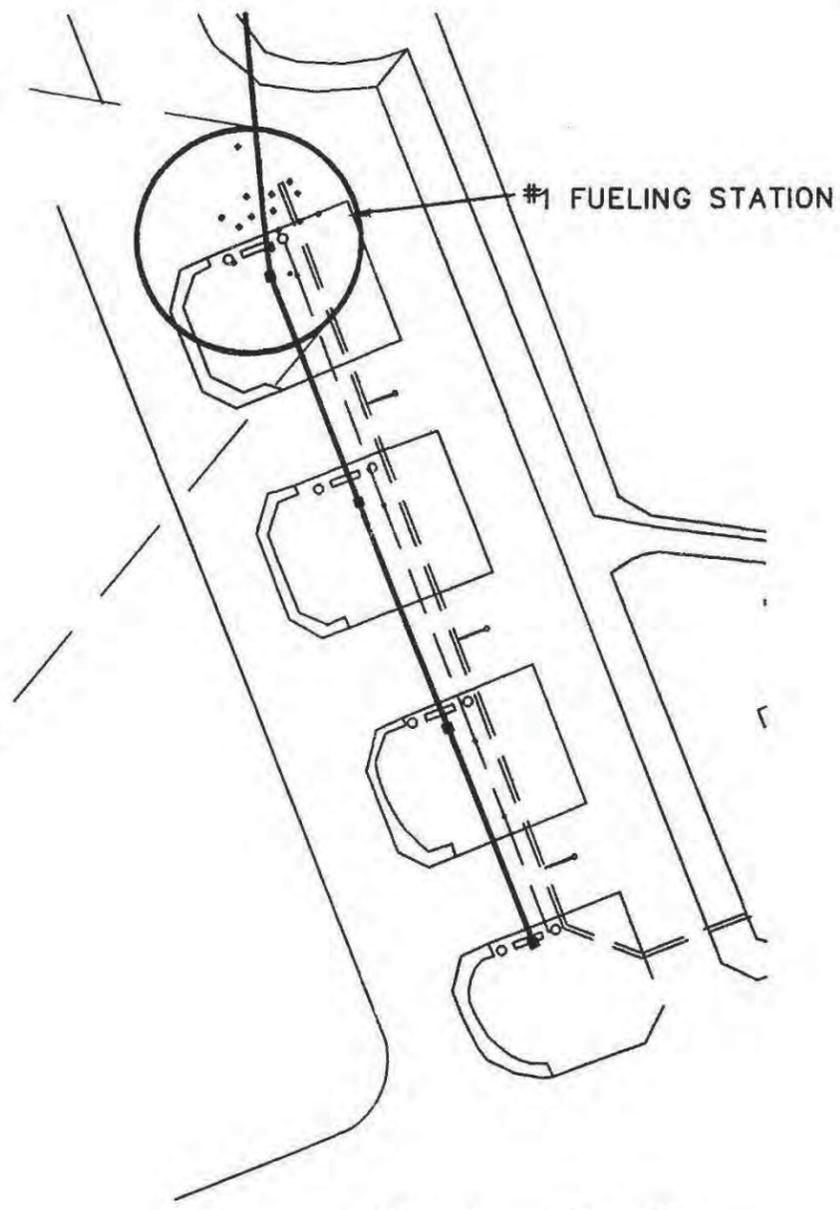
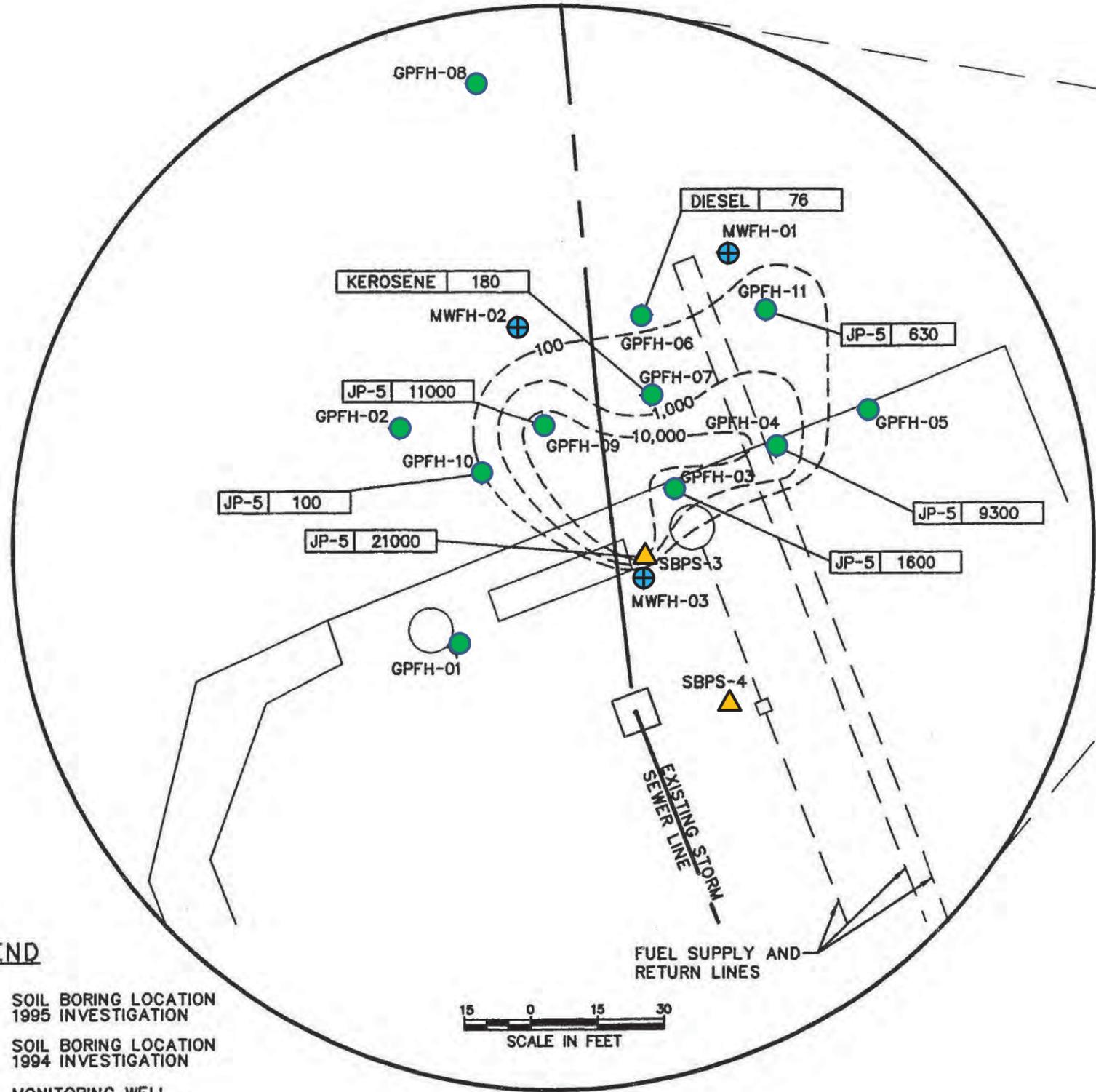
- SOIL BORING LOCATION 1995 INVESTIGATION
- ▲ SOIL BORING LOCATION 1994 INVESTIGATION



FIGURE 10

TPH-e sampling results in soil for Hydrant 2.

Figure 10 from Active Petroleum Sites Investigation



LEGEND

-  SOIL BORING LOCATION 1995 INVESTIGATION
-  SOIL BORING LOCATION 1994 INVESTIGATION
-  MONITORING WELL 1995 INVESTIGATION
-  100 ISOCONCENTRATION CONTOUR ($\mu\text{g/L}$)

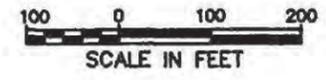
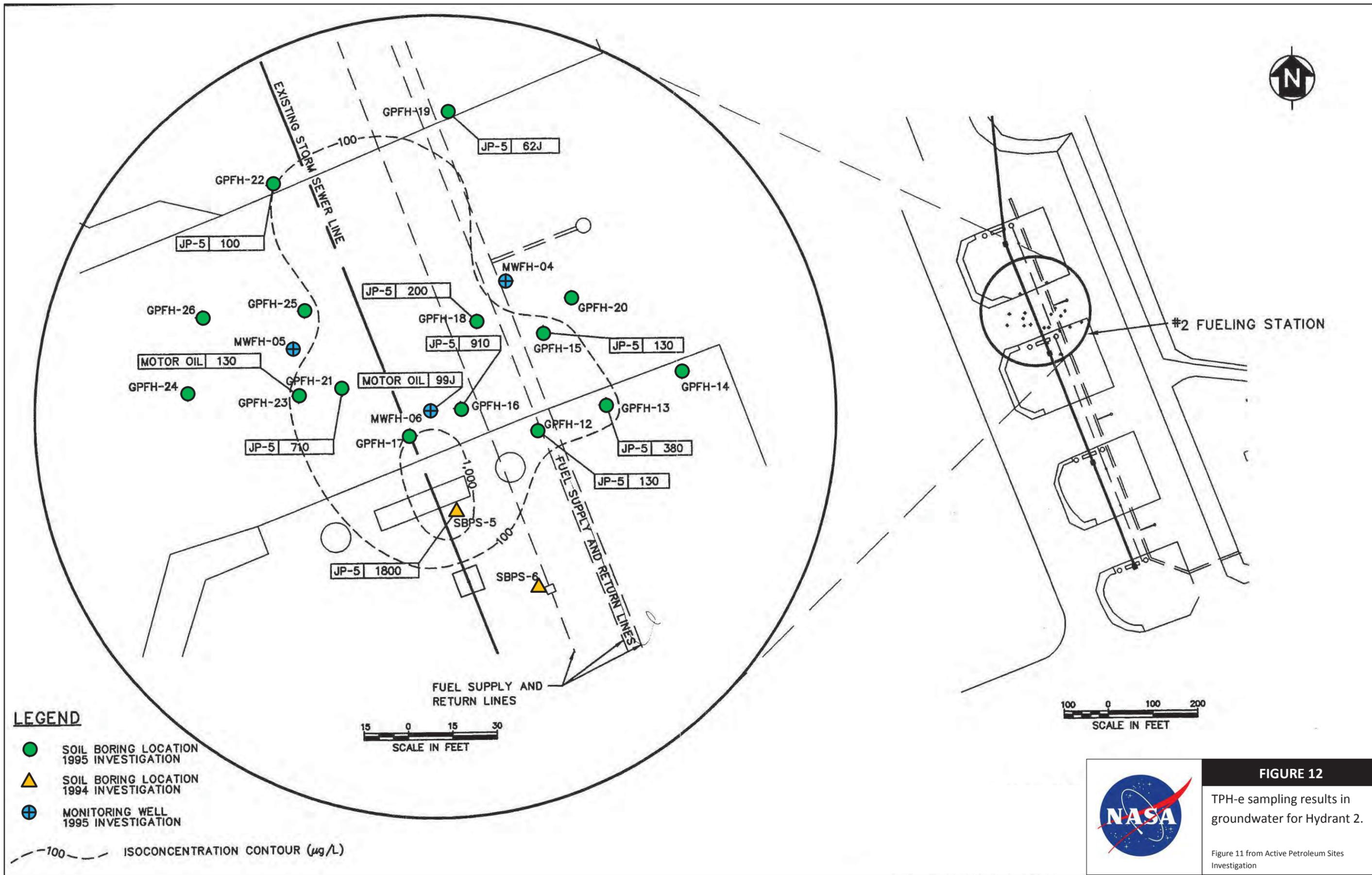


FIGURE 11

TPH-e sampling results in Groundwater for Hydrant 1.

Figure 9 from Active Petroleum Sites Investigation



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SITE NAME:	Site 25 – Eastern Diked Marsh & Stormwater Retention Pond				
Version:	Final	Date:	02/27/2015		
RESPONSIBLE PARTY					
Organization	Department of the Navy, BRAC				
Address	1455 Frazee Rd., Suite 900 San Diego, CA 92108				
Contact	Scott Anderson				
	scott.d.anderson@navy.mil				
	619-532-0938				
LOCATION					
Facility Name	Moffett Federal Airfield	Site Location			
Facility Address	Mountain View, CA	Latitude	37.431707° N		
	Santa Clara County	Longitude	122.054034° W		
Regulatory Program	Lead Agency(ies)	Site Status			
		Open	Closed	ROD	Current Phase
CERCLA	EPA/RWQCB		X	Site 25 January 7, 2010	Monitoring
SITE SUMMARY					
<p>Site 25 is located in the northern portion of Moffett Field (Figure 1). Site 25 is approximately 230 acres in size and is divided into three parts: the Eastern Diked Marsh (EDM), the Stormwater Retention Pond (SWRP), and the Mid-Peninsula Regional Open Space District (MROSD) parcel. Stormwater from the NASA Ames Research Center and the western portion the former Naval Air Station Moffett Field (NASMF) flows through the EDM and into the SWRP.</p> <p>Site 25 was originally part of tidal wetlands that bordered the San Francisco Bay. In the early 20th century, the majority of the wetlands were separated from the bay to form several evaporation ponds that were used for the production of salt.</p> <p>Stormwater from NASA and the former NASMF flowed north through Lindberg Ditch (Figure 1). At the northern end of the base, Lindberg Ditch turned to the east and discharged into the Northern Channel. In the early 1950s, the runways were extended and covered a portion of Lindberg Ditch. Stormwater from the west side of the runways then flowed to the SWRP which was constructed by the Navy from a portion of a salt pond. Eventually, the stormwater from the Lindberg Ditch was directed through the EDM into a newly installed culvert which discharged into the SWRP. In 1993, NASA diverted stormwater from Lindberg Ditch through two newly-installed pipes. The new stormwater pipes discharged into a concrete stormwater settling basin constructed by NASA. The purpose of the settling basin was to collect sediment in the stormwater. From the settling basin, the water flowed into the EDM and on to the SWRP.</p> <p>Lindberg Ditch was found to be contaminated with polychlorinated biphenyls (PCBs) and other contaminants. NASA excavated the ditch and disposed of the soils at an approved facility. The excavation was backfilled with clean soils. The Lindberg Ditch no longer exists.</p>					

SITE NAME:**Site 25 – Eastern Diked Marsh & Stormwater Retention Pond****SITE SUMMARY**

The Navy and NASA conducted several investigations of the sediments in Site 25. Sampling of the sediments revealed the presence of four main Chemicals of Ecologic Concern (COECs). These were PCBs, pesticides, lead, and zinc. Figures 2 and 3 illustrate the distribution of the sampling points and the COECs. These sample locations were used to develop Thiessen polygons throughout the site. The polygons were then used as the basis for remediating sediments of Site 25 (Figure 4).

Several alternatives were evaluated for the remediation of Site 25. The selected remedy consisted of four components: excavation, in situ or ex situ treatment, focused restoration, and ecological monitoring. The ROD also established the following remediation goals (do-not-exceed remediation goals and a site-wide average for each chemical of concern):

Remediation Goals for Site 25 Sediments	Lead (mg/kg)	Zinc (mg/kg)	Total DDT (mg/kg)	Total PCBs (mg/kg)
Site-Wide Average	33	180	0.016	0.200
Do-Not Exceed	93.8	314	0.109	0.210

Only 4.1 acres of Site 25 lies within the Lease Area (Figure 5). The area within the Lease Area is adjacent to the northern portion of the Site 1 Landfill. Within the portion of Site 25 in the Lease Area, there is only one polygon where contamination was found: A6.5. Two contaminated polygons, A6.3 and A6.4, were located just north of the Lease Area boundary. Lead was the COEC for polygon A6.3. PCBs were the COECs for polygons A6.4 and A6.5. Sediments from A6.3 and A6.4 were excavated to a depth of 0.5 feet and removed. Only a small portion of A6.5 was excavated to a depth of 0.5 feet. The remainder of the polygon was not excavated so as not to damage the structural integrity of the Site 1 landfill. Confirmation sampling indicated that concentrations of COCs were below the remediation goals. A total of 371 cy of sediment was removed:

- A6.3 – 344 cy
- A6.4 – 15 cy
- A6.5 – 12 cy

The remedial action for Site 25 was completed on February 2013 with the final inspection. Monitoring by the Navy of habitat restoration is ongoing and will be completed once the habitation restoration success criteria in Appendix H of the Remedial Design/Remedial Action (RD/RA) Work Plan are achieved and concurrence with the regulatory agencies has been received. Site 25 is now open to unrestricted use.

SITE NAME:		Site 25 – Eastern Diked Marsh & Stormwater Retention Pond			
REMEDIAL ACTION					
Remedy	Excavation, Treatment, Restoration, Monitoring	Begin Date	May 2011	End Date	Feb. 2013
<p>Excavation:</p> <ul style="list-style-type: none"> Excavations proceeded in 0.5 – foot increments followed by confirmation sampling until cleanup goals were met Sediments with concentrations of DDT or PCBs above the do not exceed cleanup goals were disposed of as hazardous waste <p>Focused Restoration</p> <ul style="list-style-type: none"> Excavations not located in the wetlands were backfilled where needed to maintain hydrologic conditions Excavations in wetlands were restored and appropriate vegetation was planted to support any habitat that existed prior to excavation 		<p>Habitat monitoring</p> <ul style="list-style-type: none"> Monitoring by the Navy of the ecological recovery of the excavated wetlands Monitoring will continue until the Fall of 2014 unless success criteria are not met. <p>The selected remedy was chosen to be protective of ecological receptors.</p> <p>Completion of the remedial action leaves Site 25 available for unlimited use and unrestricted exposure</p> <p>All excavated soil was disposed of off-site.</p>			
Land Use Restrictions			Development Issues		
<p>Land use must conform to restrictions provided in the NASA 2002 Record of Decision for the Programmatic Environmental Impact Statement, Mitigated Alternative 5.</p> <p>Site 25 is located next to the runway area and is subject to height restrictions as specified under 14 CFR Part 77, especially §77.17 and §77.19.</p>			<p>While the Site 25 remedial action allows for unlimited use and unrestricted exposure, development for the site is restricted:</p> <ul style="list-style-type: none"> Site 25 will continue to be used for the collection and management of storm water. Site 25 is a seasonal wetland. Site 25 provides habitat for endangered species such as the salt marsh harvest mouse. 		

SITE NAME:

Site 25 – Eastern Diked Marsh & Stormwater Retention Pond

RESIDUAL CONTAMINATION

Compound	Residual Concentration (max)		Notes
	Soil (mg/kg)	Groundwater (µg/L)	
			Cleanup goals were achieved through the remedial action.

REFERENCES (Chronological Order)

- *Final Record of Decision, Site 25, Former Naval Air Station Moffett Field, CA.* Department of the Navy, BRAC PMO West, San Diego, CA. November 2009.
- *Remedial Design and Remedial Action Work Plan, Remedial Action at IR site 25, Former NAS Moffett Field, Moffett Field, CA.* ITSI, Walnut Creek, CA. March 2012.
- *Final Remedial Action Completion Report, Site 25, Former Naval Air Station Moffett Field, CA.* ITSI Gilbane, Walnut Creek, CA. July 2013.
- *Vegetation Restoration Maintenance and Monitoring Report – Year One, Installation Restoration Site 25, Moffett Field, CA.* ITSI Gilbane, Walnut Creek, CA. December 2013.

FIGURES

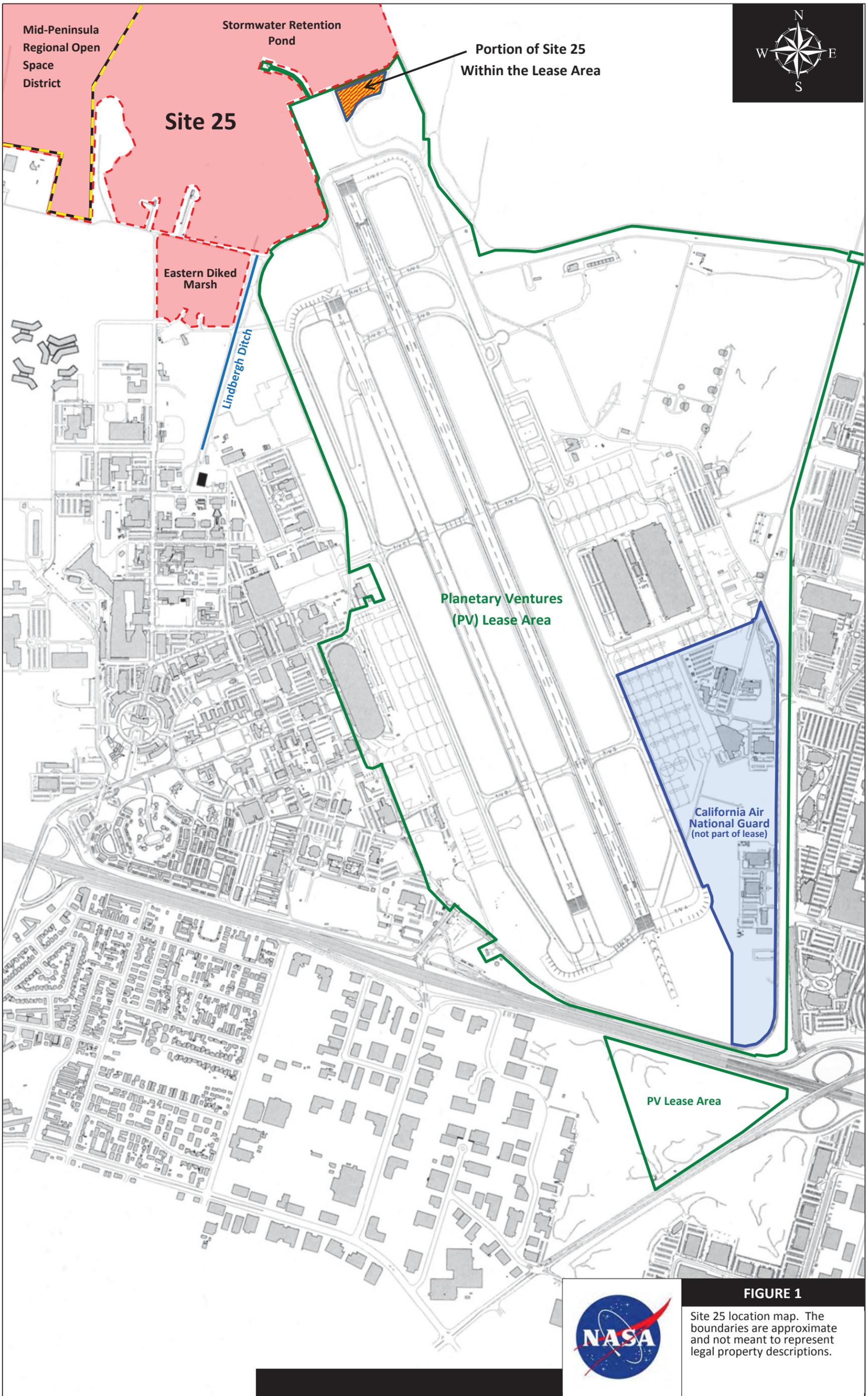
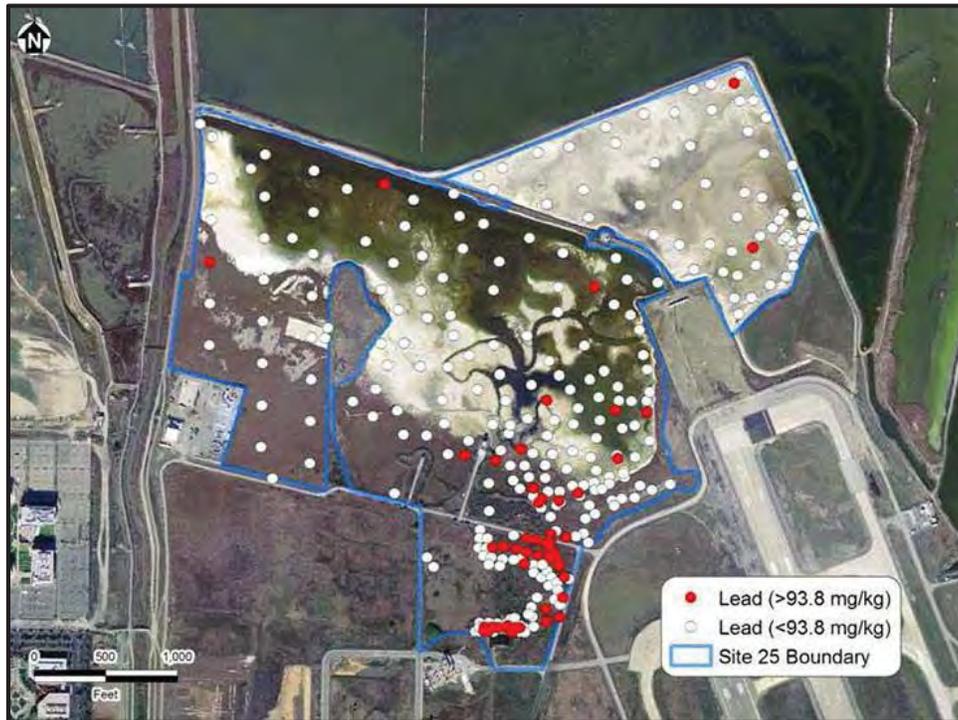


FIGURE 1
 Site 25 location map. The boundaries are approximate and not meant to represent legal property descriptions.



Sediment Sampling Locations for Lead



Sediment Sampling Locations for Zinc

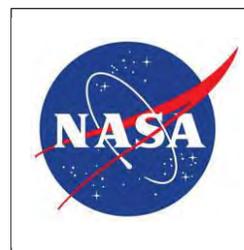


FIGURE 2

Maps showing the sampling locations for lead and zinc.

Source: Final Site 25 Record of Decision



Sediment Sampling Locations for Total DDT



Sediment sampling Locations for PCBs



FIGURE 3
 Maps showing the sampling locations for total DDT and total PCBs.
 Source: Final Site 25 Record of Decision



FIGURE 5

Aerial view of the portion of Site 25 that is within the lease boundary.

NASA photograph 11/06/2012



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SITE NAME:	Site 26 – East-Side Aquifer Treatment System (EATS) Area				
Version:	Final	Date:	02/28/2015		
RESPONSIBLE PARTY					
Organization	Department of the Navy, BRAC				
Address	1455 Frazee Rd., Suite 900 San Diego, CA 92108				
Contact	Scott Anderson				
	scott.d.anderson@navy.mil				
	619-532-0938				
LOCATION					
Facility Name	Moffett Federal Airfield	Site Location			
Facility Address	Mountain View, CA	Latitude	37.419961° N		
	Santa Clara County	Longitude	122.041696° W		
Regulatory Program	Lead Agency(ies)	Site Status			
		Open	Closed	ROD	Current Phase
CERCLA	EPA/RWQCB	X		OU5 1996 ¹	O&M
SITE SUMMARY					
<p>Note: 1. ROD Amendment for Site 26 finalized on September 30, 2014.</p> <p>Site 26 is located on the east side of Moffett Field, northeast of Hangar 3 (Figure 1). The area was originally investigated as a portion of Operable Unit (OU) 5, the east side aquifer. Based on data collected during the Remedial Investigation (RI), groundwater contamination from chlorinated solvents was found to exist northeast of Hangar 3. Two groundwater plumes were identified on the OU5 Remedial Investigation: the Northern Plume and the Southern Plume (Figure 3).</p> <p>The Northern Plume was located in an area where the total dissolved solids (TDS) in the groundwater are at concentrations above 3,000 mg/L. The high TDS concentrations disqualifies the groundwater as a possible drinking water source according to the State Water Resources Control Board Resolution 88-63 standards. The Navy selected groundwater monitoring for the Northern Plume in the OU5 Record of Decision (ROD). Concentrations of Chemicals of Concern have been below Maximum Contamination Levels for groundwater since 2008.</p> <p>The Southern Plume was renamed Site 26.</p> <p>Chlorinated solvents such as trichloroethene (TCE) and tetrachloroethene (PCE) were used in Hangars 2 and 3 and contaminated the groundwater below the site. Solvents and wastewater from Hangar 3 were also discharged to two underground storage tanks (USTs): Tank 2 and Tank 43. Both tanks have been removed. Tank 2 was a 2000 gallon steel tank that had been installed in 1979 and removed in 1990. Tank 43 was a 2000 gallon steel tank that was installed in 1979 and removed in 1993. Both tanks are part of IR Site 19.</p> <p>In addition to TCE and PCE, their breakdown products are also found in the groundwater:</p> <ul style="list-style-type: none"> • cis-1,2-dichloroethene (DCE), • 1,1- DCE, • vinyl chloride 					

SITE NAME:**Site 26 – East-Side Aquifer Treatment System (EATS) Area****SITE SUMMARY**

The groundwater in the area is not currently used for drinking water. An ecological risk assessment showed that plants and animals are not at risk from contaminants in groundwater.

Five alternatives were evaluated in the OU5 Feasibility Study (FS). These alternatives are described in Table 1. Alternative 5A, groundwater extraction with treatment by air stripper was the selected remedy prescribed in the OU5 ROD. In addition, the selected remedy includes institutional controls and groundwater monitoring. The groundwater cleanup standards are the maximum contaminant levels (MCL) for the chemicals of concern (COC):

- 1,2-DCA: 0.5 µg/L
- 1,2-DCE: 6 µg/L
- 1,1-DCE: 6 µg/L
- PCE: 5 µg/L
- TCE: 5 µg/L
- PCE: 0.5 µg/L

Treated groundwater would either be used to supplement irrigation of the golf course or discharged to the storm drain system.

The ROD also included institutional controls:

- Operation and maintenance of the Bldg. 191 Lift Station and storm drainage system,
- Fencing of the treatment system area,
- Domestic use restrictions on the groundwater at OU5.

A Memorandum of Agreement between the Navy and NASA was executed to maintain continued operation of the Bldg. 191 Lift Station. A copy of the MOA is in Attachment 1. The fencing was installed as part of the construction of EATS including the treatment area and each extraction well. All areas are kept locked. Restrictions prohibiting residential development and use of groundwater for drinking water are noted in planning and transfer documentation for the facility.

Construction of EATS began in July 1997. Completion of the system and operations began January 1999. The system consists of the following main components:

- 5 extraction wells (Figure 2),
- Shallow tray air stripper,
- 10 micron bag filters,
- 2 granular activated carbon (GAC) filters,
- Discharge to the storm drain system.

EATS operated from January 1999 until July 2003. During that time, EATS processed 67,050,786 gallons of extracted groundwater and removed approximately 23.65 pounds of VOCs.

SITE NAME:**Site 26 – East-Side Aquifer Treatment System (EATS) Area****SITE SUMMARY**

A series of treatability studies were carried out after the pump-and-treat system was taken off-line. A natural attenuation study was performed from 2003 through 2005 which found that attenuation of COCs is taking place at the site but at a slow rate. In 2005, a hydrogen release compound (HRC) study was conducted to determine the effectiveness and applicability of HRC to promote reductive dechlorination of VOCs. The study concluded that reductive dechlorination was occurring, but that the process was not proceeding toward completion because the microbial populations within the aquifer were too low to sustain biodegradation of the COCs. An abiotic/biotic treatment technology study was performed in 2009. The study involved injecting a substrate made up of zero-valent iron and solid organic compound in the subsurface (Figure 3). The abiotic/biotic method was shown to be a potentially applicable treatment alternative at Site 26 as VOCs were reduced to below remediation goals in several treatment areas and complete dechlorination of VOCs was observed at locations where sufficient substrate and highly reducing conditions persisted.

The Navy completed a Focused Feasibility Study in 2012 to evaluate alternatives to improve or replace the remedy selected in the OU5 ROD. Figure 3 (2004 map, figure 6 in the ROD Amendment) illustrates the distribution of VOCs in November/December 2010. Five alternatives were considered (Table 2). The Navy proposed Alternative 5: Biostimulation/Bioaugmentation Treatment, MNA, and ICs to address the VOC plume at Site 26 (Figures 4-6). A ROD Amendment was completed on September 30, 2014. A future remedial design will determine the exact locations of wells and the specific equipment/activities associated with the final remedy for the site.

Site Name:

Site 26 – East-Side Aquifer Treatment System (EATS) Area

OPERATION AND MAINTENANCE REQUIREMENTS

Maintenance		Monitoring	
Inspections/Activities	Frequency	Parameters	Frequency
With EATS off-line no O&M requirements		<i>Groundwater</i>	
		<i>Monitoring Parameters</i>	
New O&M Requirements may be listed in the Remedial Design		Physical:	
		Temperature	Semi-annual
		Conductivity	Semi-annual
		Dissolved oxygen	Semi-annual
		pH	Semi-annual
		Turbidity	Semi-annual
		Wells & Analytical:	
		VOCs, TPH-e, metals:	
		W7-7	Semi-annual
		VOCs, TPH-e	
		W7-6	Semi-annual
		W7-10	Semi-annual
		W43-4	Semi-annual
		VOCs, Metals	
		EXW-1	Semi-annual
		EXW-2	Semi-annual
		EXW-3	Semi-annual
		EXW-4	Semi-annual
		EXW-5	Semi-annual
		W4-3	Semi-annual
		W7-8	Semi-annual
		WU5-10	Semi-annual
		WU5-16	Semi-annual
		WU5-19	Semi-annual
		WSW-6	Semi-annual
		VOCs	
		W4-1	Semi-annual
	W4-2	Semi-annual	
	W4-6	Semi-annual	
	W4-11	Semi-annual	
	W4-14	Semi-annual	
	W4-15	Semi-annual	
	W4-16	Semi-annual	
	W7-17	Semi-annual	
	WU5-1	Semi-annual	
	WU5-2	Semi-annual	
	WU5-4	Semi-annual	
	WU5-5	Semi-annual	
	WU5-8	Semi-annual	
	WU5-9	Semi-annual	
	WU5-10	Semi-annual	
	WU5-11	Semi-annual	
	WU5-12	Semi-annual	
	WU5-13	Semi-annual	
	WU5-14	Semi-annual	
	WU5-15	Semi-annual	
	WU5-17	Semi-annual	
	WU5-18	Semi-annual	
	WU5-21	Semi-annual	
	WU5-22	Semi-annual	
	WU5-23	Semi-annual	
	WU5-24	Semi-annual	
	WU5-25	Semi-annual	
	WSW--5	Semi-annual	

SITE NAME:		Site 26 – East-Side Aquifer Treatment System (EATS) Area			
REMEDIAL ACTION					
Remedy	Pump and Treat	Begin Date	Jan. 1999	End Date	
<p>Extraction and treatment of contaminated groundwater. EATS consists of:</p> <ul style="list-style-type: none"> • Five extraction wells: EXW-1 to EXW-5 • Anti-scalant • Shallow-tray air stripper • Four 10-micron bag filters • Two granular activated carbon filters • Discharge of treated groundwater <p>EATS designed to treat up to 30 gpm</p> <p>EATS was taken off-line in July 2003. The Navy has carried out several pilot tests to determine an alternative remedial action. The Navy will implement Biostimulation/Bioaugmentation Treatment, MNA, and ICs as an alternative. Remedial design is in process.</p>					
Land Use Restrictions			Development Issues		
<p>Institutional Controls:</p> <ul style="list-style-type: none"> • Operation and maintenance of the Bldg. 191 Lift Station and storm drainage system, • Fencing of the treatment system area, • Domestic use restrictions on the groundwater at OU5. <p>A MOA between NASA and Navy was signed to maintain O&M of the Bldg. 191 Lift Station and storm drain system (Attachment 1).</p> <p>Fencing of EATS and wells was completed during construction.</p> <p>Site 26 is located next to the runway area and is subject to height restrictions as specified under 14 CFR Part 77, especially §77.17 and §77.19. In general, all building must be shorter than limits set by the FAA; the farther from the center of the runway, the taller the buildings can be. The height restrictions are reviewed as part of the building permit process.</p> <p>Residential land use is not permitted within Site 26.</p>			<p>Construction or modifications to existing structures may expose contaminated soil. Any dewatering that may take place will have to be tested to determine the appropriate disposal of the water. Construction of new structures or modification of existing must consider the possibility of vapor intrusion.</p> <p>EIMP must be followed.</p>		

SITE NAME:		Site 26 – East-Side Aquifer Treatment System (EATS) Area	
RESIDUAL CONTAMINATION			
Compound	Residual Concentration (max)		Notes
	Soil (mg/kg)	Groundwater (µg/L)	
TCE [W43-2]		20	Concentrations from the 2013 Groundwater Monitoring Report for EATS & WATS. Combined VOC concentration from Focused Feasibility Study
PCE [W43-2]		41	
cis-1,2-DCE [W7-10]		17	
vinyl chloride [W4-14]		9.6	
Combined VOCs		85.90	
REFERENCES (Chronological Order)			
<ul style="list-style-type: none"> • <i>Final Operable Unit 5 Feasibility Study Report Moffett Federal Airfield, CA.</i> Department of the Navy, Western Division, NAVFAC, San Bruno, CA. August 31, 1995. • <i>Moffett Federal Airfield Final Operable Unit 5 Record of Decision.</i> Department of the Navy, EFA West, San Bruno, CA. June 28, 1996. • <i>East-Side Aquifer Treatment System Final Long-Term Groundwater Monitoring Plan, Moffett Federal Airfield.</i> PRC Environmental Management, Inc., San Francisco, CA. Jul 3, 1997. • <i>Final East-Side Aquifer Treatment System Evaluation Work Plan, Moffett Federal Airfield, CA.</i> Foster Wheeler Environmental Corp., San Diego, CA. January 14, 2003. • <i>Final East-Side Aquifer Treatment System (Operable Unit 5) Five-Year Review Report for the Period January 1999 to December 2002, Former Naval Air Station Moffett Field, CA.</i> Department of the Navy, BRAC PMO West, San Diego, CA. February 2005. • <i>Final Five-Year Review Report Installation Restoration Sites 1, 22, 26, and 28, Former Naval Air Station Moffett Field, CA.</i> ChaduxTt, San Diego, CA. February 12, 2010. • <i>Final Focused Feasibility Study Installation Restoration Site 26 Former Naval Air Station Moffett Field, CA.</i> Shaw, Concord, CA. July 2012. • <i>2012 Annual Groundwater Report for Installation Restoration Sites 26 and 28 Former Naval Air Station Moffett Field, CA.</i> SES-TECH Remediation Services, San Diego, CA. April 2013. • <i>Proposed Plan for Groundwater Cleanup, Former Naval Air Station Moffett Field, Installation Restoration Site 26.</i> Department of the Navy, BRAC PMO West, San Diego, CA. April 2013. • <i>Final 2013 Annual Groundwater Report for Installation Restoration Sites 26 and 28, Former Naval Air Station Moffett Field, Moffett Field, CA.</i> SES-TECH Remediation Services, San Diego, CA. April 2014. • <i>Final Record of Decision Amendment for Installation Restoration Site 26, Former Naval Air Station Moffett Field, Moffett Field, CA.</i> Dept. of the Navy, BRAC PMO West, San Diego, CA. Sept. 30, 2014. 			

Table 1: Remedial Alternatives for Site 26 from OU5 Feasibility Study

Alternative Number	Collection	Treatment	Discharge	Other Action
1	No action	No action	No action	Groundwater monitoring
2	No Action	No action	No action	Institutional controls, groundwater monitoring, indirect restoration
3	No action	Future Treatment Plant (70 gpm)	No Action	Institutional controls, groundwater monitoring
4A	No action	Iron Curtain	No action	Institutional controls, groundwater monitoring
4B	No action	Air Sparging/Soil Vapor Extraction with air pollution control device	No action	Institutional controls, groundwater monitoring
5A ¹	Groundwater extraction at 70 gpm for 50 years from 15 extraction wells	Packed air stripper with filtration pretreatment	Reinject treated water into aquifer	Institutional controls, groundwater monitoring
5B	Groundwater extraction at 70 gpm for 50 years from 15 extraction wells	UV/oxidation with filtration pretreatment	Reinject treated water into aquifer	Institutional controls, groundwater monitoring

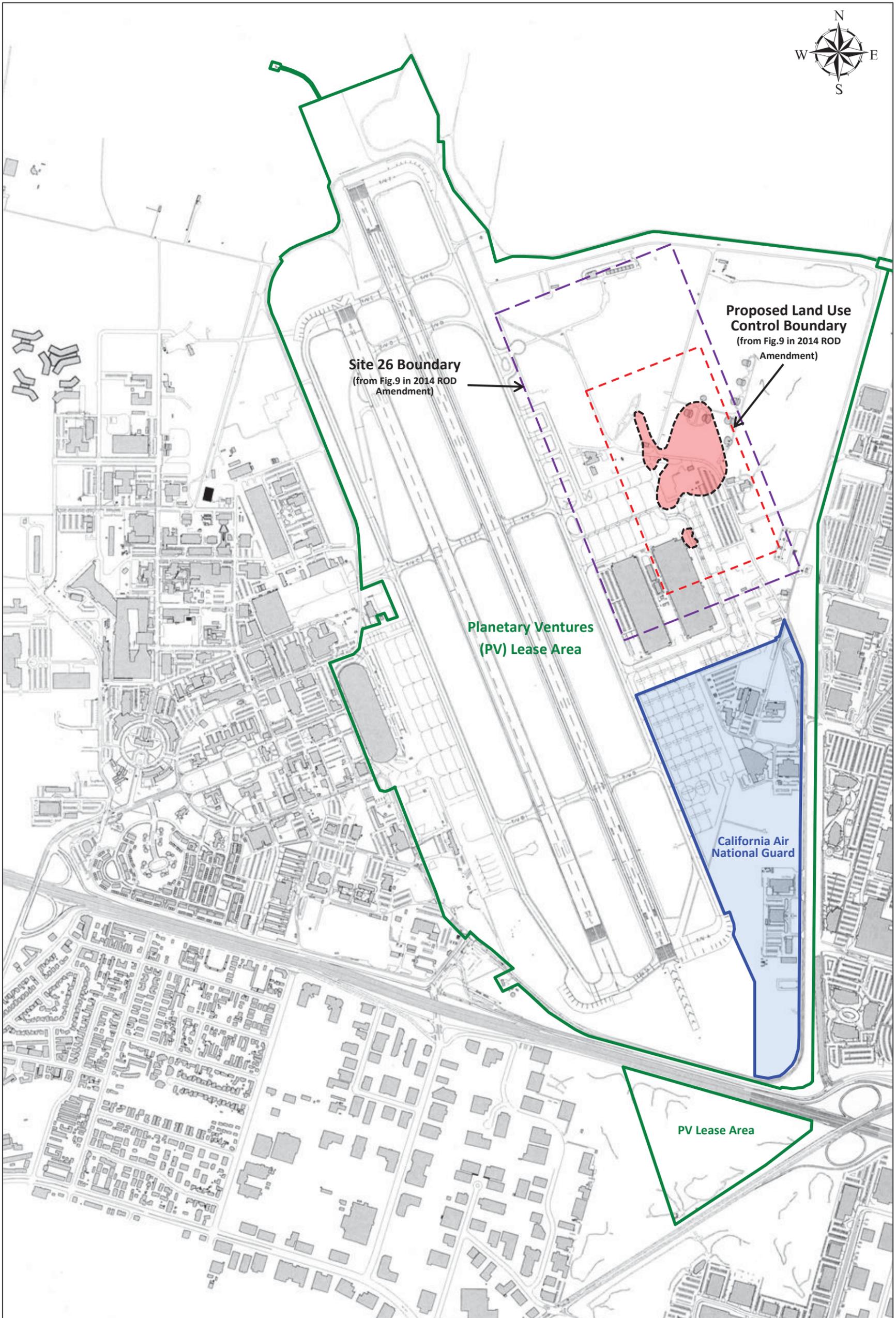
1. Selected remedy, OU5 ROD

Table 2: Proposed Remedial Alternatives for Site 26

Alternatives	Overall Protection of Human Health & the Environment	Compliance with Applicable or Relevant and Appropriate Requirement	Project Duration (Years)
1: No Action	Not protective	Not Applicable	0
2: Monitored Natural Attenuation (MNA) and Institutional Controls (IC)	Protective	Meets	100
3: Optimized Pump and Treat and ICs	Protective	Meets	43
4: Biotic/Abiotic Treatment, MNA, & ICs	Protective	Meets	38
5. Biostimulation/Bioaugmentation, MNA, ICs ¹	Protective	Meets	38

1. Selected remedy from the ROD Amendment.

FIGURES



Site 26 Boundary
(from Fig.9 in 2014 ROD
Amendment)

Proposed Land Use
Control Boundary
(from Fig.9 in 2014 ROD
Amendment)

Planetary Ventures
(PV) Lease Area

California Air
National Guard

PV Lease Area



FIGURE 1

Site 26 location map. The plumes indicate total VOCs. The box boundaries are from the Site 26 ROD Amendment. The boundaries are approximate and not meant to represent legal property descriptions.

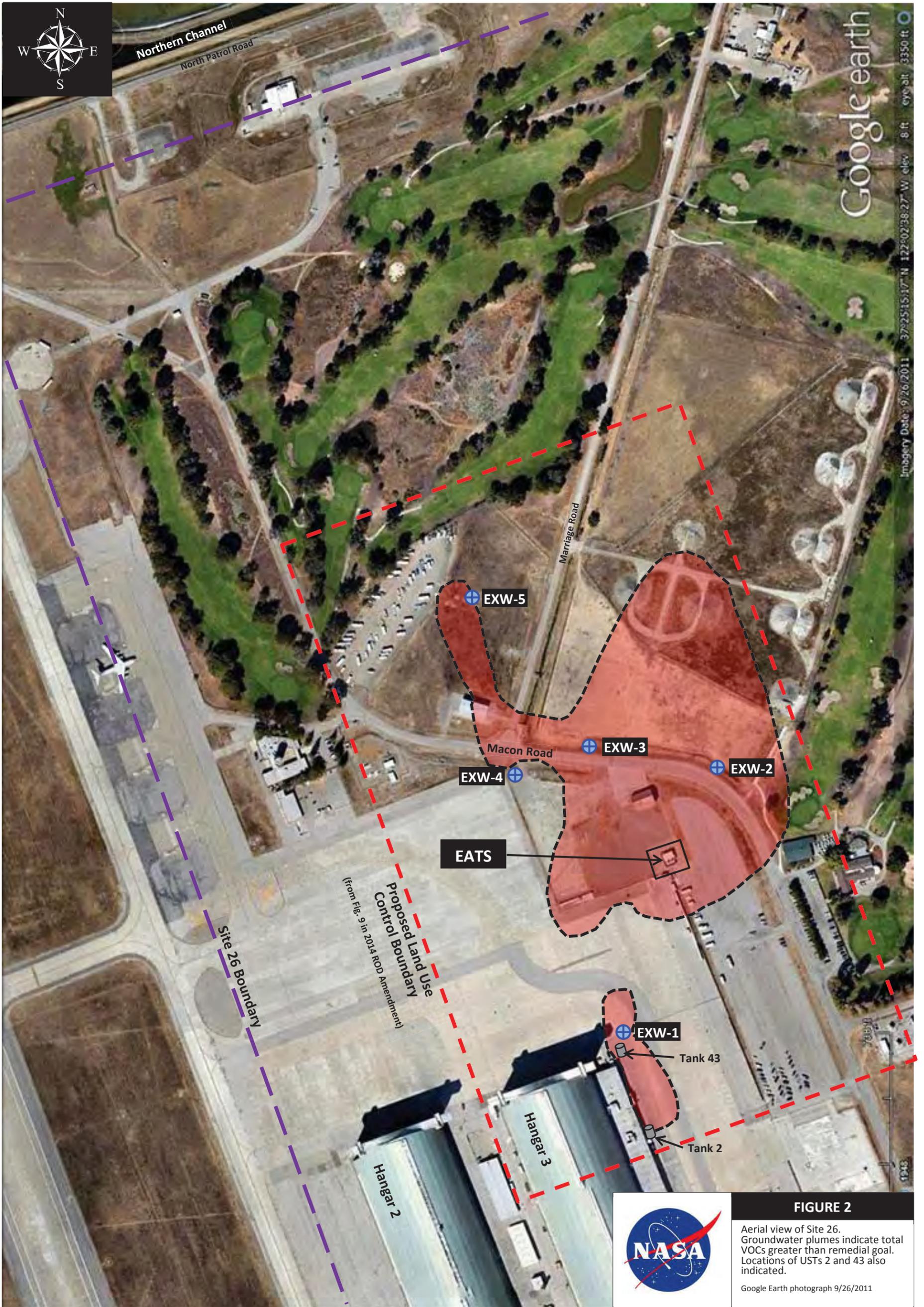
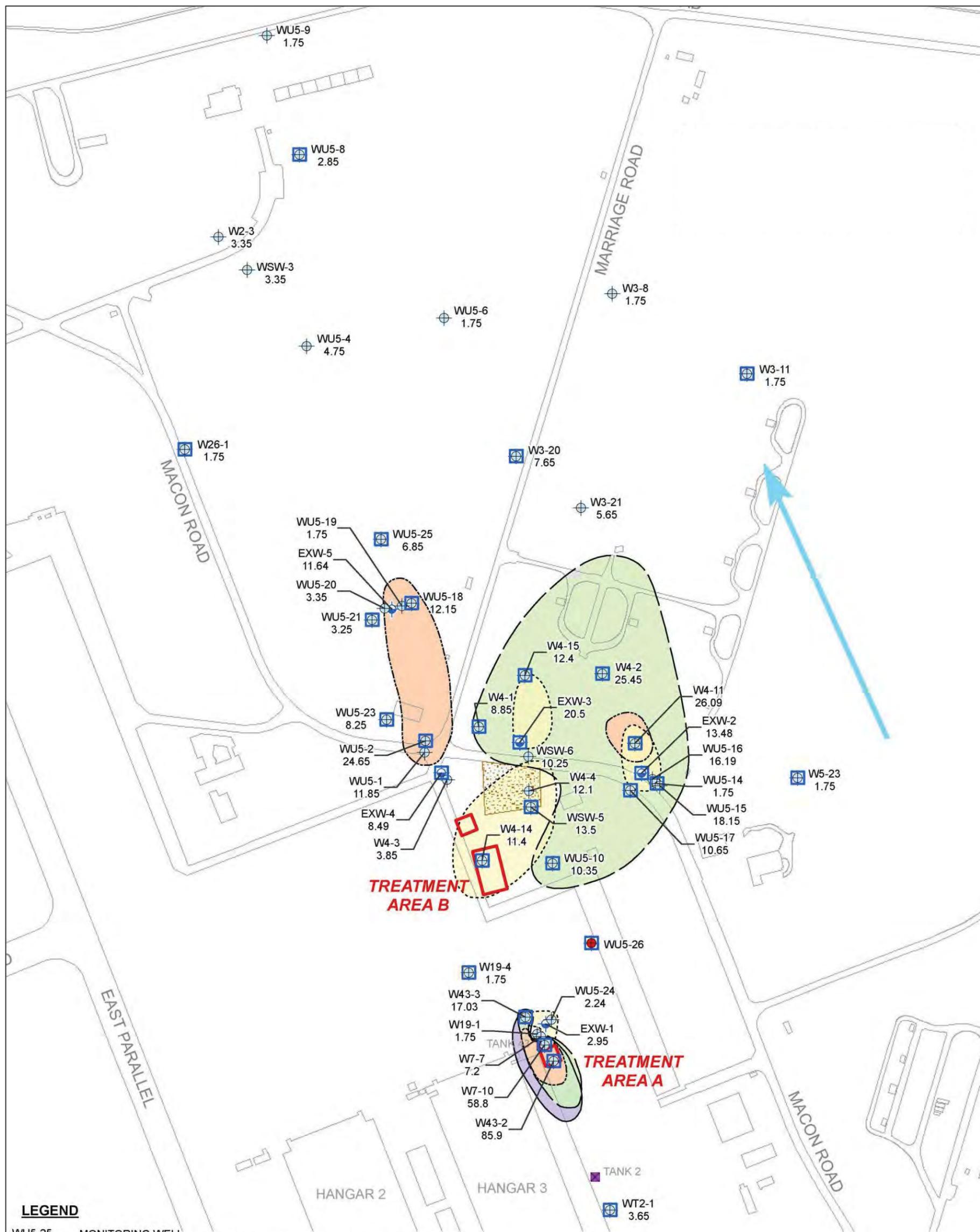


FIGURE 2

Aerial view of Site 26. Groundwater plumes indicate total VOCs greater than remedial goal. Locations of USTs 2 and 43 also indicated.

Google Earth photograph 9/26/2011



LEGEND

- WU5-25 7.6 MONITORING WELL
COMBINED PCE, TCE, CIS-1,2-DCE, AND VC CONCENTRATION ($\mu\text{g/L}$)¹
- EXW-3 20.5 EXTRACTION WELL
COMBINED PCE, TCE, CIS-1,2-DCE, AND VC CONCENTRATION ($\mu\text{g/L}$)¹
- WELL TO BE SAMPLED FOR MNA
- WU5-26 NEW UPGRADIENT WELL
- FORMER UNDERGROUND STORAGE TANK²
- REGIONAL GROUNDWATER FLOW DIRECTION
- BURROWING OWL HABITAT
- TETRACHLOROETHENE (PCE) PLUME ($> 5 \mu\text{g/L}$)³
- TRICHLOROETHENE (TCE) PLUME ($> 5 \mu\text{g/L}$)³
- CIS-1,2-DICHLOROETHENE (CIS-1,2-DCE) PLUME ($> 6 \mu\text{g/L}$)³
- VINYL CHLORIDE (VC) PLUME ($> 0.5 \mu\text{g/L}$)³

NOTES:
 $\mu\text{g/L}$ - MICROGRAMS PER LITER
 IR - INSTALLATION RESTORATION
 MNA - MONITORED NATURAL ATTENUATION
 NAS - NAVAL AIR STATION

¹ Combined winter 2010 PCE, TCE, cis-1,2-DCE, and VC values include non-detect and estimated data. Non-detects (U) were estimated as half the analysis reporting limit. Estimated values (J) were assigned the estimated value.

² Approximate former underground storage tank location from Site 26 East-Side Aquifer Treatment System Evaluation Report (TREM, 2008).

³ The plumes were derived from Figures 3-30 through 3-33 of the "Final 2010 Annual Groundwater Report for Installation Restoration Sites 26 and 28," (ERS-JV and Brown and Caldwell, 2011).

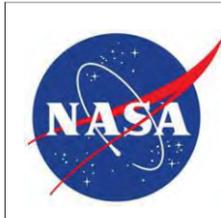
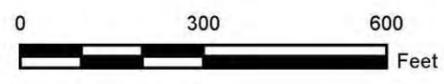
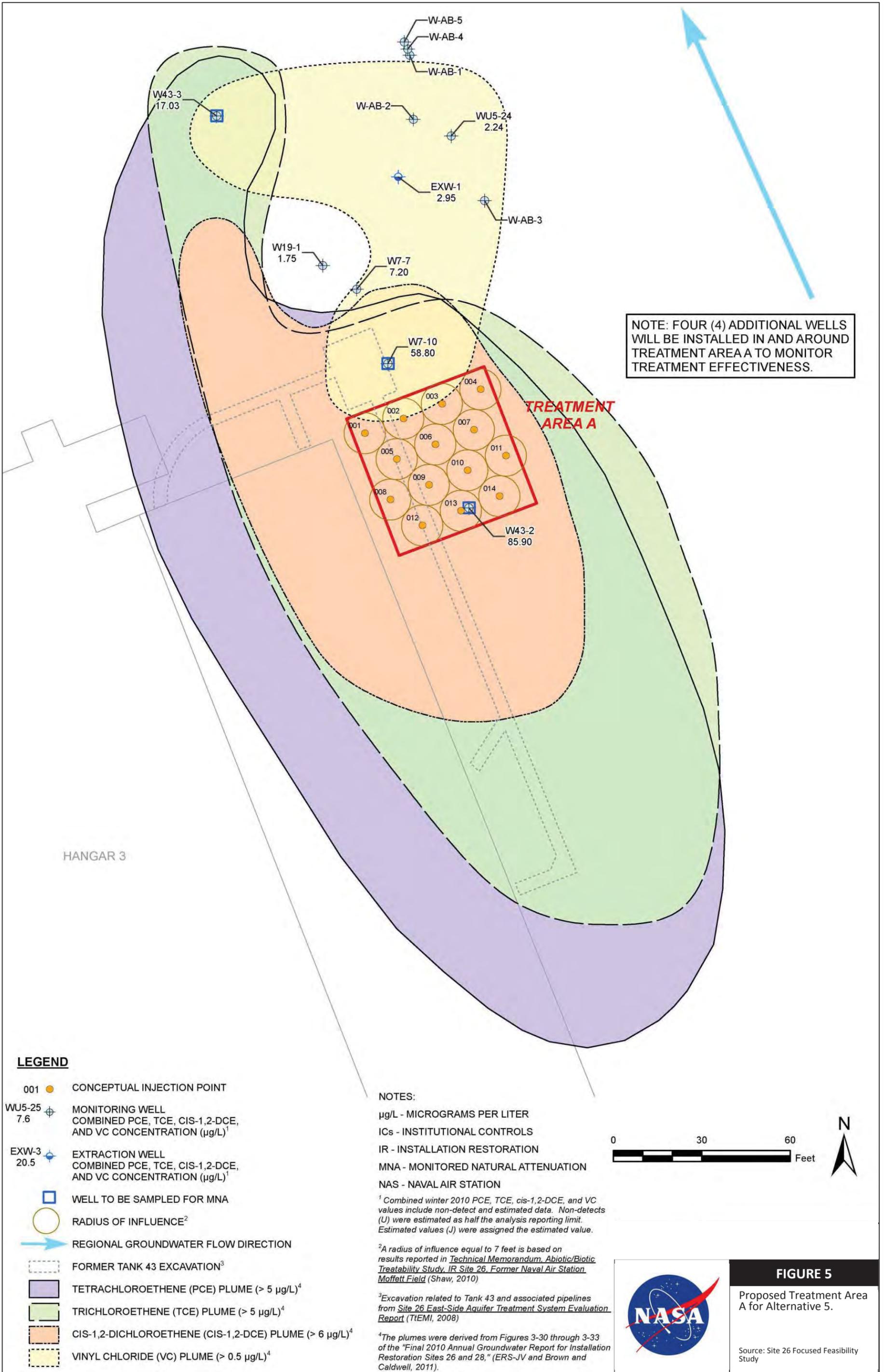


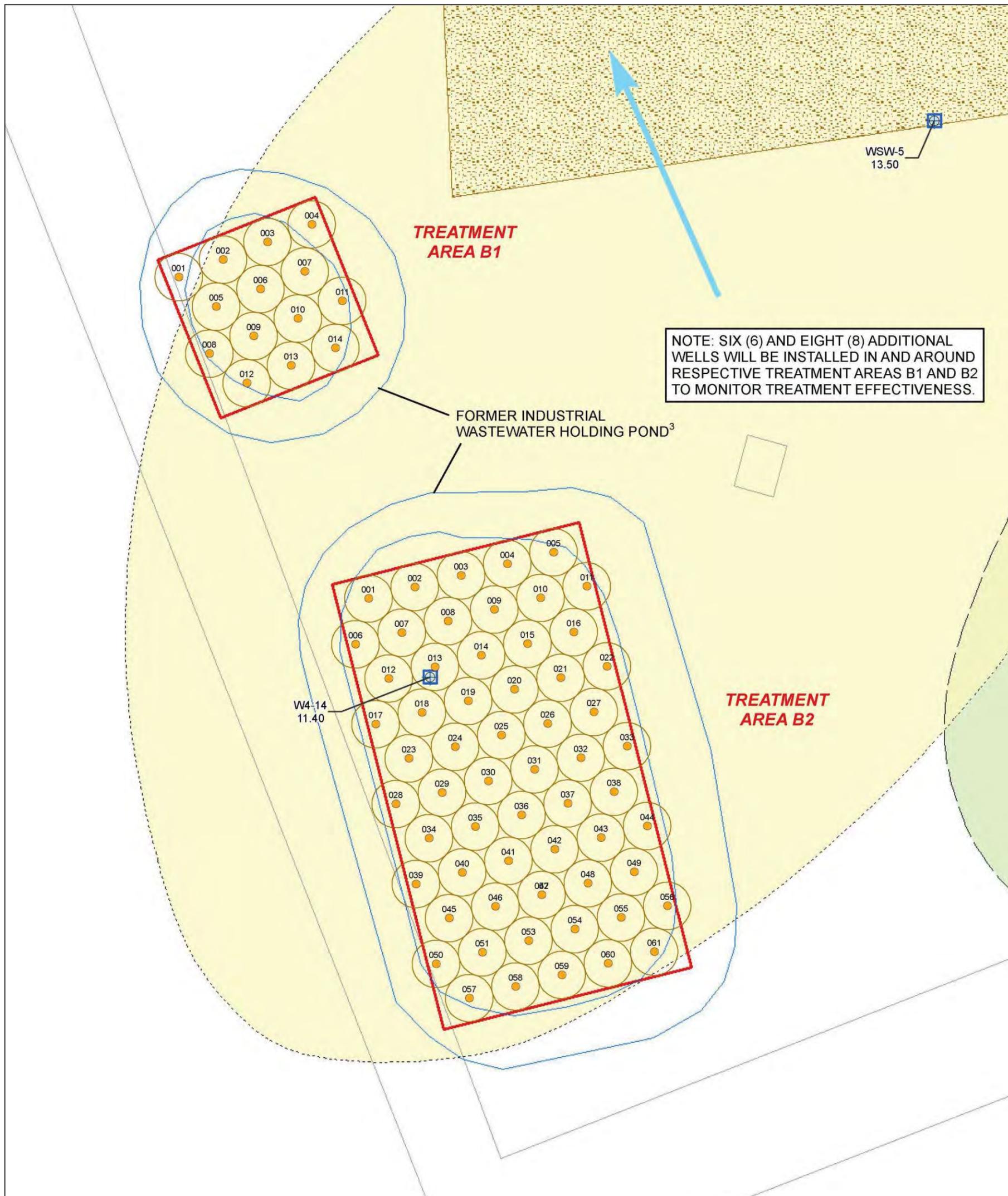
FIGURE 4

Proposed treatment areas for Alternative 5, Biostimulation/Bioaugmentation.

Source: Site 26 Focused Feasibility Study



NOTE: FOUR (4) ADDITIONAL WELLS WILL BE INSTALLED IN AND AROUND TREATMENT AREA A TO MONITOR TREATMENT EFFECTIVENESS.



LEGEND

- 001 ● CONCEPTUAL INJECTION POINT
- WU5-25 7.6 ⊕ MONITORING WELL
COMBINED PCE, TCE, CIS-1,2-DCE,
AND VC CONCENTRATION (µg/L)¹
- EXW-3 20.5 ⊕ EXTRACTION WELL
COMBINED PCE, TCE, CIS-1,2-DCE,
AND VC CONCENTRATION (µg/L)¹
- WELL TO BE SAMPLED FOR MNA
- RADIUS OF INFLUENCE²
- REGIONAL GROUNDWATER FLOW DIRECTION
- ▨ BURROWING OWL HABITAT
- ▨ TETRACHLOROETHENE (PCE) PLUME (> 5 µg/L)⁴
- ▨ TRICHLOROETHENE (TCE) PLUME (> 5 µg/L)⁴
- ▨ CIS-1,2-DICHLOROETHENE (CIS-1,2-DCE) PLUME (> 6 µg/L)⁴
- ▨ VINYL CHLORIDE (VC) PLUME (> 0.5 µg/L)⁴

NOTES:

- µg/L - MICROGRAMS PER LITER
- ICs - INSTITUTIONAL CONTROLS
- IR - INSTALLATION RESTORATION
- MNA - MONITORED NATURAL ATTENUATION
- NAS - NAVAL AIR STATION

¹ Combined winter 2010 PCE, TCE, cis-1,2-DCE, and VC values include non-detect and estimated data. Non-detects (U) were estimated as half the analysis reporting limit. Estimated values (J) were assigned the estimated value.

² A radius of influence equal to 7 feet is based on results reported in *Technical Memorandum, Abiotic/Biotic Treatability Study, IR Site 26, Former Naval Air Station, Moffett Field* (Shaw, 2010)

³ From *Final Draft Initial Assessment Study for NAVSTA Moffett Field, Sunnyvale, CA* (NEESA, 1984)

⁴ The plumes were derived from Figures 3-30 through 3-33 of the "Final 2010 Annual Groundwater Report for Installation Restoration Sites 26 and 28," (ERS-JV and Brown and Caldwell, 2011).

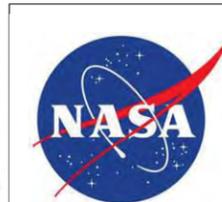
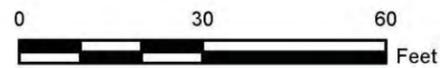


FIGURE 6

Proposed Treatment Area B for Alternative 5.

Source: Site 26 Focused Feasibility Study

ATTACHMENTS

MEMORANDUM OF AGREEMENT
BETWEEN
U.S. DEPARTMENT OF THE NAVY - ENGINEERING FIELD ACTIVITY WEST
NAVAL FACILITIES ENGINEERING COMMAND
AND
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AMES RESEARCH
CENTER
REGARDING INSTITUTIONAL CONTROLS AT OPERABLE UNITS ONE AND
FIVE
MOFFETT FIELD, CALIFORNIA

The purpose of this Memorandum of Agreement (MOA) is to document the major points of agreement which the National Aeronautics and Space Administration Ames Research Center (NASA ARC) will use in implementing the institutional controls that are required in the *Moffett Federal Airfield Final Operable Units 1 and 5 Record of Decisions* (Pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act), dated August 1, 1997 and June 28, 1996, respectively.

I. BACKGROUND

The Operable Unit 1 (OU1) Record of Decision (ROD) selected remedy includes the following:

The OU1 remedy also includes institutional controls. These controls include restrictions on cap disturbances and O&M of the Building 191 pump station and drain/subdrain system. O&M of the pump station was included as a component of the remedy to prevent potential flooding of OU1. The necessity of these restrictions and actions will be noted in the land use planning documents and real property records. The Navy will resolve any issues with NASA regarding the process to develop appropriate restrictive provisions to ensure continued O&M of the Building 191 pump station and to maintain the integrity of the Site 1 cap. The Navy will enter into an agreement with NASA or develop necessary restrictive provisions within 1 year of the date of this ROD. In the event of a future conveyance of the property, the necessity of pump station O&M and use restrictions at Site 1, will be addressed by appropriate notices and land use covenants; however, subsequent landowners may propose remedy modifications to the Navy and, if appropriate, the remedy may be modified in accordance with CERCLA Section 120 and the NCP.

In addition, the Operable Unit 5 (OU5) ROD selected remedy states:

The continued operation of Building 191, the pump station, is necessary for successful implementation of the OU5 cleanup (and for continued runway operation) and is therefore considered part of the selected OU5 pump and

treat remedy. Without its operation, flooding of the northern end of the runways and surrounding area, including portions of the golf course, which overlie the OU5 east side aquifers, will occur during the rainy season. Therefore, the Building 191 pump station is a component of the groundwater remedy and must remain operational. The necessity of continued operation and maintenance of the pump station will be noted in the Master Plan for the government's land uses. (OU5 ROD, page 45)

II. BUILDING 191 PUMP STATION OPERATION AND MAINTENANCE (O&M)

NASA agrees to maintain the Building 191 pump station and drain/subdrain system as long as NASA either owns the property or maintains operational control over the site. This restriction will be recorded in NASA's *Environmental Resources Document*. Furthermore, in the event of a future conveyance of the property, NASA will notify subsequent landowners of this restriction by appropriate notices and land use restrictions.

III. SITE 1 LANDFILL CAP

NASA agrees to not undertake any activities that would compromise the integrity of the landfill cap at Site 1. This restriction will be recorded in NASA's *Environmental Resources Document*. Furthermore, in the event of a future conveyance of the property, NASA will notify subsequent landowners of these restrictions in land use.

Navy agrees to conduct any required ongoing maintenance needed to maintain the integrity of the landfill cap at Site 1.

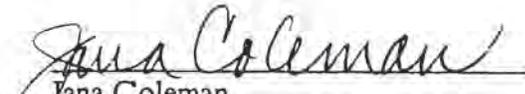
IV. FUNDING

Any requirement for the payment or obligation of funds by the Navy or by NASA pursuant to this MOA shall be subject to the availability of appropriated funds, and no provision herein shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act, 31 U.S.C. 1341. This MOA shall take effect on the later date appearing under the signature below.

V. MODIFICATION

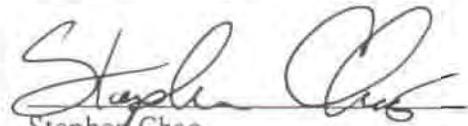
This agreement can be modified at any time by mutual agreement of the parties.

On behalf of NASA:

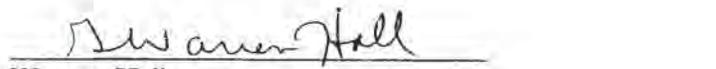

Jana Coleman
Director, Center Operations
NASA Ames Research Center

Date 11-15-99

On behalf of Navy:


Stephen Chao
BRAC Environmental Coordinator
Moffett Federal Airfield

Date 10/13/99


Warren Hall
Director, Safety, Environmental and Mission Assurance
Ames Research Center

Date 10/28/99

SITE NAME:	Site 27 – Northern Channel/Site 21 Patrol Road Ditch				
Version:	Final	Date:	02/28/2015		
RESPONSIBLE PARTY					
Organization	Department of the Navy, BRAC				
Address	1455 Frazee Rd., Suite 900 San Diego, CA 92108				
Contact	Scott Anderson				
	scott.d.anderson@navy.mil				
	619-532-0938				
LOCATION					
Facility Name	Moffett Federal Airfield	Site Location			
Facility Address	Mountain View, CA	Latitude	37.426807° N		
	Santa Clara County	Longitude	122.041185° W		
Regulatory Program	Lead Agency(ies)	Site Status			
		Open	Closed	ROD	Current Phase
CERCLA	EPA/RWQCB		X	Site 27 6/24/2005	Closed
SITE SUMMARY					
<p>Site 27 consists of the Northern Channel and associated ditches: Marriage Road Ditch, Patrol Road Ditch, and the North Patrol Road Ditch (Figure 1). The Northern Channel is located at the northeastern end of Moffett Field. It is bordered on the north by former salt ponds that are managed by the US Fish and Wildlife Service (USFWS) and to the south by Moffett Field. The channel then extends to the east where the water flows into the adjacent Lockheed Channel. From there it is pumped by a lift station into a drainage ditch that ultimately flows into the Guadalupe Slough and into the San Francisco Bay.</p> <p>The areas that make up Site 27 are summarized below and shown on Figure 1.</p> <p>Northern Channel and Berms</p> <p>The Northern Channel receives stormwater from the eastern portion of Moffett Field. Stormwater flows through various drains, ditches, and subsurface conveyances to the Bldg. 191 Lift Station. The lift station pumps the stormwater into the Northern Channel (Figure 2). The channel is approximately 2 miles long. The water flows east by gravity. At the terminus of the channel, water flows from the Northern Channel into the adjacent Lockheed Channel through a pipe (Figure 4). The water is pumped from the Lockheed Channel into the Moffett Channel which carries the water to the Guadalupe Slough and finally the San Francisco Bay. The Northern Channel is part of the NASA Ames Research Center.</p> <p>Marriage Road Ditch (Site 3)</p> <p>Marriage Road Ditch is 2300 feet long. Surface water from the nearby aircraft apron and water from drains around Hangars 2 & 3 flow into Marriage Road Ditch. Marriage Road Ditch drains into the North Patrol Road Ditch. An auxiliary pump station is located where the ditch drains into the NPD (Figure 3). The pump is used during heavy storm events to help prevent flooding. The pump discharges into the Northern Channel.</p>					

SITE NAME:**Site 27 – Northern Channel/Site 21 Patrol Road Ditch****SITE SUMMARY****Patrol Road Ditch (also called the East Patrol Road Ditch)**

The Patrol Road Ditch runs along the eastern boundary of Moffett Field and next to the East Patrol Road and is 2100 feet in length (Figure 1). The Patrol Ditch is also Installation Restoration Program (IRP) Site 21. The northern end of the Patrol Road Ditch contains water in a pond year round. Patrol Road Ditch discharges through a culvert into the North Patrol Road Ditch. An auxiliary pump station is also located at the northern end of the channel and serves the same function as the pump at Marriage Road Ditch.

North Patrol Road Ditch

The ditch runs 4300 feet along the North Patrol Road. It is also parallel to and south of the Northern Channel. Water flows from east to west to Bldg. 191. There the water is pumped into the Northern Channel

Debris Pile

The debris pile was just north of Bldg. 191 (Figure 5). The debris pile consisted of about 10,000 cubic yards of dredged sediment from the Northern Channel and construction debris from the 1950s to 1990s.

The following chemicals of ecological concern were present at Site 27:

- Total polychlorinated biphenyls (sum of Aroclor-1254 and Aroclor 1260)
- Total DDT
- Total chlordane
- Cadmium
- Lead
- Mercury
- Selenium
- Silver
- Zinc

The selected remedy was the excavation of sediments from the Northern Channel and other ditches in Site 27/Site 21. Sediments were sampled and disposed of at appropriate landfills. The debris pile was completely excavated and disposed of at an off-site landfill. The excavated areas were sampled. Where the confirmation samples indicated the presence of any of the chemicals of concern above the remedial goals, additional excavation was done. The sites where additional removal was needed were excavated an additional six inches and 50 feet laterally in each direction. The berms were revegetated with plants native to California and a portion of the Patrol Ditch was restored.

The Navy issued the *Remedial Action Completion Report (RACR)* describing the remedial work. The report concluded that all of the chemicals were removed or reduced below goals with exception of selenium. Selenium remained in several locations in the berms of the Northern Channel. The selenium issue is discussed in the *Remedial Action Completion Report*.

The Navy issued the *Final Record of Decision (ROD)* in June 24, 2005. The remedy selected by the Navy was

SITE NAME:

Site 27 – Northern Channel/Site 21 Patrol Road Ditch

SITE SUMMARY

the excavation and disposal of contaminated soil. After completion of the remedial action, the Navy recommended in the RACR that no further action was required. The EPA and Water Board issued letters concurring with the Navy's recommendation of no further action (Attachments 1 and 2).

SITE NAME:		Site 27 – Northern Channel/Site 21 Patrol Road Ditch			
REMEDIAL ACTION					
Remedy	Excavation and Disposal	Begin Date	3/26/2006	End Date	2/23/2007
<p>The major components of the selected remedy included:</p> <ul style="list-style-type: none"> Excavation of sediment in areas where concentrations of ecological concern exceeded cleanup goals, Excavation of sediment from the debris pile and soil from portions of the Northern Channel berms, Transporting excavated sediments, soils, and debris pile off site to an appropriate disposal facility Collecting confirmation samples at the bottoms of excavations including beneath the debris pile & on berms Restoring Site 27 Revegetation of the berms with native California plants 		<p>Ecological sediment cleanup goals:</p> <ul style="list-style-type: none"> Total PCBs – 0.35 mg/kg Total DDT – 0.0648 mg/kg Total Chlordane – 0.931 mg/kg Cadmium – 184 mg/kg Lead – 173 mg/kg Mercury – 1.52 mg/kg Selenium – 0.926 mg/kg Silver – 13.7 mg/kg Zinc – 720 mg/kg <p>Soil in berms (residential preliminary remediation goals)</p> <ul style="list-style-type: none"> Total PCBs – 0.22 mg/kg DDE – 2.4 mg/kg DDD – 1.7 mg/kg DDT – 1.7 mg/kg Total Chlordane – 1.6 mg/kg Cadmium – 37 mg/kg Lead – 150 mg/kg Mercury – 23 mg/kg Selenium – 390 mg/kg Silver – 390 mg/kg Zinc – 23,000 mg/kg 			
Land Use Restrictions			Development Issues		
<p>No land use restrictions defined in the ROD.</p>			<p>The Northern Channel, Marriage Road Ditch, Patrol Road Ditch, and North Patrol Ditch are adjacent to US Fish & Wildlife Service wetlands restoration which limits development of the site.</p> <p>The Northern Channel is the sole discharge for storm water for the eastern portion of Moffett Field.</p>		

SITE NAME:	Site 27 – Northern Channel/Site 21 Patrol Road Ditch
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RESIDUAL CONTAMINATION		
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Compound	Residual Concentration (max)		Notes
	Soil (mg/kg)	Groundwater (µg/L)	
Selenium (estimated)	5.9		Selenium was found in various locations on the berms of the Northern Channel and at the bottom of the North Patrol Road Ditch. The concentration listed is the maximum concentration. Other chemicals of concern were below the cleanup levels.

REFERENCES (Chronological Order)

- *Final Record of Decision Site 27 – Northern Channel, Former Naval Air Station Moffett Field, Santa Clara County, California.* Department of the Navy, San Diego, CA. June 24, 2005.

- *Environmental Baseline Survey for the Northern Channel, NASA Ames Research Center, Moffett Field, CA.* NASA Environmental Services Division, NASA Ames Research Center, Moffett Field, CA. July 2008.

- *Final Remedial Action Completion Report, Installation Restoration Program Site 27, Former Naval Air Station Moffett Field, Moffett Field, CA.* Tetra Tech, San Diego, CA. March 2012.

- *EPA Approval of Former Moffett Field Site 27 Remedial Action Completion Report.* US EPA, Region IX, San Francisco, CA. April 27, 2012.

- *Concurrence with Final Remedial Action Completion Report, Installation Restoration Program Site 27, Former NAS Moffett Field, Santa Clara County.* San Francisco Bay Regional Water Quality Control Board, Oakland, CA. May 4, 2012.

FIGURES

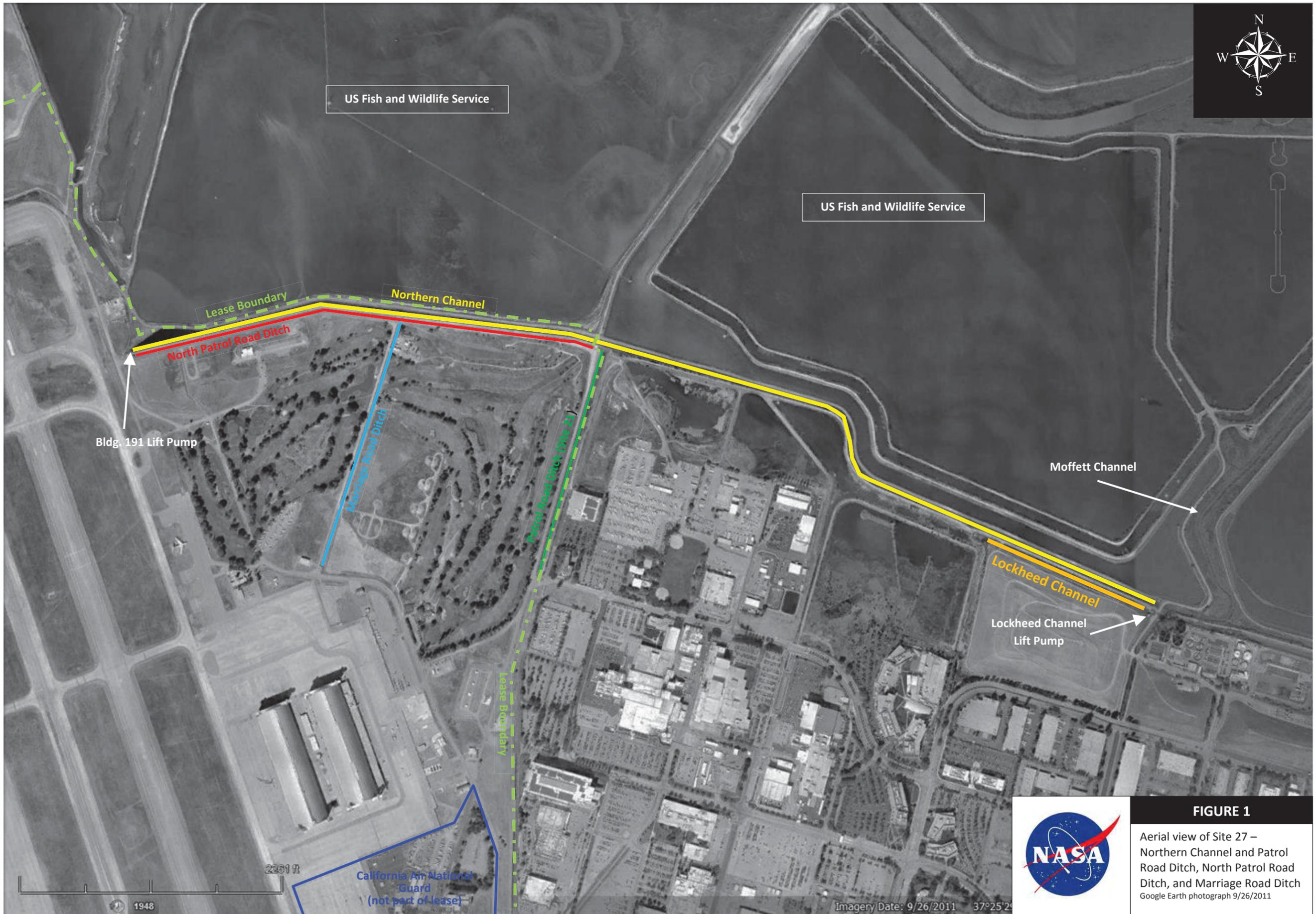


FIGURE 1
 Aerial view of Site 27 – Northern Channel and Patrol Road Ditch, North Patrol Road Ditch, and Marriage Road Ditch
 Google Earth photograph 9/26/2011

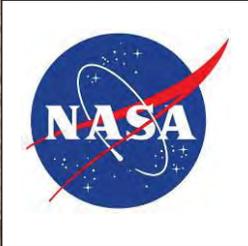
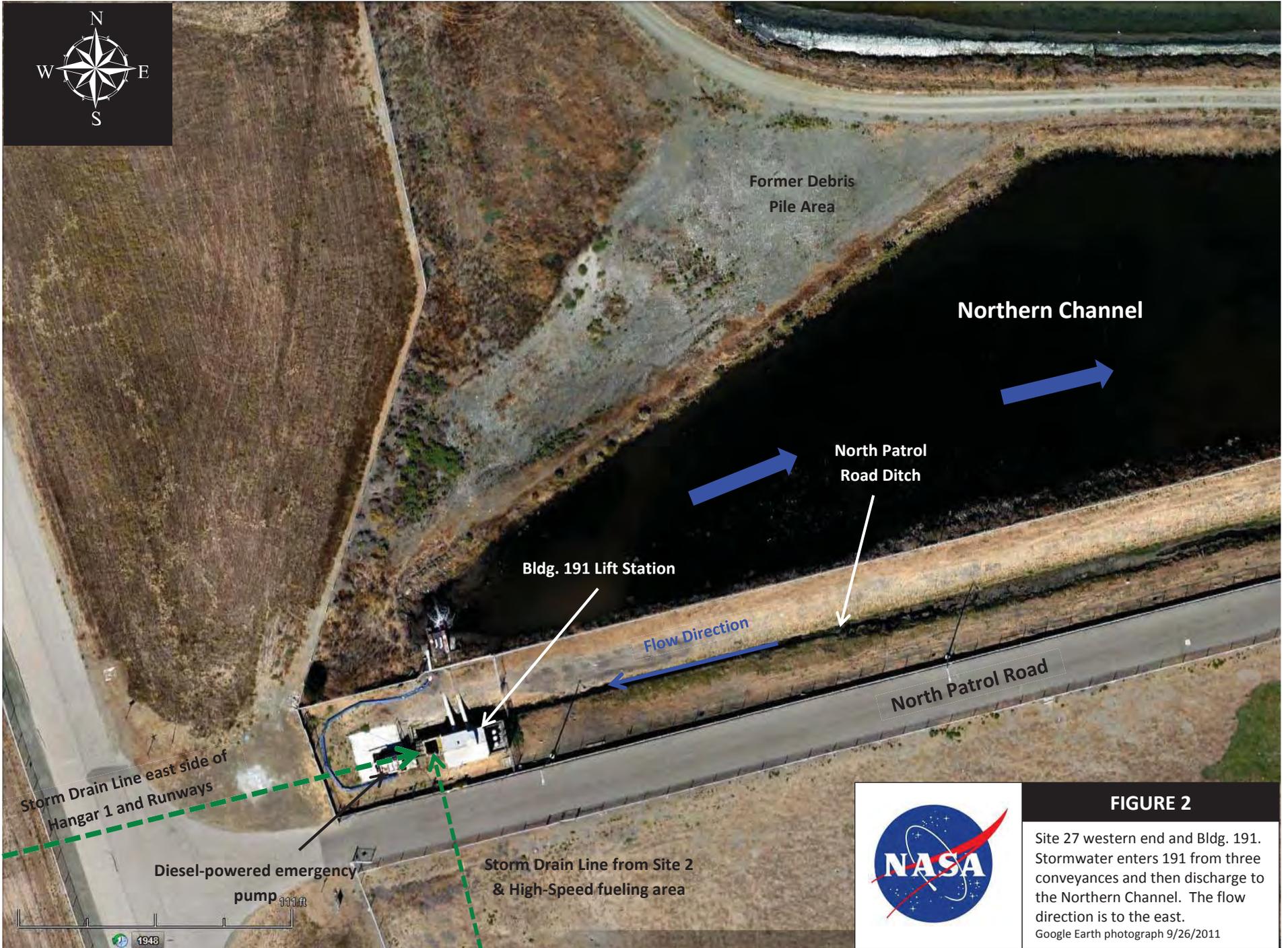


FIGURE 2

Site 27 western end and Bldg. 191. Stormwater enters 191 from three conveyances and then discharge to the Northern Channel. The flow direction is to the east.
 Google Earth photograph 9/26/2011

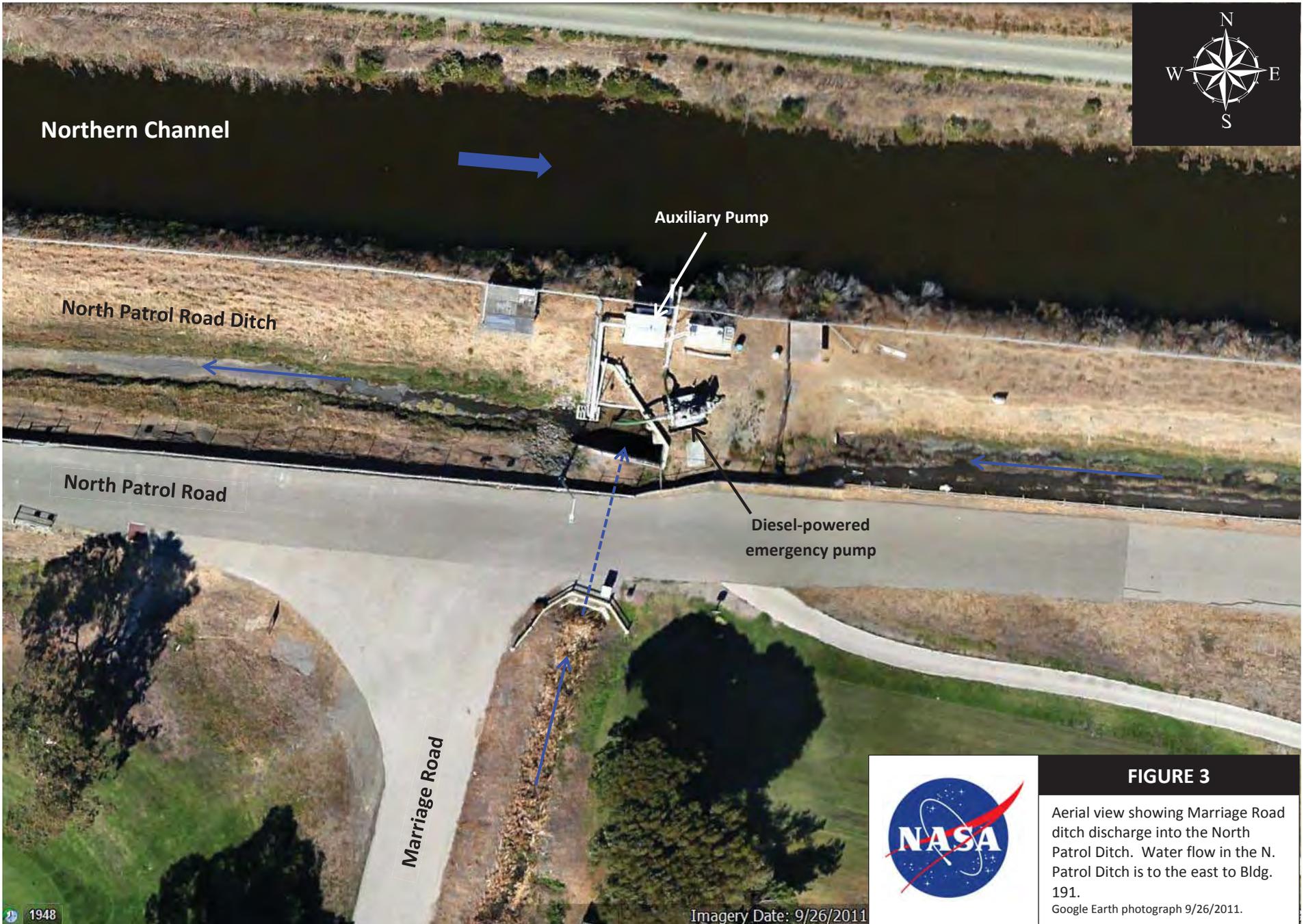


FIGURE 3
 Aerial view showing Marriage Road ditch discharge into the North Patrol Ditch. Water flow in the N. Patrol Ditch is to the east to Bldg. 191.
 Google Earth photograph 9/26/2011.

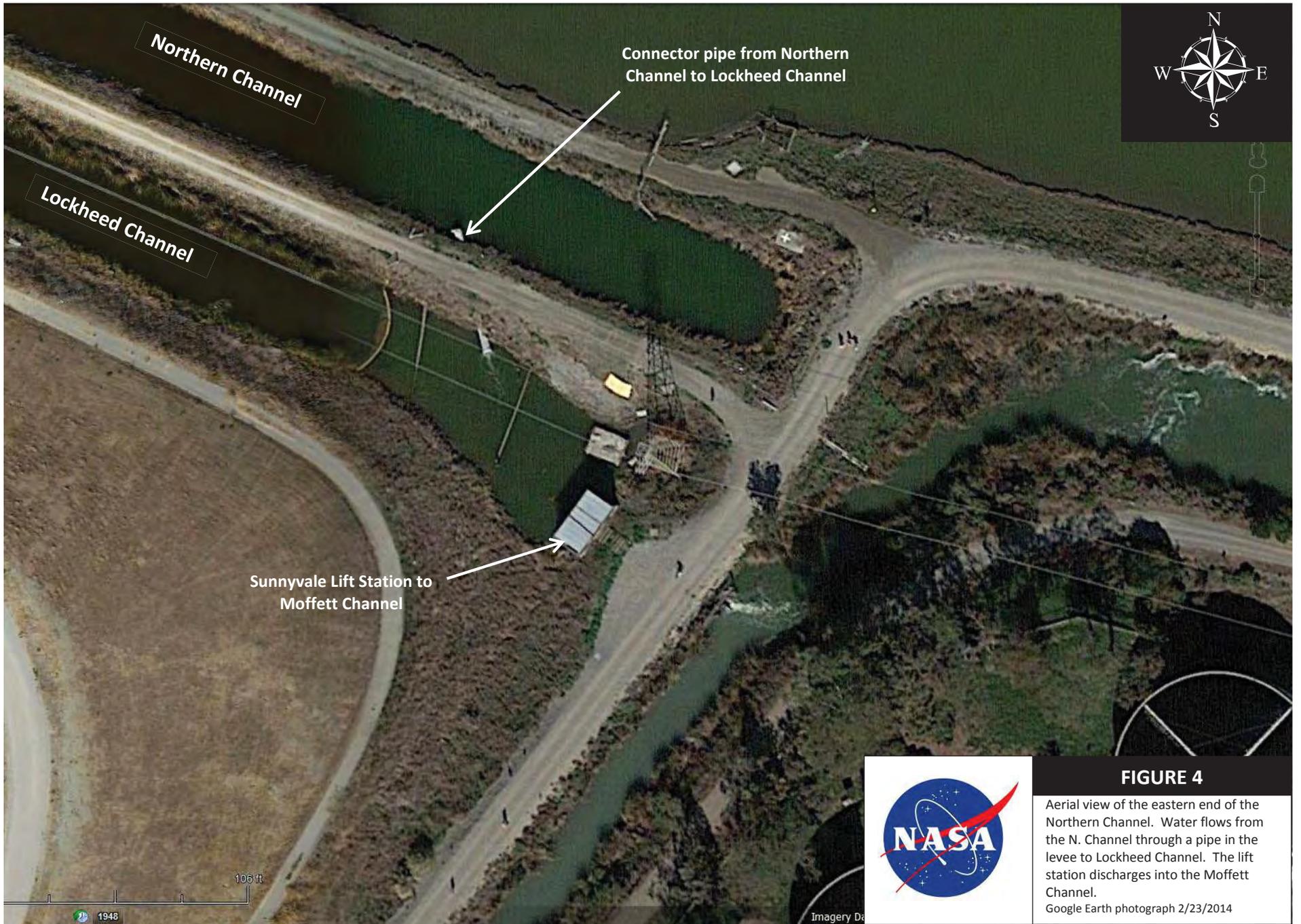


FIGURE 4

Aerial view of the eastern end of the Northern Channel. Water flows from the N. Channel through a pipe in the levee to Lockheed Channel. The lift station discharges into the Moffett Channel.
Google Earth photograph 2/23/2014

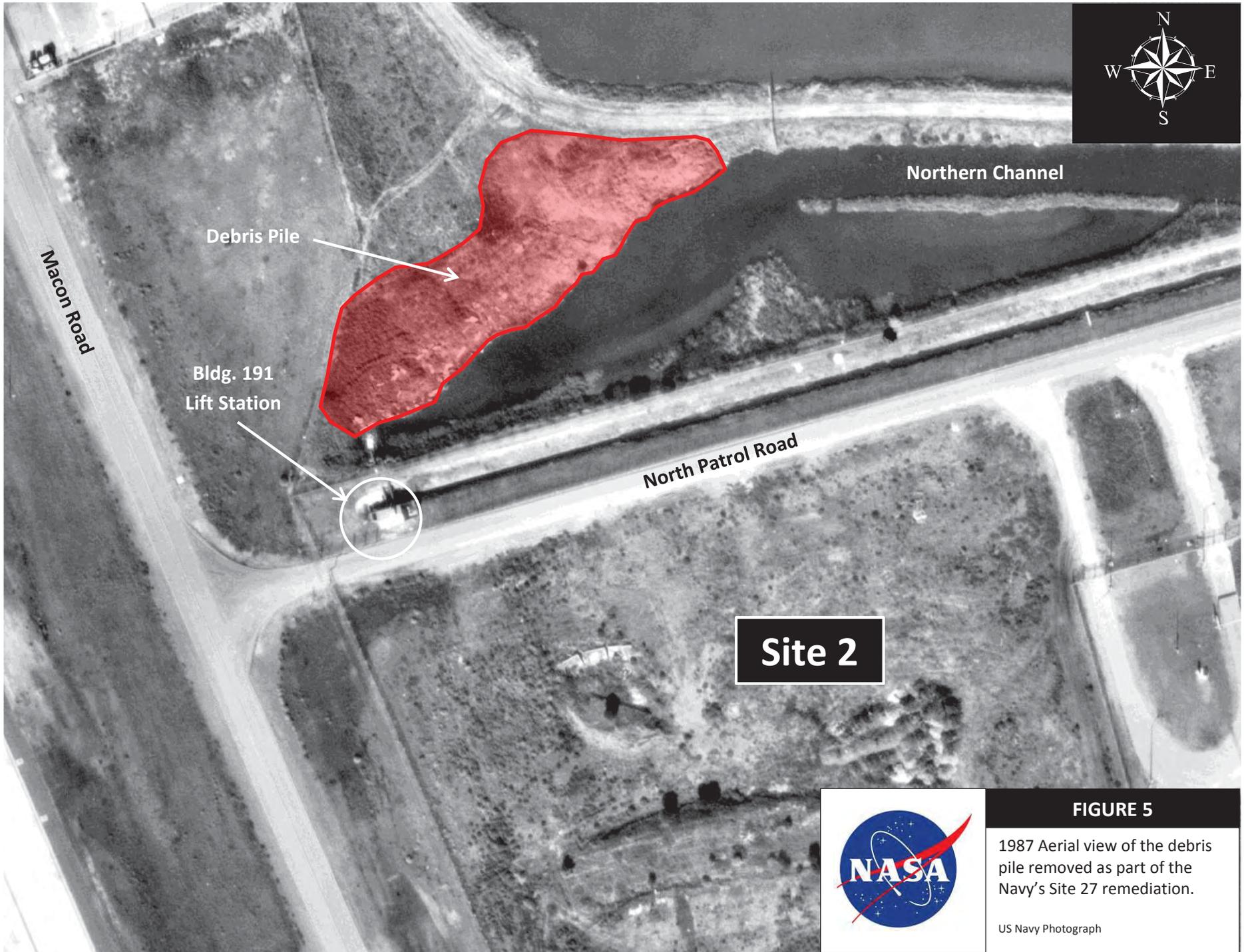


FIGURE 5

1987 Aerial view of the debris pile removed as part of the Navy's Site 27 remediation.

US Navy Photograph

ATTACHMENTS



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

April 27, 2012

Scott Anderson
BRAC Environmental Coordinator
Department of the Navy
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

Re: EPA Approval of Former Moffett Field Site 27 Remedial Action Completion Report

Dear Mr. Anderson:

The U.S. Environmental Protection Agency (EPA) has reviewed the *Final Remedial Action Completion Report, Installation Restoration Program Site 27, Former Naval Air Station Moffett Field, Moffett Field, CA*, dated March 2012. The Site 27 Record of Decision called for the excavation and offsite disposal of contaminated sediments, and site restoration activities to achieve a protective, ecological-based remedy. EPA concurs with the referenced Remedial Action Completion Report that the Navy has completed the remedy as prescribed. EPA especially appreciates the effort the Navy went to with respect to site restoration activities.

If you have any questions concerning this matter, please contact John Chesnutt of my staff at 415-972-3005.

Sincerely,

A handwritten signature in cursive script that reads "John Chesnutt".

Michael Montgomery
Assistant Director
Superfund Division

cc: Elizabeth Wells, SF RWQCB



San Francisco Bay Regional Water Quality Control Board

May 4, 2012 (EKW)
GeoTracker Global ID: SL0608541147

Department of the Navy
Base Realignment and Closure Program
Management Office West
Attn. Mr. Scott Anderson
1455 Frazee Road, Suite 900
San Diego, CA 92108
Via email: scott.d.anderson@navy.mil

Subject: Concurrence with Final Remedial Action Completion Report, Installation Restoration Program Site 27, Former NAS Moffett Field, Santa Clara County

Dear Mr. Anderson:

Regional Water Board staff reviewed the March 2012 *Final Remedial Action Completion Report* (Final Report), for IR Site 27. The Final Report describes the remedial action and restoration activities performed at the site. The Navy completed excavation and off-site disposal of contaminated sediment to reduce exposure of ecological receptors to contaminants of concern present in site sediment. Regional Water Board staff concur with the Final Report and that the Navy has satisfactorily implemented the remedy outlined in the IR Site 27 Record of Decision.

If you have any questions, you can contact me via phone at (510) 622-2440 or email at ewells@waterboards.ca.gov.

Sincerely,

Elizabeth K. Wells, P.E.
Water Resource Control Engineer

- 2 -

cc (via email):

Ms. Yvonne Fong, US EPA, Region 9, fong.yvonnew@epa.gov
Mr. Jim Whitcomb, Department of the Navy, BRAC PMO West, james.h.whitcomb@navy.mil
Mr. Wilson Doctor, Department of the Navy, BRAC PMO West, wilson.doctor@navy.mil
Mr. Allen Tsao, California Dept. of Fish and Game, atsao@ospr.dfg.ca.gov
Ms. Tami Nakahara, California Dept. of Fish and Game, atsao@ospr.dfg.ca.gov
Dr. Ann Clarke, NASA Ames Research Center, ann.clarke@nasa.gov
Mr. Donald Chuck, NASA Ames Research Center, donald.m.chuck@nasa.gov
Mr. Jim Blamey, Santa Clara County DEH, jim.blamey@deh.sccgov.org
Mr. George Cook, Santa Clara Valley Water District, gcook@valleywater.org
Ms. Lynne Kilpatrick, City of Sunnyvale, lkilpatrick@ci.sunnyvale.ca.us
Mr. William Berry, RAB Community Co-Chair, wmeberry@comcast.net
Mr. Lenny Siegel, Center for Public Environmental Oversight, lennysiegel@gmail.com
Mr. Peter Strauss, PM Strauss & Associates, petestrauss1@comcast.net

SITE NAME:	Site 28 – West-Side Aquifers Treatment System (WATS) Area				
Version:	Final	Date:	02/28/2015		
RESPONSIBLE PARTY					
Organization	Department of the Navy, BRAC				
Address	1455 Frazee Rd., Suite 900 San Diego, CA 92108				
Contact	Scott Anderson				
	scott.d.anderson@navy.mil				
	619-532-0938				
LOCATION					
Facility Name	Moffett Federal Airfield	Site Location¹			
Facility Address	Mountain View, CA	Latitude	37.413533° N		
	Santa Clara County	Longitude	122.055230° W		
Regulatory Program	Lead Agency(ies)	Site Status			
		Open	Closed	ROD	Current Phase
CERCLA	EPA/RWQCB	X		MEW	O&M
SITE SUMMARY					
<p>Note 1: Site location coordinates are for the WATS.</p> <p>Site 28 is located on the west side of the runways (Figure 1). The site consists of chlorinated volatile organic compounds (VOCs) that impact groundwater in the upper and lower portions of the A aquifer and vadose zone. Deeper groundwater areas may have also been impacted, such as in the traffic island (TI) area near the southwest end of Hangar 1. The VOCs most frequently seen are tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride (VC). In addition to VOCs, petroleum compounds are also present.</p> <p>The initial response action at Site 28 included site characterization consisting of the Initial Assessment for Moffett Field (1984), Confirmation Study (1986), and Phase I Characterization Report (1991). Site 28 became Operable Unit (OU) 4 under the Navy’s Installation Restoration Program (IRP) as the West-Side Aquifer. Four main sources of contamination were identified in OU-4:</p> <ol style="list-style-type: none"> 1. The old fuel farm next to Bldg. 29, 2. The former Navy Exchange Gasoline Station at Bldg. 31, 3. The former Navy Dry Cleaner at Bldg. 88 4. The aircraft wash rack located 250 feet south of Hangar 1. <p>Historically, VOCs were released to the environment by the Middlefield-Ellis-Whisman (MEW) companies, the Navy, and NASA at or near Moffett Field (USEPA, 1989). IR Site 28 consists of chlorinated VOC groundwater plumes attributable to Navy sources located west of the Moffett Field runways. In a December 1993 amendment to the 1990 Federal Facility Agreement (FFA) (USEPA, 1993), the Navy agreed to adopt the June 1989 MEW ROD. The remedy selected in the MEW ROD includes:</p> <ul style="list-style-type: none"> • Extracting and treating contaminated groundwater from the regional plume so that COC concentrations would be reduced to drinking water MCLs. 					

SITE NAME:**Site 28 – West-Side Aquifers Treatment System (WATS) Area****SITE SUMMARY**

- Treating contaminated, unsaturated soil by in-situ vapor extraction or excavation and aeration so that COC concentrations were no more than 100 times the groundwater remediation goals.

There have been two Explanations of Significant Differences (ESD) for the MEW ROD. The September 1990 ESD (USEPA, 1990) clarified that the cleanup goals constituted final cleanup standards and the April 1996 ESD (USEPA, 1996) clarified the groundwater remedy to include liquid-phase granular activated carbon (GAC) for groundwater treatment.

Several COCs were identified in the MEW ROD. The most frequently occurring VOCs detected in groundwater are the chlorinated solvents TCE and cis-1,2-DCE, with lesser amounts of PCE and vinyl chloride. The MEW ROD selected TCE as the indicator chemical for cleanup goals because of the assumption that achieving the cleanup goal for TCE (5 micrograms per liter ($\mu\text{g/L}$)) would result in cleanup of the other site COCs as well.

The MEW ROD identified the selected remedies for VOC-contaminated soil and groundwater and specified the chemicals of concern and their cleanup goals for soil and groundwater. The soil cleanup goal was based on the concentration of contamination that could remain in soil, leach into the groundwater and still achieve the cleanup goal for the shallow aquifers. The groundwater cleanup goals, to be achieved using hydraulic remediation by groundwater extraction and treatment, were 5 ppb TCE for the shallow aquifers and 0.8 ppb for the C and D deep aquifers. The extracted groundwater was to be reused to the maximum extent feasible, with 100% reuse as a goal. The remedy also included identification and sealing of any conduits or potential conduits.

The ROD listed the following chemicals of concern (COCs) and their respective cleanup standards (based on maximum contaminant levels (MCLs) available at time of the 1989 ROD:

- Chloroform – 100 $\mu\text{g/L}$
- 1,2-Dichlorobenzene (1,2-DCB)– No MCL listed in ROD
- 1,1- Dichloroethane (1,1-DCA) – No MCL listed in ROD
- 1,1-Dichloroethene (1,1-DCE) – 6 $\mu\text{g/L}$
- 1,2-Dichloroethene (1,2-DCE) – No MCL listed in ROD
- Freon-113 – No MCL listed in ROD
- Phenol – No MCL listed in ROD
- PCE – No MCL listed in ROD
- 1,1,1-Trichloroethane (1,1,1-TCA) – No MCL listed in ROD
- TCE – 5 $\mu\text{g/L}$
- Vinyl chloride – 0.5 $\mu\text{g/L}$

Soil contamination is also addressed in the MEW ROD. Two remedies were selected in the ROD:

- In-situ vapor extraction with treatment by vapor phase granular activated carbon,
- Excavation and treatment by aeration to meet federal, state, and local air standards.

SITE NAME:**Site 28 – West-Side Aquifers Treatment System (WATS) Area****SITE SUMMARY**

The soil cleanup goals for the MEW area are 0.5 part per million (ppm) TCE for all soils located outside the slurry walls located at the MEW site.

The West-Side Aquifers Treatment System (WATS), located west of the runways near Hangar 1, is the groundwater treatment system associated with IR Site 28. WATS remediates groundwater contaminants originating from Navy sources that have commingled with a regional VOC plume originating from offsite sources south of U.S. Highway 101. WATS originally consisted of an advanced oxidation process (AOP), followed by a shallow-tray air stripper and liquid-phase granular activated carbon (GAC) units. To eliminate discharge of VOCs to the air, the WATS air stripper was removed from the treatment train on May 8, 2003, and treated water from the AOP was directed to the four pre-existing GAC units. The AOP unit destroys the majority of the influent VOCs, and the four liquid-phase GAC units remove any remaining VOCs.

WATS consists of nine extraction wells: six in the upper zone of the A aquifer and three in the lower zone of the A aquifer. In addition to the extracted groundwater, contaminated water from two sumps is also treated at WATS. Electrical vault #5 is on the western side of Hangar 1 and the second sump is located at the terminal end of a utility tunnel that runs under Hangar 1 (Figure 2). The utility tunnel was constructed to contain helium lines from Bldg. 10. Other utilities were located in the tunnel. The utilities are no longer in use. The treated water from WATS is discharged into the storm drain system under a National Pollution Discharge Elimination System (NPDES) permit and eventually passes through the NASA storm water sediment settling basin and then into the Eastern Diked Marsh and the Stormwater Retention Basin (also known as Navy IR Site 25).

WATS has operated consistently since November 1998. The volume of water treated by WATS since start-up is 476,305,846 gallons. The mass of VOCs removed since WATS start-up is approximately 5,685 pounds (SES-Tech, 2014).

Dissolved VOCs in the regional plume continue to migrate into IR Site 28 with groundwater flow from upgradient source areas. The upgradient source is contributing contaminants at concentrations greater than cleanup standards.

In 2005, the Navy implemented an investigation to evaluate whether the residual PCE in the vadose zone at the former Building 88 location is a continuing source of contamination for groundwater, the extent of saturated soil with PCE concentrations that could be a source of groundwater contamination, and PCE source area treatability. The investigation concluded that residual contamination at two locations act as continuing sources of contamination to the groundwater: the Building 88 Dry Cleaner Site and the TI. The TI is located at the southwest corner of Hangar 1 and is within the lease area (Figure 2). The Building 88 site is not within the lease area.

The source of the PCE in the TI area likely originated from the break in the sanitary sewer line which received water from Building 88, as well as, from the former wash rack located south of Hangar 1.

The Navy conducted treatability studies (TS) to evaluate methods to reduce concentrations of chlorinated ethenes in three areas of Site 28: 1) the TI area, 2) former Building 88 Area, and 3) the well W9-18 area

SITE NAME:**Site 28 – West-Side Aquifers Treatment System (WATS) Area****SITE SUMMARY**

(Figure 3). The TS in the TI area consisted of injecting 28,086 gallons of emulsified vegetable oil and a microbial consortium (SDC-9™) into the groundwater in 15 locations from 10 to 65 feet bgs. The TS in the former Building 88 Area injected 8,179 gallons of lactate and SDC-9™ into the groundwater at 10 locations spaced 13.5 feet on center from 35 to 60 feet bgs. The TS in the well W9-18 area injected 8,000 pounds of EHC slurry at four locations centered on W9-18 from 10 to 30 feet bgs.

Based on the test results, each treatment process was determined to be effective in degrading PCE, TCE and DCE to below the MCLs and ROD cleanup standards within the timeframe of the TS. Although substantial degradation of VC was observed in each treatment area, VC remained above its MCL at each test area.

The Navy conducted a supplemental investigation in the former Building 88 and TI areas in 2012 and 2013. Fifteen additional monitoring wells were installed in these areas to further delineate Navy sources. Soil samples were collected at several intervals during the installation of the wells. Soils were analyzed for VOCs. The following contaminants were detected:

- PCE: range from ND to 27,000 mg/kg
- TCE: range from ND to 110 mg/kg
- Cis-1,2-DCE: range from ND to 74 mg/kg
- Vinyl chloride: range from ND to 0.07 mg/kg

The sample locations and analytical results are illustrated on Figure 4. The Navy is planning to conduct additional treatment in the traffic island area.

Only small portions of the regional plume north of Highway 101 exist within the lease area (Figure 1). This includes the TI area where VOCs are still present in the groundwater. Figures 5 - 12 provide sampling locations and analytical results for groundwater from the 2013 Annual Groundwater Report for Sites 26 and 28.

The majority of the regional plume, including the portion beneath the lease area, is being address by WATS and the MEW Regional Remediation Treatment System. The distal end of the plume has migrated into the lease area.

The Navy continues to operate WATS. The Navy will be working with the EPA to develop a plan to optimize groundwater treatment and remove contaminant mass in the WATS area.

Vapor Intrusion

The EPA has been concerned about the way contamination can migrate from subsurface soils and groundwater to indoor air of structures, otherwise known as vapor intrusion (VI). The EPA requested that the Potentially Responsible Parties (PRPs) to the regional plume – MEW Companies, Navy, and NASA – to evaluate potential vapor intrusion into buildings overlying the shallow TCE groundwater contamination. The area north of Highway 101 was divided into three areas of responsibility for the investigation of vapor intrusion (Figure 13). More than 3,000 air samples were collected by the PRPs.

SITE NAME:**Site 28 – West-Side Aquifers Treatment System (WATS) Area****SITE SUMMARY**

Based on the findings of the investigations, the EPA issued the Final Feasibility Study for the Vapor Intrusion Pathway in June 2009. The Final Feasibility Study evaluated a range of remedial alternatives that can be used to mitigate potential vapor intrusion into existing and future buildings within the Vapor Intrusion Study Area.

In August 2010, the EPA amended the 1989 MEW ROD to select a remedy for the vapor intrusion pathway to prevent subsurface volatile contaminants in groundwater from migrating into indoor air or accumulating in enclosed building spaces at concentrations exceeding the indoor air cleanup criteria for long-term exposure in residential and commercial buildings. Table 1 lists the indoor air cleanup levels.

The ROD Amendment provides a tiering system to determine the appropriate response action for each building or property within the Vapor Intrusion Study Area. The response action may include both engineering and institutional controls. Table 2 summarizes the tiering system and response actions. Table 3 provides the selected remedies for the various building tiers.

SITE NAME:		Site 28 – West-Side Aquifers Treatment System (WATS) Area			
REMEDIAL ACTION					
Remedy	Pump and Treat, Soil Vapor Extraction, Soil Excavation	Begin Date	1998	End Date	
<p>Groundwater treatment consists of:</p> <ul style="list-style-type: none"> • 9 extraction wells • Pretreatment using injection of hydrogen peroxide and ozone (the process is referred to as the Advanced Oxidation Process (AOP)) • Polishing of treated water with GAC units • Discharge to the storm drain system • Water is also collected from two sumps and treated @ WATS <ul style="list-style-type: none"> ○ Hangar 1 tunnel sump ○ Electric Vault #5 <p>Groundwater is sampled annually. Groundwater levels in monitoring wells are gauged semiannually.</p> <p>WATS is sampled monthly as part of the National Pollutant Discharge Elimination System (NPDES) requirements.</p> <p>Soil remedy:</p> <ul style="list-style-type: none"> • In-situ vapor extraction with treatment by vapor phase GAC • Excavation and treatment by aeration to meet federal, state, and local air standards 		<p>WATS originally designed to include a shallow tray air stripper which was located after the AOP. Treated water was discharged to the storm drain after the air stripper. Due to concerns about air emissions from the air stripper, it was taken off line. The water from the AOP was then directed to GAC units before discharge to the storm drain.</p> <p>Vapor Intrusion Remedy: Tables 2 and 3 describe the tiering system and selected remedies.</p>			
Land Use Restrictions			Development Issues		
<p>No land use or institutional controls (ICs) were prescribed in the 1989 MEW ROD.</p> <p>The MEW ROD Amendment for the Vapor Intrusion Pathway includes the following ICs:</p> <p>Existing Buildings –</p> <ul style="list-style-type: none"> • Permitting and building requirements to install appropriate engineering controls in future construction • Recorded Agreements to ensure installation and operation of engineering controls; require information be provided to future owners; require information of building changes be provided to EPA and MEW Responsible Parties. Tracking service to provide information to EPA and MEW Responsible Parties of occupancy and building changes. <p>Future Buildings –</p> <ul style="list-style-type: none"> • Permitting and building requirements to install appropriate engineering controls in future construction <p>NASA will provide notice to lessees of restrictions on the property prior to lease.</p> <p>Land use must conform to the November 2002 Record of Decision for NASA's Development plan as outlined by Mitigated Alternative 5 of the Final Programmatic Environmental Impact Statement.</p>			<p>Development is subject to the NASA Programmatic Environmental Impact Statement, mitigated Alternative 5.</p> <p>Development at Site 28 is subject to the NASA Environmental Issues Management Plan (EIMP), in particular:</p> <ul style="list-style-type: none"> • New structures must incorporate measures to mitigate vapor intrusion • Installation of utility trenches must be constructed to reduce the potential of creating conduits for the later migration of contaminated groundwater • Installation of piles or elevator shafts must not create vertical conduits for migration of contamination to deeper aquifers • Removal or replacement of exiting groundwater monitoring wells, extraction wells and piping must be coordinated and approved by NASA, Navy, MEW, and/or regulatory agencies <p>Construction or modifications to existing structures may expose contaminated soil. Any dewatering that may take place will have to be tested to determine the appropriate disposal of the water. Construction of new structures or modification of existing must consider the possibility of vapor intrusion.</p>		

SITE NAME:		Site 28 – West-Side Aquifers Treatment System (WATS) Area	
RESIDUAL CONTAMINATION			
Compound	Residual Concentration (max)		Notes
	Soil (mg/kg)	Groundwater (µg/L)	
PCE (Upper A Aquifer)		170	Concentrations are from 2013 Annual Groundwater Report for Sites 26 & 28 and from wells within the Traffic Island Area.
PCE (Lower A Aquifer)		28,000	
TCE (Upper A Aquifer)		310	
TCE (Lower A Aquifer)		4300	
cis-1,2-DCE (Upper A Aquifer)		4500	
cis-1,2-DCE (Lower A Aquifer)		84,000	
VC (Upper A Aquifer)		130	
VC (Lower A Aquifer)		12,000	
PCE (28SI-06 @ 63' bgs)	27,000		See Figure 4.
TCE (28SI-06 @ 63' bgs)	110		
cis-1,2-DCE (28SI-06 @ 63' bgs)	74		
REFERENCES (Chronological Order)			
<ul style="list-style-type: none"> Record of Decision, Fairchild, Intel, and Raytheon Sites, Middlefield/Ellis/Whisman (MEW) Study Area, Mountain View, CA. US EPA, Region 9, San Francisco, CA. May 1989. Remedial Investigation Report, Operable Unit 4, West Side Aquifer, NAS Moffett Field, CA., Vol. 1. Martin Marietta Energy Systems, Inc., Oak Ridge, TN. August 1992. West-Side Aquifer Treatment System Draft Long-Term Groundwater Monitoring Plan, Moffett Federal Airfield, CA. PRC Environmental Management, Inc., San Francisco, CA. January 17, 1997. Final West-Side Aquifers Treatment System Long-Term Groundwater Monitoring Plan, Rev. 0, Former Naval Air Station Moffett Field, CA. Foster Wheeler Environmental Corp., San Diego, CA. December 4, 2003. Final First Five-Year Review Report for Middlefield-Ellis-Whisman (MEW) Superfund Study Area, Mountain View, CA. US EPA Region 9, San Francisco, CA. September 2004. Final West-Side Aquifers Treatment System Five-Year Review Report for the Period November 1998 to October 2002, Former Naval Air Station Moffett Field, CA. Department of the Navy, BRAC PMO West, San Diego, CA. February 2005. Environmental Issues Management Plan, NASA Research Park, Santa Clara County, CA. Erler & Kalinowski, Inc., Burlingame, CA. March 1, 2005. Final Second Five-year Review Report for Middlefield-Ellis-Whisman (MEW) Superfund Study Area, Mountain View and Moffett Field, CA. USEPA Region IX, San Francisco, CA, September 2009. Final Five-Year Review Report Installation Restoration Sites 1, 22, 26, and 28, Former Naval Air Station Moffett Field, CA. ChaduxTt, San Diego, CA. February 12, 2010. Final Technical Memorandum, In Situ Anaerobic Biotic/Abiotic Treatability Study, Installation Restoration Site 28, Moffett Field, CA. Shaw, Concord, CA. March 2012. Final 2011 Annual Groundwater Report for Installation Restoration Sites 26 and 28, Former Naval Air Station Moffett Field, CA. ERS-JV, Sacramento, CA., Brown & Caldwell, San Diego, CA. April 2012. 2012 Annual Groundwater Report for Installation Restoration Site 26 & 28, Former Naval Air Station Moffett Field, CA. SES-TECH Remediation Services, San Diego, CA. April 2013. Final 2013 Annual Groundwater Report for Installation Restoration Site 26 & 28, Former Naval Air Station Moffett Field, CA. SES-TECH Remediation Services, San Diego, CA. April 2014. 			

Table 1. Indoor Air Cleanup Levels for Long-term Exposure for the MEW Site – Residential and Commercial Buildings.¹

MEW Site Chemical of Potential Concern	Indoor Air Cleanup Level (µg/m ³)		Comments
	Residential	Commercial	
TCE	1	5	Representing 1x10 ⁻⁶ lifetime target cancer risk the application of the Cal/EPA toxicity factor and a 1x10 ⁻⁴ lifetime target cancer risk through application of draft 2001 EPA toxicity factor.
PCE	0.4	2	Representing 1x10 ⁻⁶ lifetime cancer risk.
cis-1,2-DCE	60	210	Not available. Based on trans-1,2-DCE non-cancer Hazard Index of 1.
Trans-1,2-DCE	60	210	Representing non-cancer Hazard Index of 1.
Vinyl Chloride	0.2	2	Representing 1x10 ⁻⁶ lifetime target cancer risk. EPA uses a larger conversion factor from residential to commercial for vinyl chloride because the residential value takes into account child exposure and higher sensitivity earlier in life.
1,1-DCA	2	6	Representing 1x10 ⁻⁶ lifetime target cancer risk.
1,1-DCE	210	700	Representing non-cancer Hazard Index of 1.

Notes:

1. From Table 3 in the 2010 Vapor Intrusion ROD Amendment.

Table 2: Response Action Tiering System for Existing and Future Commercial and Residential Buildings in the Vapor Intrusion Study Area.¹

Tier	Description	Response Actions
Tier 1	Building with indoor air concentrations greater than outdoor (background) ² air concentrations and indoor air cleanup level	Implement selected remedy (appropriate engineering control) to meet indoor air cleanup levels. Once indoor air cleanup levels achieved and confirmed, building then categorized as Tier 2. Implement governmental, proprietary, and informational ICs.
Tier 2	Building with indoor air concentrations below the indoor air cleanup levels. Former Tier 1 existing building and Tier A future (new) building that confirmed indoor air concentrations are below the indoor air cleanup levels.	Ensure continued operation and maintenance of active ventilation system or other selected engineered remedy to meet RAOs. Develop and implement long-term monitoring and ICs implementation plan. Implement governmental, proprietary, and informational ICs. Where remedy is achieved through operation of an active ventilation system, agreement of property owner must be contained in a recorded agreement.
Tier 3A	Building with indoor air concentration below indoor air cleanup levels, but greater than outdoor (background) ² concentrations.	No engineered remedy required. Develop and implement long-term monitoring plan. Implement governmental ICs.
Tier 3B	Building with indoor air concentrations at or within outdoor (background) ² concentrations.	No engineered remedy not long-term monitoring required. Implement governmental ICs.
Tier 4	Buildings where converging lines of evidence demonstrates that there is no longer the potential for vapor intrusion into the building exceeding indoor air cleanup levels.	No action required after performance of all necessary confirmation sampling and documentation approved by EPA that no action is necessary.

Tier	Description	Response Actions
Tier A	Future (new) building on property where lines of evidence (soil gas, sub-slab soil gas, crawlspace) indicate that there is the potential for vapor intrusion into the new building above indoor air cleanup levels.	Implement selected remedy to meet RAOs. Perform indoor air sampling after construction to confirm remedial action is effective. Implement governmental and proprietary ICs. Re-categorize as Tier 2 Existing Building.
Tier B	Future (new) buildings on properties where lines of evidence indicate there is no potential for vapor intrusion into the building exceeding EPA's indoor air cleanup levels.	Perform indoor air sampling after building is constructed to confirm that there is no potential vapor intrusion risk and indoor air cleanup levels are met. If confirmed with EPA approval, then no action is required.

Notes:

1. Table 3 is based on Tables 6A, 6B, and 7 from the 2010 ROD Amendment.
2. Outdoor concentrations of TCE typically range from below laboratory analytical detection limits to 0.4 µg/m³.

Table 3: EPA's Selected Vapor Intrusion Remedy for Existing and Future Buildings in the Vapor Intrusion Study Area.¹

Building Tier	Selected Remedy
Tier 1 & Tier 2	Active sub-slab/sub-membrane ventilation, monitoring, and ICs (including conduit sealing) ICs consist of: <ul style="list-style-type: none"> • Permitting and building requirements to install appropriate engineering controls in future construction. • Recorded agreements to ensure installation and operation of engineering controls; require information be provided to future owners; require information of building changes be provided to EPA and MEW Responsible Parties of occupancy and building changes.
Tier 3A & 3B	No engineering control. ICs only. ICs consist of: <ul style="list-style-type: none"> • Permitting and building requirements to install appropriate engineering controls in future construction.
Tier 4	No remedy required.
Tier A	Passive sub-slab/sub-membrane ventilation with vapor barrier (and the ability to be made active), monitoring, and ICs. ICs consist of: <ul style="list-style-type: none"> • Permitting and building requirements to install appropriate engineering controls. Recorded agreement remain in place.
Tier B	No remedy required.

Note:

1. Based on Table 8 in the 2010 MEW ROD Amendment.

FIGURES

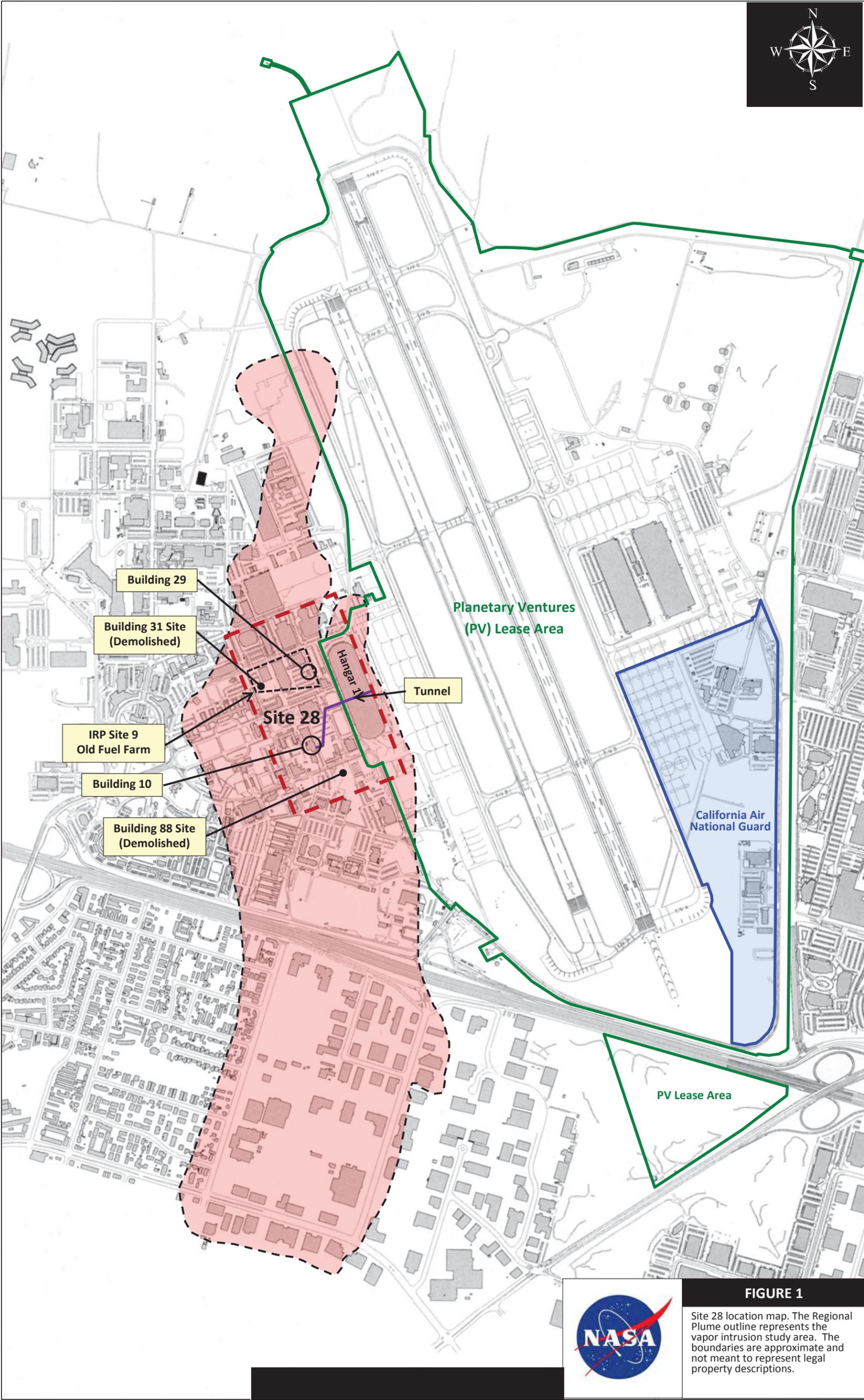


FIGURE 1

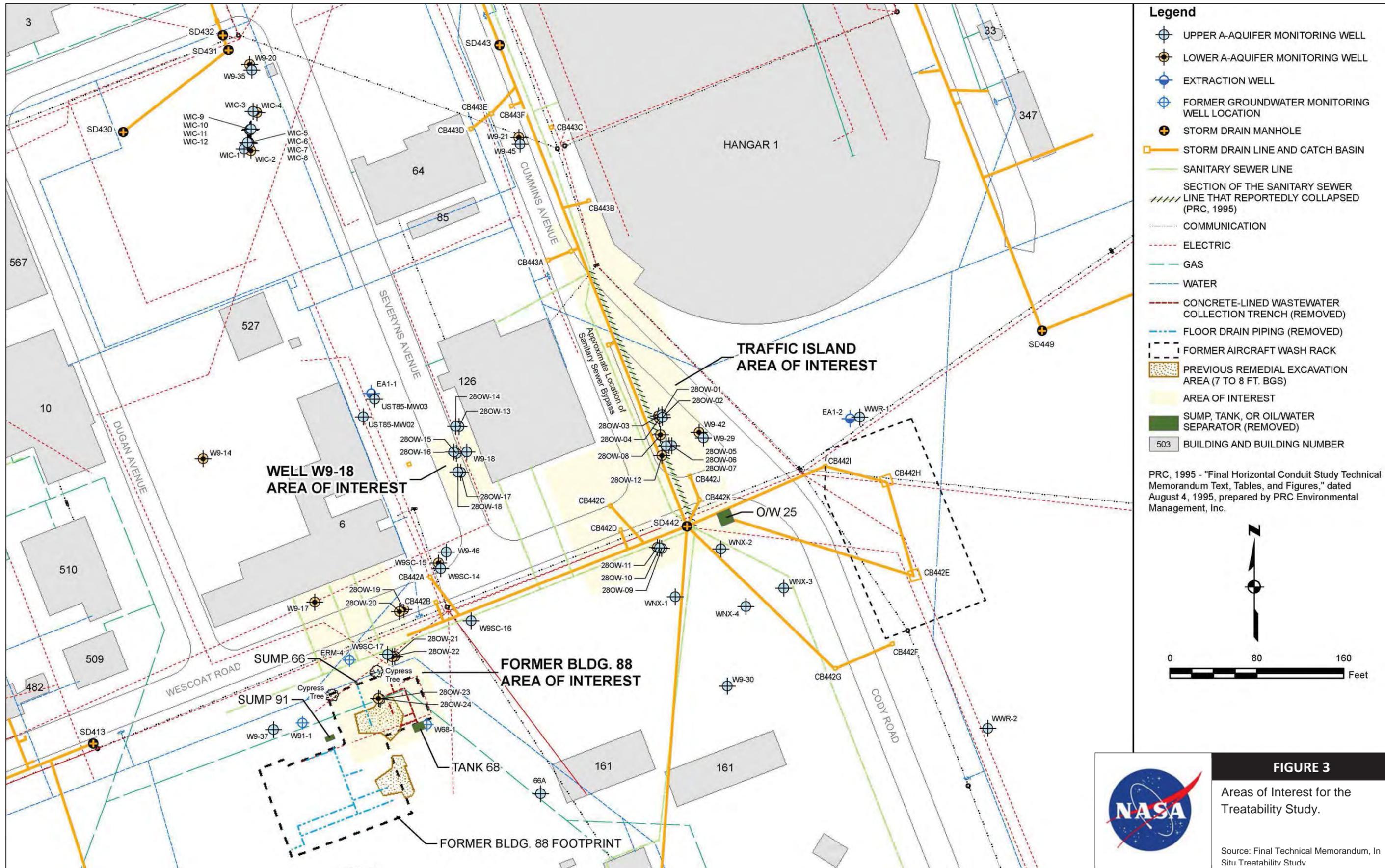
Site 28 location map. The Regional Plume outline represents the vapor intrusion study area. The boundaries are approximate and not meant to represent legal property descriptions.



FIGURE 2

Aerial view of Site 28 showing WATS location and extraction wells, Traffic Island, Bldg. 88 Site, tunnel location, and Electrical Vault #5.

Google Earth Photograph 9/26/2011





LEGEND	
PCE	Tetrachloroethene
TCE	Trichloroethene
cis-1,2-DCE	cis-1,2-Dichloroethene
trans-1,2-DCE	trans-1,2-Dichloroethene
1,1-DCE	1.1- Dichloroethene
J	estimated concentration below the reporting limit
U	Analyte not detected at or below the reporting limit

Approximate Lease Boundary

Site 28 Boundary

28SI-11 (mg/kg) [7/23/13]

Compound	26'	49'
PCE	0.240J	1.3
TCE	0.180	0.029J
cis-1,2-DCE	0.110	0.030U
Trans-1,2-DCE	0.0012U	0.030U
1,1-DCE	0.0041J	0.030U
Vinyl chloride	0.022	0.030U

28SI-08 (mg/kg) [7/10/13]

Compound	6.5	13
PCE	0.540	12
TCE	0.088J	0.960
cis-1,2-DCE	0.031U	1.8
Trans-1,2-DCE	0.062U	0.063U
1,1-DCE	0.062U	0.063U
Vinyl chloride	0.120U	0.130U

28SI-09 (mg/kg) [7/18/13]

Compound	54'	95'
PCE	0.710	0.0011U
TCE	0.038	0.0011U
cis-1,2-DCE	0.011	0.0011U
Trans-1,2-DCE	0.001U	0.0011U
1,1-DCE	0.001U	0.0011U
Vinyl chloride	0.0073J	0.00056U

28SI-10 (mg/kg) [7/17/13]

Compound	39'	52'	94'
PCE	2.5	6.6	0.0011U
TCE	0.200J	0.071J	0.0012U
cis-1,2-DCE	0.380J	0.032U	0.0012U
Trans-1,2-DCE	0.0054	0.064U	0.0012U
1,1-DCE	0.0019J	0.064U	0.0012U
Vinyl chloride	0.070	0.130U	0.0012U

28SI-07 (mg/kg) [7/15/13]

Compound	61'	94'	109'
PCE	0.0013U	0.047	27
TCE	0.0013U	0.0048J	0.6J
cis-1,2-DCE	0.0013U	0.0012U	0.078U
Trans-1,2-DCE	0.0013U	0.0012U	0.160U
1,1-DCE	0.0026U	0.0012U	0.160U
Vinyl chloride	0.0013U	0.00058U	0.310U

28SI-06 (mg/kg) [7/11/13]

Compound	12'	63'	80'	93'
PCE	5.4	27,000	310	49
TCE	0.54	110	3.6J	2.4
cis-1,2-DCE	10	74	1.3U	0.160U
Trans-1,2-DCE	0.065U	2.5U	2.5U	0.320U
1,1-DCE	0.065U	2.5U	2.5U	0.320U
Vinyl chloride	0.130U	5.1U	5.0U	0.640U



FIGURE 4

Site 28 soil contamination located within the lease area.

Figure based on Figure 3 and Table 8 from the Draft Tech Memo Supplemental Investigation July 2014. NASA photograph 12/4/2013.



Legend	
X.X	TCE Concentration (µg/L)
J	Estimated value
U	Not detected
●	Monitoring well
▲	Extraction well

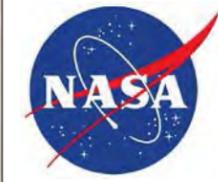


FIGURE 5
Site 28 PCE distribution in the Upper A Aquifer & in/near the lease area
Google Earth Photograph 9/26/2011. Data from Figure 2-115, 2013 Annual Groundwater Report for Sites 26 & 28



Legend	
X.X	TCE Concentration ($\mu\text{g/L}$)
J	Estimated value
U	Not detected
●	Monitoring well
▲	Extraction well



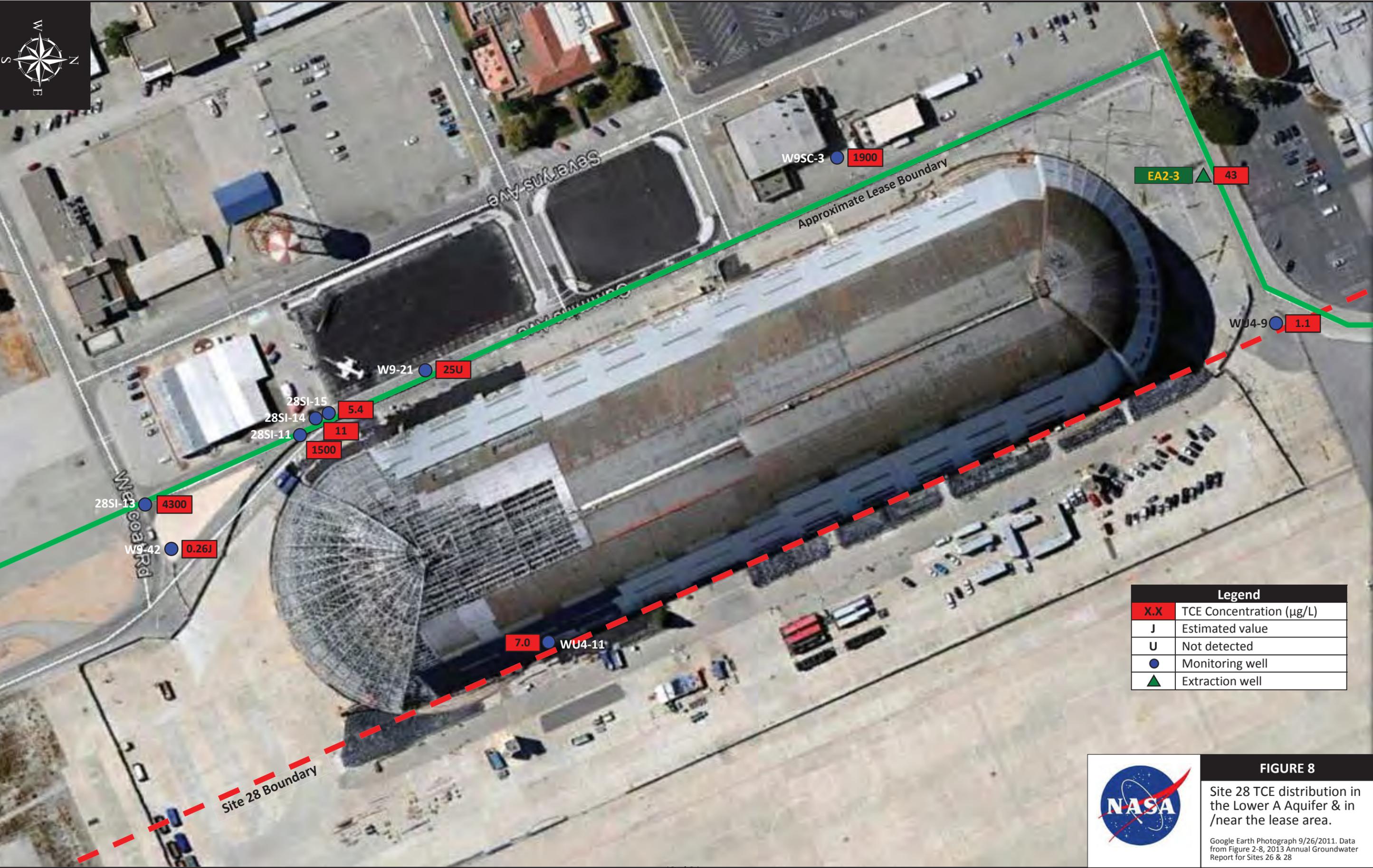
FIGURE 6
 Site 28 PCE distribution in the Lower A Aquifer & in /near the lease area.
 Google Earth Photograph 9/26/2011. Data from Figure 2-116, 2013 Annual Groundwater Report for Sites 26 & 28



Legend	
X.X	TCE Concentration ($\mu\text{g/L}$)
J	Estimated value
U	Not detected
●	Monitoring well
▲	Extraction well



FIGURE 7
 Site 28 TCE distribution in the Upper A Aquifer & in/near the lease area
 Google Earth Photograph 9/26/2011. Data from Figure 2-7, 2013 Annual Groundwater Report for Sites 26 & 28



Legend	
X.X	TCE Concentration (µg/L)
J	Estimated value
U	Not detected
●	Monitoring well
▲	Extraction well



FIGURE 8
 Site 28 TCE distribution in the Lower A Aquifer & in /near the lease area.
 Google Earth Photograph 9/26/2011. Data from Figure 2-8, 2013 Annual Groundwater Report for Sites 26 & 28



Legend	
X.X	TCE Concentration (µg/L)
J	Estimated value
U	Not detected
●	Monitoring well
▲	Extraction well



FIGURE 9
 Site 28 cis-1,2-DCE distribution in the Upper A Aquifer & in/near the lease area
 Google Earth Photograph 9/26/2011. Data from Figure 2-113, 2013 Annual Groundwater Report for Sites 26 & 28



Legend	
X.X	TCE Concentration (µg/L)
J	Estimated value
U	Not detected
●	Monitoring well
▲	Extraction well



FIGURE 10

Site 28 cis-1,2-DCE distribution in the Lower A Aquifer & in /near the lease area.

Google Earth Photograph 9/26/2011. Data from Figure 2-114, 2013 Annual Groundwater Report for Sites 26 & 28



Legend	
X.X	TCE Concentration (µg/L)
J	Estimated value
U	Not detected
●	Monitoring well
▲	Extraction well



FIGURE 11
 Site 28 vinyl chloride distribution in the Upper A Aquifer & in/near the lease area
 Google Earth Photograph 9/26/2011. Data from Figure 2-117, 2013 Annual Groundwater Report for Sites 26 & 28



Legend	
X.X	TCE Concentration (µg/L)
J	Estimated value
U	Not detected
●	Monitoring well
▲	Extraction well



FIGURE 12
 Site 28 vinyl chloride distribution in the Lower A Aquifer & in /near the lease area.
 Google Earth Photograph 9/26/2011. Data from Figure 2-118, 2013 Annual Groundwater Report for Sites 26 & 28



Navy IR Site 25

Regional Plume Boundary – Vapor Intrusion Study Area

NASA

Planetary Ventures (PV) Lease Area

Site 29 Hangar 1

NAVY

Bldg. 10 – Hangar 1 Tunnel

Bldg. 10

California Air National Guard

MEW

PV Lease Area



FIGURE 13

Regional Plume – Vapor Intrusion Study Area and Areas of Responsibility at the Moffett Field Site.

Based on EPA 8/23/2011 map and Figure 3 from Draft Navy Air Sampling Summary 2014

SITE NAME:	Site 29: Hangar 1				
Version:	Final	Date:	02/28/2015		
RESPONSIBLE PARTY					
Organization	Department of the Navy, BRAC				
Address	1455 Frazee Rd., Suite 900 San Diego, CA 92108				
Contact	Scott Anderson				
	scott.d.anderson@navy.mil				
	619-532-0938				
LOCATION					
Facility Name	Moffett Federal Airfield	Site Location			
Facility Address	Mountain View, CA	Latitude	37.412979° N		
	Santa Clara County	Longitude	122.053975° W		
Regulatory Program	Lead Agency(ies)	Site Status			
		Open	Closed	ROD¹	Current Phase
CERCLA	EPA/RWQCB	X		Pending	Feasibility Study
SITE SUMMARY					
<p>1. Hangar 1 is also subject to the 2010 Vapor Intrusion ROD amendment for the MEW Superfund ROD</p> <p>Hangar 1 is located west of the runways and adjacent to Cummins Road (Figure 1). The hangar is 1133 feet long, 308 feet wide and 198 feet high.</p> <p>Hangar 1 was constructed in 1932 to house the airship <i>U.S.S. Macon</i>. The hangar was part of the Naval Air Station (NAS) Sunnyvale that was established as the west coast base for the Navy's lighter-than-air program (Figure 2). On February 12, 1935, the <i>Macon</i> crashed off of Point Sur, CA. After the loss of the <i>Macon</i>, Hangar 1 was used for aircraft maintenance, training facilities, storage, office space, and special events. The Moffett Field Historical Society museum was located within the hangar. Under the Base Realignment and Closure (BRAC) program, NAS Moffett field was closed on July 1st, 1994. Custodianship of Hangar 1 was transferred to NASA Ames Research Center along with the majority of Moffett Field on that same date.</p> <p>In 1997, as part of NASA's routine cleaning of the storm water settling basin (Figure 1), Aroclor-1268, a relatively uncommon polychlorinated biphenyl (PCB), was found in the sediment. Concentrations ranged from 0.05 mg/kg to 0.8 mg/kg. Aroclor-1268 is considered comparable to Aroclor-1254 due to a similar molecular structure. While there was no preliminary remediation goal (PRG) for 1268, using the PRG for 1254, the 0.8 mg/kg exceeded the industrial soil level of 0.74 mg/kg.</p> <p>In April 1999, Aroclor 1268 was reported in a storm water sample collected from Manhole D-1 at 1.1 µg/L (Figure 3). In an attempt to define the source of the Aroclor-1268, sediments samples from 15 catch basins upstream of D-1 were collected and analyzed. The results indicated no detectable concentrations for any isomers for PCBs. Five additional sampling locations upstream of D-1 were added to the storm water sampling program.</p> <p>In 2002, samples from Manholes SD-107 and SD-109 (Figure 3) indicated the presence of Aroclor-1268: 1.2 µg/L (SD-107) and 0.63 µg/L (SD-109).</p>					

SITE NAME:**Site 29: Hangar 1****SITE SUMMARY**

In 2003, two storm water runoff samples were collected directly from the siding along the eastern side of the hangar and one from a rainwater downspout. Aroclor 1268 was found in the samples from the siding runoff at 3.09 µg/L and 6.7 µg/L and 0.37 µg/L in the downspout. Table 1 lists the various investigations and analytical results.

Air samples were taken both inside and outside of the hangar. Aroclor-1268 was not found in any of the outside ambient air samples. However, Aroclor-1268 was reported from inside the hangar at 0.0888 to 0.1115 µg/m³. For the direct-contact exposure pathway of ambient air, the USEPA Region 9 PRG for PCBs is 0.0034 µg/m³.

In September 2003, NASA implemented a Time-Critical Removal Action (TCRA) to remove sediments from the stormwater collection trench surrounding the hangar. Sediments that may potentially be impacted by PCBs were also removed from paved areas surrounding Hangar 1. NASA also closed the hangar and removed tenants to limit exposure to PCBs. Access to the hangar was restricted and personal protective equipment (PPE) was required for entry.

The Navy performed a TCRA in October 2003 as an interim removal action to limit the migration of PCBs from the exterior surfaces of the building materials to the storm drain system. The TCRA consisted of the following:

- Pressure washing of the exterior to remove any grease, oil, or dirt;
- The exterior corrugated siding was coated with an asphalt emulsion to isolate the siding contaminants;
- The area around the hangar was pressure washed following the coating phase;
- A permanent, 6-foot-high, chain-link security fence was installed to control access to the hangar.

The results from sampling and testing building materials confirmed that Hangar 1 was a source of the contamination found in the sediment at the settling basin. Aroclor-1260 and Aroclor-1268 were found at significantly elevated levels from the siding material. Relatively low to nondetectable levels were present in the flat roof materials, roof sealant, and window putty.

The corrugated siding of the hangar is Robertson Protective Metal siding. The siding consists of multiple layers laminated symmetrically during manufacturing:

- Layer 1: A specially annealed steel sheet protected from corrosion by the following four layers.
- Layer 2: An air blown (pre-oxidized) petroleum asphalt layer approximately 24 to 28 mils thick.
- Layer 3: Asphalt- and PCB-saturated asbestos felt ranging from 24 to 28 mils thick.
- Layer 4: A weatherproof compounded bitumen layer 12 to 20 mils thick to keep moisture and oxygen away from the underlying asphalt and to lock in the bituminous binders and oils.
- Layer 5: Layers of aluminum and lead-based paint.

These layers were then fused together in a heated press. After cooling, the sheet was then corrugated. A final layer of aluminum and lead-based paint was then applied. PCBs are the Chemicals of Concern (COC).

SITE SUMMARY

However the building materials also contained asbestos and lead-based paint. The lead-based paint on the structural frame of the hangar also had low levels of PCBs.

The Navy proposed to perform a Non-Time Critical Removal Action (NTCRA) to address the COC. The Navy prepared an Engineering Evaluation/Cost Analysis (EE/CA) for the NTCRA. The EE/CA states the removal action is being conducted to “control the migration of PCBs from Hangar 1 to the environment through source elimination or containment, thereby eliminating human health and environmental concerns associated with potential exposure pathways, including the surface water runoff pathway to Site 25.” The EE/CA also states, the proposed RAO is “to control the release of COCs at Hangar 1, thereby reducing the potential risks to human health and the environment while minimizing future operation and maintenance activities at the site.”

Thirteen removal action alternatives were selected for evaluation:

1. Enclose entire hangar inside another structure
2. Cover with rubberized material
3. Coat with asphalt emulsion
4. Coat with acrylic coating
5. Coat with a plasma-sprayed oxide
6. Cover with new visually similar siding
7. Media blast contaminated surfaces
8. Neutralize PCBs using emulsified bimetallic extraction
9. Remove contaminants by chemical stripping and coating
10. Remove siding and coat exposed surfaces
11. Demolish and remove hangar
12. Collect storm water runoff and treat on-site
13. Collect storm water runoff and treat/dispose off-site

All of the alternatives were evaluated against CERCLA criteria of implementability and effectiveness. Those alternatives that satisfied the threshold criteria of complying with Applicable or Relevant and Appropriate Requirements (ARAR) and protecting human health and the environment and were deemed effective and implementable, were then evaluated for cost. Based on the EE/CA, the Navy’s recommended alternative was Alternative 10. The Navy developed the Hangar 1 Action Memorandum for the NTCRA to describe the selected alternative. The alternative consisted of the complete removal of the hangar siding, demolition and deconstruction of all interior structures, removal off all debris to appropriate off-site disposal or recycling facilities, application of a weather-resistant epoxy coating to the hangar’s structural steel frame, and implementation of historic mitigation measures.

The NTCRA was performed from June 2010 to June 2013. The siding was removed, interior structures were demolished and the debris disposed of at appropriate off-site facilities. The mezzanine level (top and bottom) was completely abated by sandblasting and application of a primer and Carbomastic® 15 epoxy coating system (CM-15). The structural steel frame was cleaned using high-pressure washing and/or other mechanical means. CM-15 was then applied to the frame to encapsulate the PCBs on the frame and prevent exposure to the contaminants. Water from the pressure washing was collected, treated on-site, and

SITE NAME:**Site 29: Hangar 1****SITE SUMMARY**

disposed of. Plastic sheeting was hung on the scaffolding to control spray and dust. Air sampling was conducted by the Navy inside and outside of the hangar and by NASA at other locations. Details of the NTCRA are provided in the After Action Completion Report.

In addition to removal of the siding and coating of the frame, soil areas on the east side of the hangar were sampled for PCBs. Areas where concentrations of PCBs exceeded 1.0 mg/kg occurred were excavated. Excavations were backfilled with clean fill material. Decontamination of the concrete floor and stem walls was also accomplished as part of the NCTRA.

As a result of the NTCRA, Hangar 1 currently consists of a concrete floor and stem walls that support the newly coated frame (Figure 4).

Following completion of the NTCRA, the Navy conducted a Focused Feasibility Study (FFS). The overall objectives of the FFS were:

- Develop and evaluate potential IC alternatives for the long-term management of Hangar 1 that permanently and significantly reduce the threat to public health, welfare, and the environment;
- Select a cost-effective alternative that mitigates the threat(s); and
- Achieve consensus among the Navy, EPA, and state and local authorities regarding the selected action.

Remedial action is necessary at the site to ensure the NTCRA remedy remains effective. Because the NTCRA included encapsulation of the COCs, hazardous substances will remain in place at Hangar 1 above the levels that would allow unlimited use and unrestricted exposure. Two alternatives were screened in the FFS: Alternative 1: No Action; and Alternative 2: Implementation of Institutional Controls. Neither of the alternatives provide for any further reduction in contaminant concentrations. Alternative 2 was selected as the preferred remedial action. The Navy's selected alternative was presented in the Proposed Plan (PP). The Navy proposed the following potential institutional controls in the PP:

- Installation and maintenance of signs notifying of the potential exposure hazard,
- Administrative arrangements for access for future monitoring/maintenance,
- Property owner and tenant commitment to inspection and maintenance of the CM-15 epoxy coating,
- Sediment sampling to ensure that the coating remains effective,
- Regulatory agency review of site development and land use changes,
- Regulatory agency approval of any building modifications that might damage the remedy components,
- Administrative commitment to incorporate appropriate proprietary restrictions necessary for long-term management and coating maintenance in any property transfer agreements.

The Navy in coordination with the regulatory agencies is currently developing the Record of Decision (ROD). The ROD will formally select the remedial action alternative. The final institutional controls will be established in the Land Use Controls Remedial Design (LUC RD). Maintenance and inspection requirements

SITE NAME:**Site 29: Hangar 1****SITE SUMMARY**

(Figures 5 & 6) for maintaining the effectiveness of the remedial action is provided in the long-term management plan (LTMP).

A lease agreement between NASA and Planetary Ventures (PV) has been signed for the eastern portion of Moffett Field. Hangar 1 is part of the lease. During the negotiation of the lease, an inspection of the coating on the frame was conducted. The inspection covered the ground level and mezzanine. During that inspection, the CM-15 coating was observed to be lifting and peeling from the steel frame. Wipe samples were also collected. The data and observations were presented to the Navy. The Navy arranged a site walk of the hangar to observe the coating issues and to determine corrective measures. The site walk included the Navy and its contractors, PV and their consultant, NASA personnel, and the California Regional Water Quality Control Board. The Navy conducted repairs in the fall of 2014. The repairs included removal of loose coating, surface preparation, and reapplying CM-15 over the problem areas. Details of the repair work are provided in the *Coating Spot Repair Report*.

Vapor Intrusion

Site 29 is located over the regional groundwater plume and falls within the vapor intrusion study area. Details on the vapor intrusion issue is provided in the Site 28 WATS Area Existing Environmental Condition Report.

As part of the vapor intrusion study required under the MEW ROD amendment for the vapor intrusion pathway, the Potentially Responsible Parties were required to sample the air in buildings and enclosed areas to determine if vapor intrusion may be occurring. Hangar 1 was not included in the vapor intrusion investigations since the NCTRA was in progress at the time. With the siding removed, the hangar interior is open to the atmosphere and vapors cannot accumulate to concentrations exceeding the indoor cleanup levels. However, as part of the lease, the hangar will be restored for use. The restoration will include replacement of the siding which will create an enclosed space into which vapors can accumulate.

Hangar 1 is located within the Vapor Intrusion Study Area and therefore subject to the 2010 ROD Amendment. In addition to the regional plume, high concentrations of solvents in groundwater are also present in the Traffic Island area located at the southwestern end of the hangar. A tunnel is located under the hangar as well. The tunnel runs from Building 10 to the eastern side of Hangar 1 (Figure 7). The tunnel originally was used for transporting helium from compressors in Building 10 to the hangar for the *USS Macon* and other lighter than air aircraft. Other utilities included steam and electrical distribution. The tunnel is no longer in use. Due to the depth of the tunnel floor, groundwater infiltrates into the tunnel from cracks in the concrete. Currently, the groundwater is pumped from a sump at the eastern end of the tunnel and piped to WATS for treatment. The sump is located under open grating in the floor of Hangar 1 which can allow vapors from the contaminated groundwater in the tunnel to migrate within the interior of the hangar.

The Navy conducted an investigation of the vapor and groundwater seepage pathways in the tunnel on April 22, 2013. Seven air samples and seven water samples were collected from within the tunnel and analyzed for seven chlorinated chemicals of concern. Two air and water samples were collected in the tunnel directly below the hangar.

SITE NAME:

Site 29: Hangar 1

SITE SUMMARY

Analytical results for the air samples below the hangar indicated the presence of TCE at concentrations of 260 $\mu\text{g}/\text{m}^3$ and 490 $\mu\text{g}/\text{m}^3$ and PCE at 120 $\mu\text{g}/\text{m}^3$ and 300 $\mu\text{g}/\text{m}^3$. Water results indicated the presence of TCE at 56 $\mu\text{g}/\text{L}$ and 69 $\mu\text{g}/\text{L}$ and PCE at 20 $\mu\text{g}/\text{L}$ and 95 $\mu\text{g}/\text{L}$. Sample locations and results are shown on Figure 7. The report concluded that the tunnel is a pathway for vapor intrusion into Building 10 and vapor migration to tunnel accesses in the area of Hangar 1.

Soil Conditions Below Hangar 1

The extent of contamination in soil below Hangar 1, if any, has not been determined. A subsurface investigation of the southwestern end of Hangar 1 was conducted by NASA in 2009. The investigation is summarized in the Potential Additional Cleanup Sites Existing Environmental Conditions Report. Six Geoprobe borings were advanced under the floor of the hangar. Solvents were detected in the Geoprobe samples. All concentrations were below 2008 Water Board Environmental Screening Levels.

As part of the investigation of contamination at the Traffic Island, the Navy installed six new monitoring wells in July 2013 (Figure 8) from which soil samples were taken. Soil sample results are shown on Figure 8.

SITE NAME:		Site 29: Hangar 1			
REMEDIAL ACTION					
Remedy	NTCRA and ICs	Begin Date	June 2010	End Date	To be Determined
<p>NTCRA consisted of the following (Alternative 10):</p> <ul style="list-style-type: none"> • Complete removal of all siding and disposal, • Cleaning of the frame with pressure washing and/or other mechanical means, • Coat structural steel frame with Carbomastic® 15 epoxy system, • Demolition of interior structures and disposal of debris at appropriate disposal facility, • Clean concrete floor and stem walls, • Collection and treatment of wash water, • Air sampling, • Clean storm drain trench, • Excavate contaminated soil on the eastern side of the hangar and disposal at appropriate facility. <p>Remedial Action: Implementation of Institutional Controls (FFS Alternative 2)</p>		<p>The final remedy for the site is currently pending.</p>			
Land Use Restrictions			Development Issues		
<p>The ROD has not been finalized. Final ICs will be determined in the LUC RD. Potential ICs were listed in the PP:</p> <ul style="list-style-type: none"> • Installation and maintenance of signs notifying of the potential exposure hazard, • Administrative arrangements for access for future monitoring/maintenance, • Property owner and tenant commitment to inspection and maintenance of the CM-15 epoxy coating, • Sediment sampling to ensure that the coating remains effective, • Regulatory agency review of site development and land use changes, • Regulatory agency approval of any building modifications that might damage the remedy components, • Administrative commitment to incorporate appropriate proprietary restrictions necessary for long-term management and coating maintenance in any property transfer agreements. 			<p>Residing of the hangar:</p> <ul style="list-style-type: none"> • PCB-contaminated paint remains on the frame under the epoxy coating, • Residing will likely require removal of coating to install siding exposing workers to the contamination, the coating will have to be repaired, • Removed contaminated paints solids will likely require handling and disposal as hazardous waste, if necessary. <p>Development shall be conducted in a manner that protects the remedy for Hangar 1 as specified in the LTMP and any supplemental requirements specified in the Hangar 1 ROD and LUC RD currently being developed.</p> <p>Development in the hangar once the siding has been replaced will be subject to vapor intrusion.</p> <p>The subsurface of Hangar 1 has not been characterized. Based of soil sample results from the Navy investigation at the adjacent Traffic Island, contaminated soil may be encountered.</p>		

SITE NAME:		Site 29: Hangar 1	
RESIDUAL CONTAMINATION			
Compound	Residual Concentration (max)		Notes
	Soil (mg/kg)	Groundwater (µg/L)	
			Contamination from PCBs in the paint on the frame exist under the epoxy coating. Concentrations vary.
REFERENCES (Chronological Order)			
<ul style="list-style-type: none"> • <i>Draft Work Plan Remedial Investigation and Feasibility Study for Site 29, Hangar 1, Former Naval Air Station Moffett Field, CA.</i> SulTECH, San Diego, CA. September 15, 2004. • <i>Engineering Evaluation/Cost Analysis Revision 1, Installation Restoration Site 29, Hangar 1, Former Naval Air Station Moffett Field, CA.</i> Department of the Navy, BRAC PMO West, San Diego, CA. July 30, 2008. • <i>Action Memorandum, Installation Restoration Site 29, Hangar 1, Former Naval Air Station Moffett Field, CA.</i> Department of the Navy, BRAC PMO West, San Diego, CA. December, 2008. • <i>Final Long-Term Management Plan for Non-Time-Critical Removal Action for PCB Contamination at Installation Restoration Site 29 (Hangar 1), Former Naval Air Station Moffett Field, CA.</i> AMEC Environment & Infrastructure, Inc., San Diego, CA. June 2013. • <i>Final Focused Feasibility Study, Installation Restoration Site 29 (Hangar 1), Former Naval Air Station Moffett Field, CA.</i> RORE, Inc., San Diego, CA. July 2013. • <i>Proposed Plan for Hangar 1, Former Naval Air Station Moffett Field Site 29, CA.</i> Department of the Navy, BRAC PMO West, San Diego, CA. July 2013. • <i>Final After Action Completion Report for Non-Time-Critical Removal Action for Polychlorinated Biphenyl (PCB) Contamination, Installation Restoration (IR) Site 29, Hangar 1, Former Naval Air Station (NAS) Moffett Field, CA.</i> AMEC Environment & Infrastructure, Inc., San Diego, CA. November 2013. • <i>Draft Technical Memorandum Supplemental Investigation Former Building 88 and Traffic Island Areas, Installation Restoration Site 28, Former Naval Air Station Moffett Field, CA.</i> CB&I Federal Services LLC, Concord, CA. July, 2014. • <i>Draft 2014 Air Sampling and Vapor Intrusion Tier Response Evaluation Report, Former Naval Air Station Moffett Field, Moffett Field, CA.</i> Accord MACTEC 8A Joint Venture, San Diego, CA. September, 2014. • <i>Coating Spot Repair Report, Hangar 1, Former Naval Air Station Moffett Field, Mountain View, CA.</i> AMEC Earth and Environmental, Inc., San Diego, CA. December 16, 2014. 			

Table 1: Previous Investigations and Findings^A

Date	Sample Medium	Analyte(s)	Concentration(s)
1997	Sediment from settling basin	Ar-1268 ^B	0.05 to 0.8 mg/kg
1999 – 2000	Storm water	Ar-1268	non-detect
12/2001	Hangar 1 building materials, external panel, 1 sample	Lead	198,570 mg/kg
10/2002	Sediment from settling basin influent	Ar-1268	2900 µg/kg
	Storm Water from SD-107	Ar-1268	1.2 µg/L
	Hangar 1 building materials, exterior corrugated panel siding, 18 samples	Ar-1260 Ar-1268	Maximum 5,500 mg/kg Maximum 188,000 mg/kg
	Various building materials from exterior roofing and surfacing materials, 40 samples	Asbestos	18 samples with 0.7 to 18% asbestos (as chrysotile)
	Hangar 1 building materials paint chips from doors	Lead	101,160 mg/kg 198,570 mg/kg
	Hangar 1 building materials, window putty, 8 initial samples	Ar-1260 Ar-1268	1.7 mg/kg to 77 mg/kg ^C
	Hangar 1 building materials, window putty, 5 confirmation samples	Ar-1260 Ar-1268	non-detect 0.4 to 2.1 mg/kg
	Hangar 1 building materials, 5-ply asphalt roof membrane, 6 samples 5 layers per sample	Ar-1260 Ar-1268	0.9 mg/kg 0.5 mg/kg
	Hangar 1 building materials, roof sealant, one sample	Ar-1260 Ar-1268	5.7 mg/kg 4.4 mg/kg
	2002	Storm Water samples	Ar-1268
10/2002	Ambient air sampling from outside and inside of the hangar, four screening stations	PCB – inside	0.0888 – 0.1115 µg/m ³
		Lead – inside	non-detect – 0.0127 µg/m ³
		PCB – outside	non-detect
11/2002	Ambient air samples from outside and inside of the hangar	PCB – inside	0.0292 – 0.0407 µg/m ³
		PCB – outside	non-detect
12/2002	Hangar 1 concrete floor wipe samples, 83 samples	PCBs	non-detect – 16 µg/100cm ²
3/2003	Rainwater runoff from Hangar 1 siding	Ar-1268	3.09 and 6.7 µg/L
	Rainwater from Hangar 1 downspout	Ar-1268	non-detect and 0.37 µg/L
	Sediment from storm water collection trench on east side of Hangar 1	Ar-1268	65.5 and 72.4 mg/kg
	Hangar 1 interior, dust samples	PCBs	non-detect – 320 mg/kg
7/2003	Sediment from storm water collection trench around Hangar 1, 17 samples	Ar-1268	2.2 mg/kg – 540 mg/kg
		Lead	330 mg/kg – 2,200 mg/kg
		Zinc	290 mg/kg – 4,300 mg/kg
2003	Hangar 1 building materials, upper (black) walls, 8 samples	Ar-1260 Ar-1268	2 mg/kg – 12 mg/kg 5 mg/kg – 119 mg/kg
		Ar-1260 Ar-1268	non-detect 0.09 µg/quantity
5/2003	Hangar 1 concrete floor, 1 sample	Lead	4.4 mg/kg – 5.0 mg/kg
		Lead (SPLP) ^D	non-detect
		Ar-1260 Ar-1268	non-detect non-detect – 21.2 µg/100cm ²
	Hangar 1 concrete floor wipe sample, 4 samples	Lead	non-detect
2/2005	Hangar 1 rain-gutter sediment sample	Ar-1268	250 mg/kg
		Lead	4,520 mg/kg
		Zinc	3,380 mg/kg
		Asbestos	2% asbestos (as chrysotile)

Date	Sample Medium	Analyte(s)	Concentration(s)
2005	Hangar 1 building materials, interior paint on steel, 4 samples	Ar-1260	33 mg/kg – 120 mg/kg
		Ar-1268	32 mg/kg – 94 mg/ kg
		Total PCBs	65 – 214 mg/kg
		Lead	Maximum 200,000 mg/kg

Notes:

- A. Table 1 is from Table 1 in the Draft Work Plan, Remedial Investigation and Feasibility Study for Site 29, Hangar 1.
- B. Ar- = Aroclor-
- C. Samples of window putty are likely contaminated with exterior coating material.
- D. SPLP = Synthetic Precipitation Leaching Procedure

FIGURES

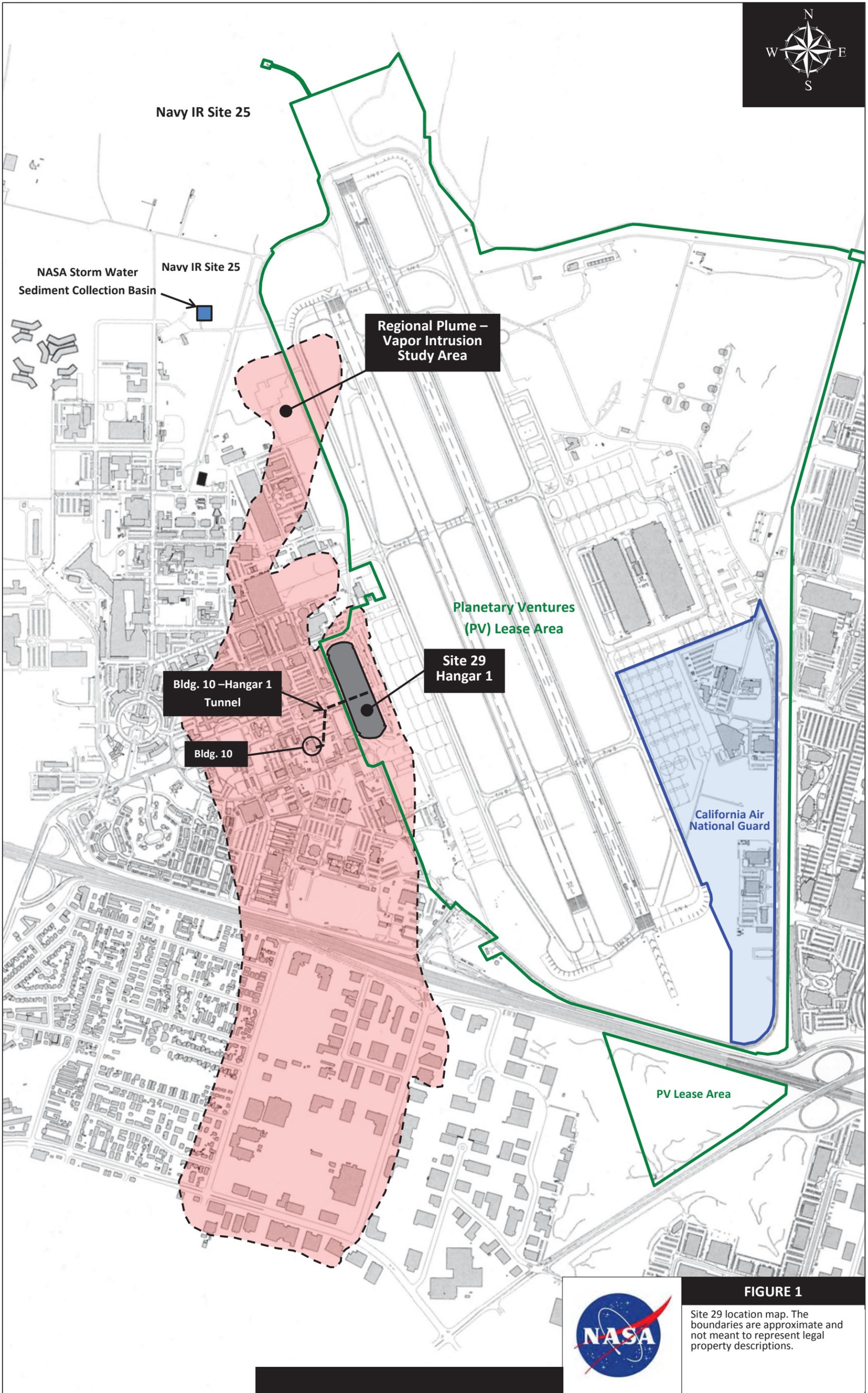
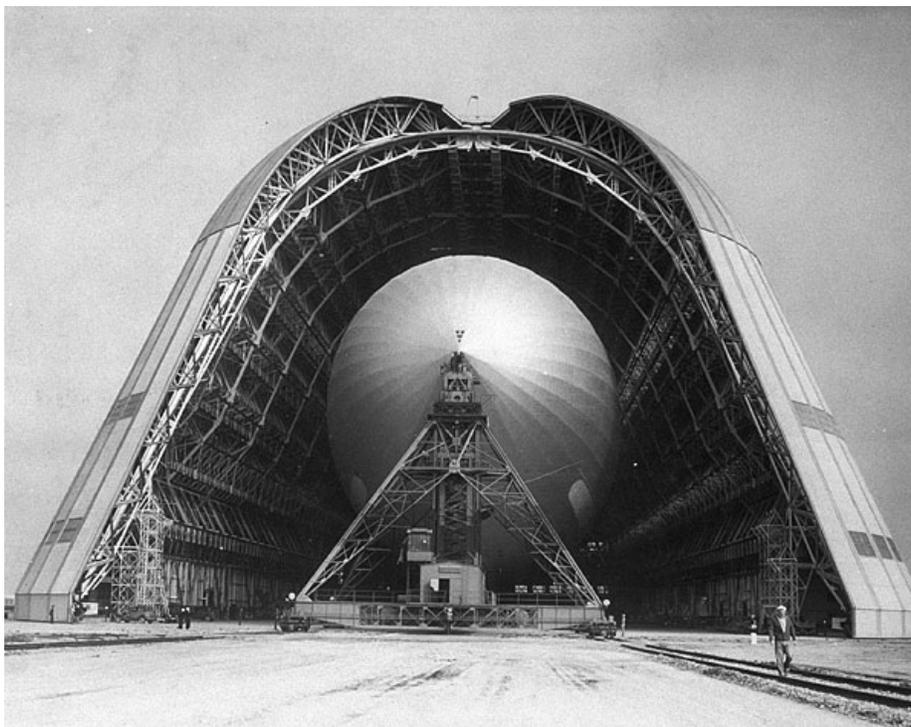


FIGURE 1

Site 29 location map. The boundaries are approximate and not meant to represent legal property descriptions.



Photograph of Hangar 1 with the *USS Macon* flying in the background.



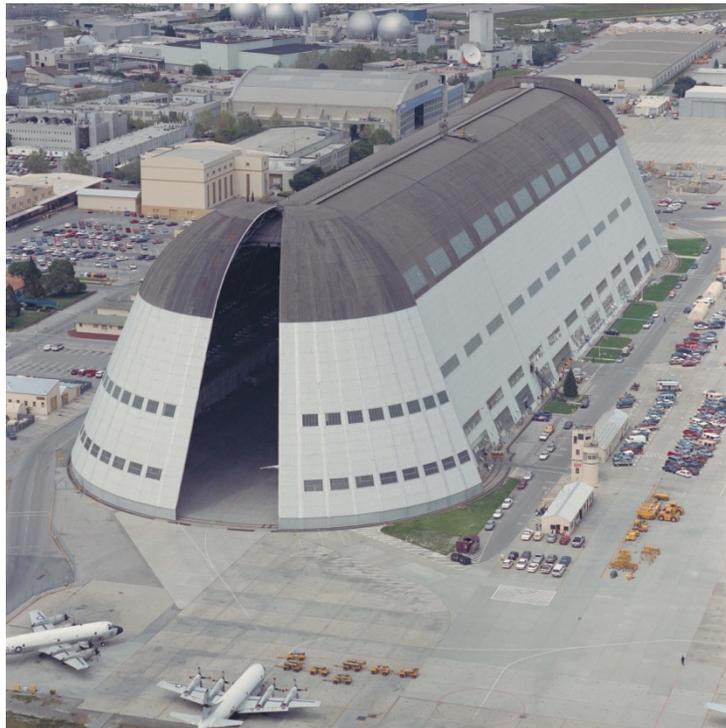
Photograph of the *USS Macon* being towed out of Hangar 1.

	FIGURE 2
	Photographs of Hangar 1 and the <i>USS Macon</i> . Navy photographs, early 1930s.



FIGURE 3
 Aerial photograph of Site 29 with NTCRA in progress. Also shown are the storm drains & storm water collection trenches.

Google Earth photograph, 9/26/2011



Hangar 1 at NAS Moffett Field (1992).



Hangar 1 with siding removed near completion of NTCRA (2013).

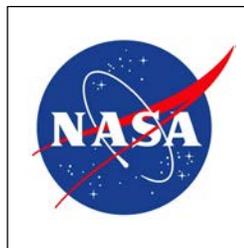


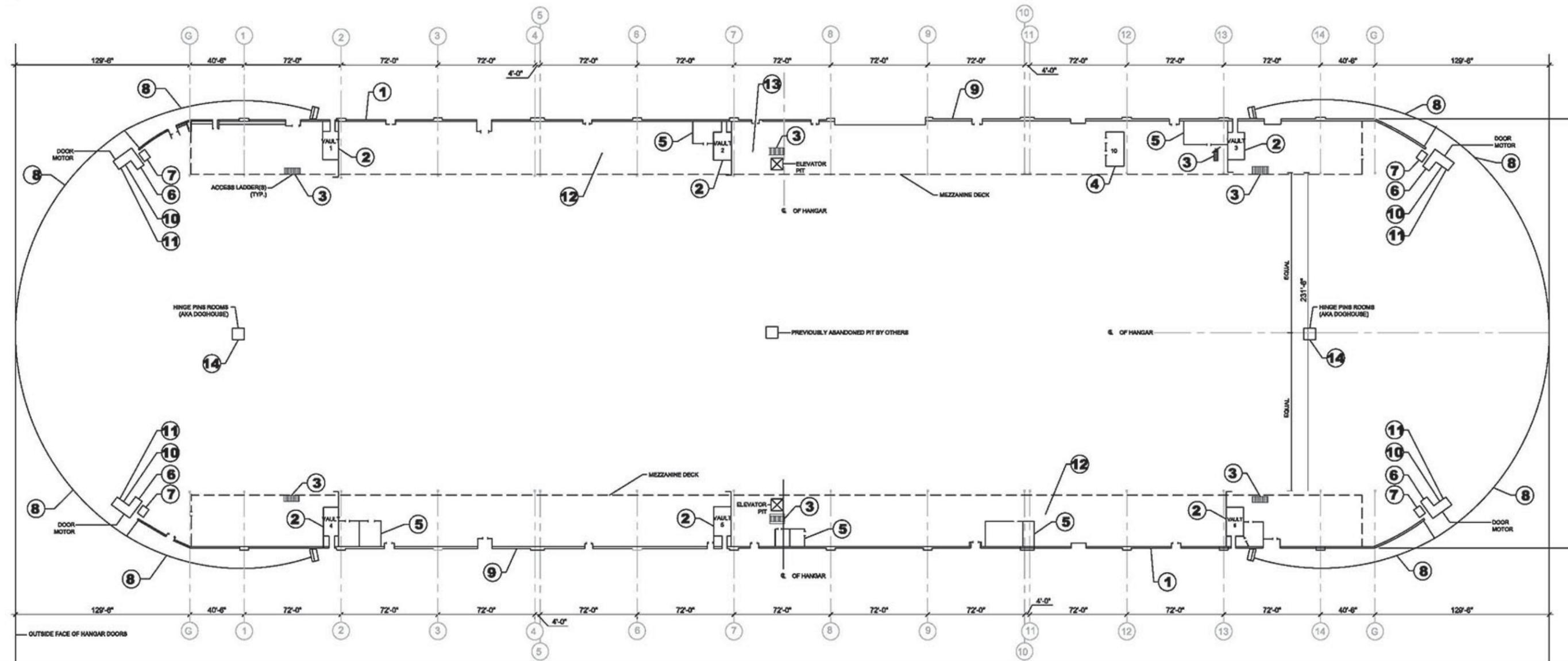
FIGURE 4

Photographs showing Hangar 1 during operations by NAS Moffett Field and after the siding was removed.

NOTES:

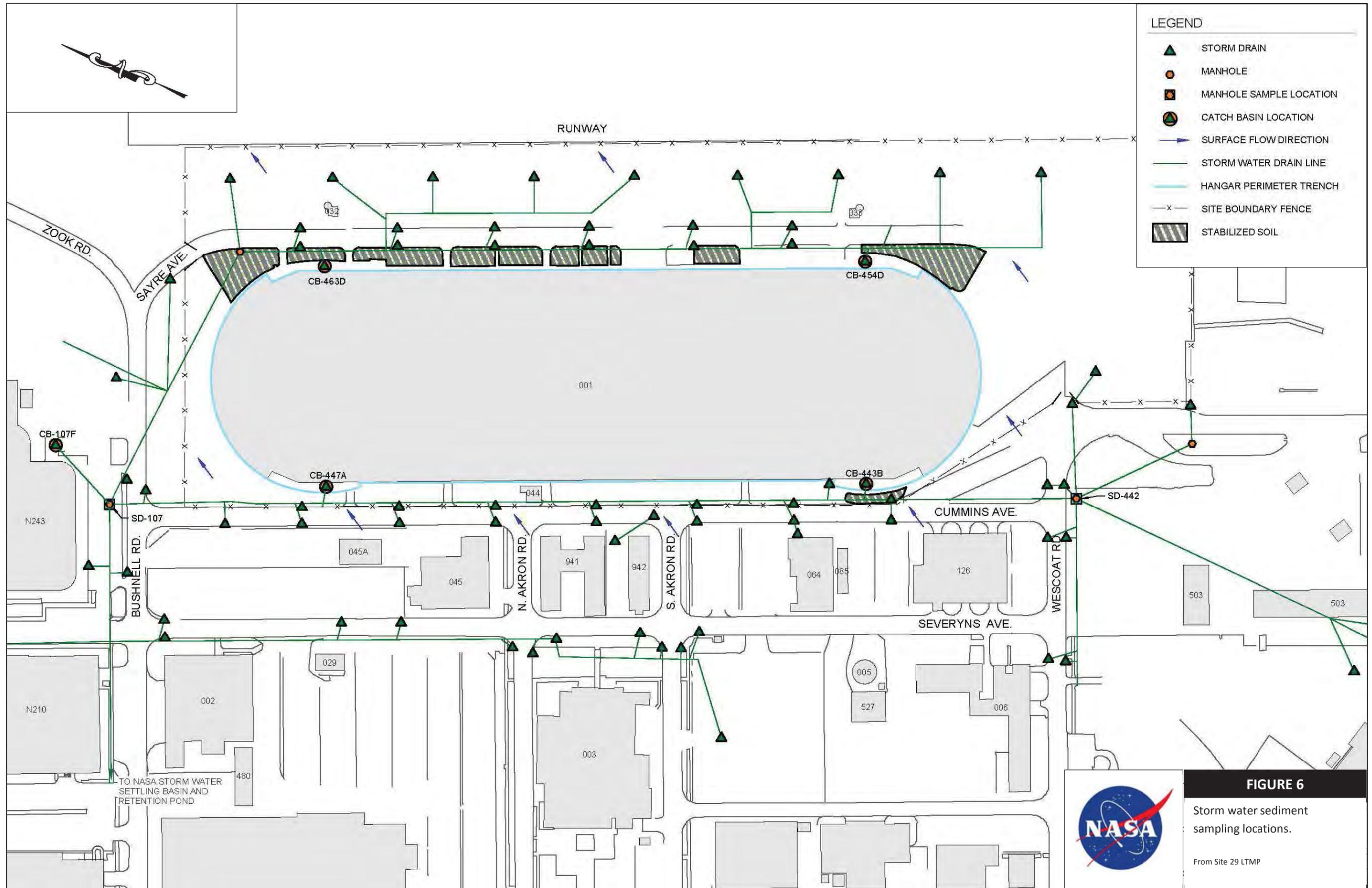
- ① STRUCTURAL STEEL FRAME (ENTIRE HANGAR).
- ② CMU WALLS SURROUNDING ELECTRICAL VAULTS.
- ③ ACCESS STAIRS LEADING FROM GROUND FLOOR TO MEZZANINE DECK.
- ④ FORMER STORAGE VAULT.
- ⑤ FORMER TOILETS.
- ⑥ DOOR MOTOR HOUSING.
- ⑦ DOOR MOTOR ELECTRICAL VAULT.
- ⑧ DOOR TRUCKS/BOLSTERS.
- ⑨ CONCRETE STEMWALLS.
- ⑩ DOOR DRIVE GEAR AND CHAIN.
- ⑪ DOOR GEAR HOUSING.
- ⑫ TOP AND BOTTOM SURFACES OF MEZZANINE STEEL DECK.
- ⑬ ACCESS TO ROOF BETWEEN COLUMNS 7 & 8.
- ⑭ HINGE PIN SYSTEM.

KEYED NOTE	DESCRIPTION	COATING APPLICATION	INSPECTION/REPAIR REQUIREMENT
1	STRUCTURAL STEEL FRAME	NEW CM15 OVERCOAT ON STEEL. ORIGINAL PAINT BENEATH CONTAINS PCBS.	INSPECT AND REPAIR CM15 COATING DURING LTMGMT INSPECTIONS.
2	CMU WALLS SURROUNDING ELECTRICAL VAULTS	NEW CM15 OVERCOAT ON CMU. ORIGINAL PAINT BENEATH CONTAINS PCBS.	INSPECT AND REPAIR CM15 COATING DURING LTMGMT INSPECTIONS.
3	ACCESS STAIRS LEADING FROM GROUND FLOOR TO MEZZANINE DECK	NEW CM15 OVERCOAT ON STEEL. ORIGINAL PAINT ON STAIR TREADS AND HANDRAILS REMOVED COMPLETELY. ORIGINAL PAINT ON BOTTOM SURFACES OF STAIR RISERS CONTAINS PCBS.	INSPECT AND REPAIR CM15 COATING DURING LTMGMT INSPECTIONS. NOTE THAT TOPSIDE OF STAIR RISERS AND HANDRAILS HAVE BEEN COMPLETELY ABATED TO REMOVE PCBS PRIOR TO OVERCOATING WITH CM15. THESE SURFACES WILL BE MAINTAINED BY THE OWNER.
4	FORMER STORAGE VAULT	NEW CM15 OVERCOAT ON CMU. ORIGINAL PAINT BENEATH CONTAINS PCBS.	INSPECT AND REPAIR CM15 COATING DURING LTMGMT INSPECTIONS.
5	FORMER TOILETS	NEW CM15 OVERCOAT ON CMU. ORIGINAL PAINT BENEATH CONTAINS PCBS.	INSPECT AND REPAIR CM15 COATING DURING LTMGMT INSPECTIONS.
6	DOOR MOTOR HOUSING	NEW CM15 OVERCOAT ON STEEL. ORIGINAL PAINT BENEATH CONTAINS PCBS.	INSPECT AND REPAIR CM15 COATING DURING LTMGMT INSPECTIONS.
7	DOOR MOTOR ELECTRICAL VAULT	NEW CM15 OVERCOAT ON STEEL. ORIGINAL PAINT BENEATH CONTAINS PCBS.	INSPECT AND REPAIR CM15 COATING DURING LTMGMT INSPECTIONS.
8	DOOR TRUCKS (BOLSTERS)	NEW CM15 OVERCOAT ON STEEL. ORIGINAL PAINT BENEATH CONTAINS PCBS.	INSPECT AND REPAIR CM15 COATING DURING LTMGMT INSPECTIONS.
9	CONCRETE STEMWALLS SURROUNDING HANGAR PERIMETER	ORIGINAL PAINT REMOVED COMPLETELY. CONCRETE SEALED WITH CARBOGUARD 1340 SEALER.	NO LTMGMT INSPECTIONS NEEDED. OWNER IS RESPONSIBLE FOR MAINTENANCE OF SEALER.
10	DOOR MOTOR DRIVE GEAR (CHAIN AND ROLLERS)	NOT OVERCOATED WITH CM15.	NO LTMGMT INSPECTIONS NEEDED. OWNER IS RESPONSIBLE FOR MAINTENANCE OF DOOR DRIVE GEAR COMPONENTS.
11	DOOR GEAR HOUSING	NEW CM15 OVERCOAT ON STEEL. ORIGINAL PAINT BENEATH CONTAINS PCBS.	INSPECT AND REPAIR CM15 COATING DURING LTMGMT INSPECTIONS.
12	TOP AND BOTTOM SURFACES OF MEZZANINE DECKS	NEW CM15 OVERCOAT ON STEEL. ORIGINAL PAINT BENEATH REMOVED COMPLETELY.	NO LTMGMT INSPECTIONS NEEDED. OWNER IS RESPONSIBLE FOR ROUTINE MAINTENANCE AND TOUCHUP OF THE COATING ON THE MEZZANINE DECKS.
13	ACCESS TO ROOF BETWEEN COLUMNS 7 AND 8	NEW CM15 OVERCOAT ON NEW GALVANIZED STEEL GRIP STRUTS. ORIGINAL PAINT ON HANDRAILS DOES NOT CONTAIN PCBS.	NO LTMGMT INSPECTIONS NEEDED. OWNER IS RESPONSIBLE FOR ROUTINE MAINTENANCE AND TOUCHUP OF THE COATING ON THE ROOF ACCESS.
14	HINGE PIN SYSTEM ON TOP OF ROOF (DOOR PIVOT POINTS)	NEW CM15 OVERCOAT ON STEEL. ORIGINAL PAINT BENEATH CONTAINS PCBS.	INSPECT AND REPAIR CM15 COATING DURING LTMGMT INSPECTIONS.



Maintenance and Inspection Plan (Fig. 3, LTMP)

FIGURE 5



SITE NAME:	Industrial Wastewater Flux Ponds				
Version:	Final	Date:	02/28/2015		
RESPONSIBLE PARTY					
Organization	Department of the Navy, BRAC				
Address	1455 Frazee Rd., Suite 900 San Diego, CA 92108				
Contact	Scott Anderson				
	scott.d.anderson@navy.mil				
	619-532-0938				
LOCATION					
Facility Name	Moffett Federal Airfield	Site Location			
Facility Address	Mountain View, CA	Latitude	37.420136° N		
	Santa Clara County	Longitude	122.041852° W		
Regulatory Program	Lead Agency(ies)	Site Status			
		Open	Closed	ROD	Current Phase
CERCLA	EPA/RWQCB		X		NFA
SITE SUMMARY					
<p>The Industrial Wastewater Flux Ponds (flux ponds) were located to the northeast of Hangar 3 (Figure 1). The ponds were opened in 1978, taken out of service in January 1994, and removed in 1995. One of the ponds was square with sides approximately 150 feet long and the other pond was triangular with sides approximately 150 feet long. The ponds were between 10 and 12 feet deep and had a total capacity of about 2,000,000 gallons and were unlined. The ponds received wastewater from two sources: the aircraft wash rack that was located south of Hangar 3 and the ground support equipment (GSE) cleaning rack located east of Hangar 3 next to Macon Road (this was Site 13) (Figure 2). Wastewater travelled from the wash rack through 1600 feet of industrial waste (IWW) sewer to a lift station at the southwest corner of Hangar 3. From the lift station, the wastewater flowed by gravity along the east side of Hangar 3 through approximately 2000 feet of 6-inch IWW sewer. The IWW sewer discharged into the west pond. The wastewater from the GSE wash rack travelled through 1000 feet of IWW sewer to a diversion box located in the center berm of the two ponds (Figure 2).</p> <p>Likely contaminants to the flux ponds include solvents such as PCE and TCE, petroleum products including oil and grease and jet fuel, and hydraulic fluid.</p> <p>In addition to the ponds, an industrial wastewater treatment facility (IWTF) was located to the west of the ponds (Figure 3). The IWTF (facility 524) was used to treat wastewater from the ponds before discharge to the sanitary sewer. The waste treatment facility consisted of 7 ASTs and one sump. The water treatment tank was a 10,000-gallon fiberglass tank, the flocculation tank was a 2,500-gallon fiberglass tank, the two lime mixing tanks were 300-gallon fiberglass tanks, the two alum mixing tanks were 380-gallon fiberglass tanks, and the air saturation tank was a 380-gallon steel tank; the sump was a 570-gallon steel sump that was called the "float tank." The IWTF was rarely used according to site personnel. The ponds operated as evaporation ponds to the extent possible. Occasionally, when water levels in the ponds became too high, the IWTF feed pump was used to pump water from the ponds to the sanitary sewer. The IWTF was removed in 1995 by the Navy as part of a tank removal.</p>					

SITE NAME:**Industrial Wastewater Flux Ponds****SITE SUMMARY**

The flux ponds were removed in 1995 by the Navy. Water from both ponds was pumped directly into temporary storage tanks. Approximately 110,000 gallons of water were pumped into six 20,000 gallon Baker tanks. Water from each tank was analyzed for Volatile Organic Compounds (VOCs), Polycyclic Aromatic Hydrocarbons (PAHs), Oil and Grease, metals, Extractable Total Petroleum Hydrocarbons (TPH-e), Polychlorinated Biphenyls (PCBs), and pesticides to determine the appropriate disposal of the water. Based on the sample results, the water was discharged directly to the sanitary sewer.

Soil samples from the bottom and sides below the water line were taken to determine disposal of the soil. Excavation of the pond soils began on August 14, 1995 (Figure 4). Test pits were dug on the bottom of each pond to determine the depth to groundwater. Depth to groundwater varied from 6" to 1 ft. below the bottom of the ponds. Excavation for each pond was extended to the interface with groundwater. Pipe connections upstream of the ponds were plugged and sealed. Approximately 1,400 tons of materials were shipped for disposal off-site. Confirmation samples were taken in each excavation. The confirmation samples were analyzed for VOCs, PAHs, TPH, pesticides, PCBs, and metals. Three zones were identified as requiring additional excavation to remove elevated levels of TPH. Approximately 800 tons of additional materials were removed and disposed of off-site. The excavations were backfilled with 9,962 tons of clean fill material. Approximately 750 tons of ¾" crushed rock were brought in and spread over the site to make the surrounding area uniform. The field work was completed on November 8, 1995.

During the excavation work, a gas line was found in the berm between the two ponds (Figure 3). The gas line was kept in place. Excavation work around the gas line was done by hand using shovels to avoid damage.

EPA submitted a letter to the Navy dated March 20, 1996 (Attachment 1) indicating it had no comments related to the closure report and understood that any contamination associated with the Flux Ponds that may have migrated to groundwater would be remediated through actions related to OU5 (Site 26, discussed in a separate Existing Environmental Conditions report).

Three boreholes were drilled in the vicinity of the flux ponds as part of the Station-Wide Remedial Investigation (Figure 5) in 1996: SBSW-4, SBSW-5, and SBSW-6. Eight soil samples were collected at the following depths:

SBSW-4: 3 and 10 feet below ground surface (bgs)

SBSW-5: 3, 6, and 19 feet bgs

SBSW-6: 4, 9, and 20 feet bgs

Groundwater depth was at approximately 14 feet bgs based on boring logs.

The samples were analyzed for VOCs, SVOC, TPH-purgeable, TPH-extractable, and metals. VOCs were detected in the soil samples. PCE was detected in concentrations ranging from 4 – 7 µg/kg in the following boreholes:

SBSW-4 at 3 ft. bgs,

SBSW-5 at 3 ft. bgs,

SBSW-6 at 4 ft. and 20 ft. bgs.

SITE NAME:

Industrial Wastewater Flux Ponds

SITE SUMMARY

TCE was detected at 5 µg/kg from SBSW-6 at 20 ft. bgs.

A risk assessment was conducted for the flux ponds as part of the Site-Wide Ecological Assessment (SWEA). To conduct the SWEA, the base was divided into several exposure areas. The pond area included two exposure areas: 2965 and 3037 (Figure 5). Findings are provided in Table 1. Neither exposure area presented a cancer risk or non-cancer risk for residential or occupational exposure scenarios.

SITE NAME:		Industrial Wastewater Flux Ponds			
REMEDIAL ACTION					
Remedy	Excavation and Disposal	Begin Date	8/14/1995	End Date	11/8/1995
<p>Remove water from the ponds</p> <ul style="list-style-type: none"> • Store in temporary tanks • Sample water • Disposal based on sample results <p>Excavation of ponds</p> <ul style="list-style-type: none"> • Sample soil for disposal • Remove soil until reaching the groundwater interface • Take confirmation samples of excavation • Conduct additional excavation if indicated by confirmation samples <p>Backfill excavations with clean materials</p> <p>Plug and seal piping</p>		<p>A natural gas line was discovered in the berm between the two ponds. The gas line was left in place.</p>			
Land Use Restrictions			Development Issues		
<p>No land use restrictions are recorded for the Flux Ponds.</p> <p>The site is subject to institutional controls for Site 26.</p> <p>Use if the site is subject to the NASA Programmatic Environmental Impact Statement and ROD, Mitigated Alternative 5. Residential use is restricted.</p> <p>The Flux Ponds are located within the airfield boundary and is subject to clearance restrictions as provided in 14 CFR Part 77, especially § 77.17 and § 77.19.</p>			<p>Contact with chemicals left in place during subsurface work.</p> <p>The EIMP must be followed.</p> <p>The EATS is located in this area. It will require agency approval before demolition and removal. The Navy is currently responsible for decommissioning and removal of EATS if it will no longer be used as part of the remedy for Site 26.</p>		

SITE NAME:	Industrial Wastewater Flux Ponds
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RESIDUAL CONTAMINATION		
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Compound	Residual Concentration (max)		Notes
	Soil (mg/kg)	Groundwater (µg/L)	
TPH-e as diesel	280		TPH was left after second excavation, see Figure 5.
PCE	0.007		
TCE	0.005		
			PCE and TCE were detected in soil samples from boring SBSW-6 (Figure 5) installed as part of the site-wide remedial investigation.
			Groundwater contamination is addressed as part of Site 26.

REFERENCES (Chronological Order)

- *Final Report Industrial Waste Engineering Study, Naval Air Station, Moffett Field, CA.* ERM-WEST/AQUA Resources, Walnut Creek, CA. April 1986.
- *Closure Plan, Industrial Wastewater Flux Ponds, Naval Air Station Moffett Field, CA.* Dames & Moore, San Francisco, CA. March 1988.
- *Draft Project Completion Report, Closure of Two Flux Ponds, Moffett Federal Airfield, CA.* IT Corporation, Martinez, CA. February 1996.
- *Closure Report for Mod. #3, Underground Storage Tank Removal at Moffett Federal Airfield, CA.* Environmental Chemical Corporation, Burlingame, CA. April 18, 1996.
- *Final Station-Wide Remedial Investigation Report, Moffett Federal Airfield, CA.* PRC Environmental Management, San Francisco, CA. May 21, 1996.
- *Draft Final Addendum to the Revised Final Station-Wide Feasibility Study, Moffett Federal Airfield, CA.* Tetra Tech EM Inc., San Francisco, CA. July 6, 2001.
- *Final Station-Wide No Action Sites, Record of Decision, Moffett Federal Airfield, CA.* Department of the Navy, BRAC PMO West, San Diego, CA. August 22, 2002.

**Table 1: Summary of Human Health and Ecological Risks at the No Further Action Sites
Moffett Federal Airfield**

SITE	SCENARIO	HUMAN HEALTH RISK				ECOLOGICAL RISK			RATIONALE FOR NO FURTHER ACTION
		Cancer ¹	Non-Cancer ¹	Risk Drivers	Acceptable Risk	Receptor	Risk Drivers	Acceptable Risk	
Former Industrial Wastewater Flux Ponds	Recreational	4.1E-07, 4.7E-07	2.3E-01, 9.5E-02	Cd, benzo(A)pyrene, and Ni	Yes	Burrowing owl	VOCs	Yes	The site was closed in 1995, and closure was accepted by the USEPA. No risk was identified.
	Occupational	1.3E-07, 1.0E-07	1.7E-02, 5.4E-03		Yes				

Notes:

1. Top number is for Exposure Area 2965 and the bottom number is for Exposure Area 3037.

Cd – cadmium

Ni – nickel

VOC – volatile organic compound

FIGURES

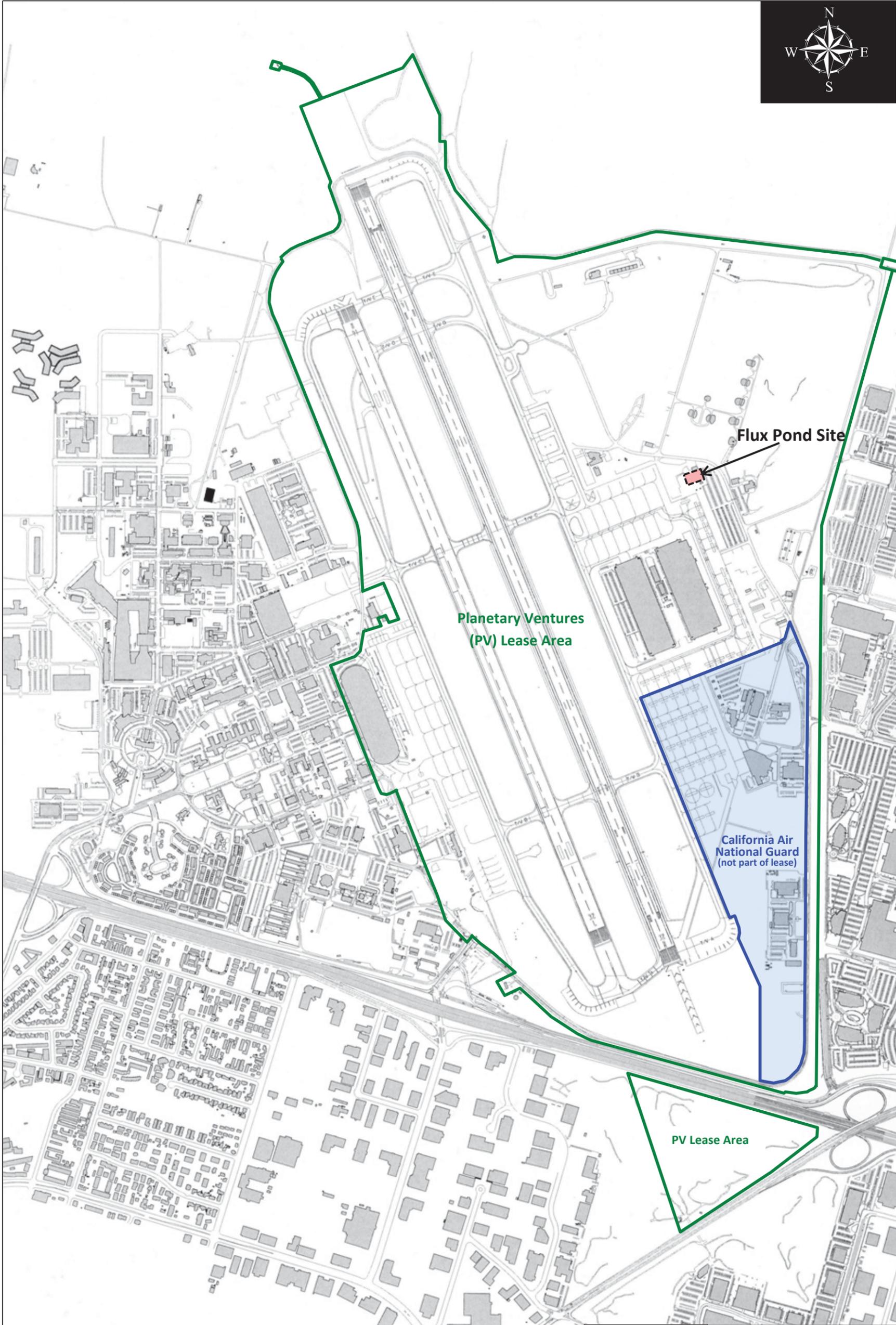


FIGURE 1
Location of former Flux Ponds. The boundaries are approximate and not meant to represent legal property descriptions.

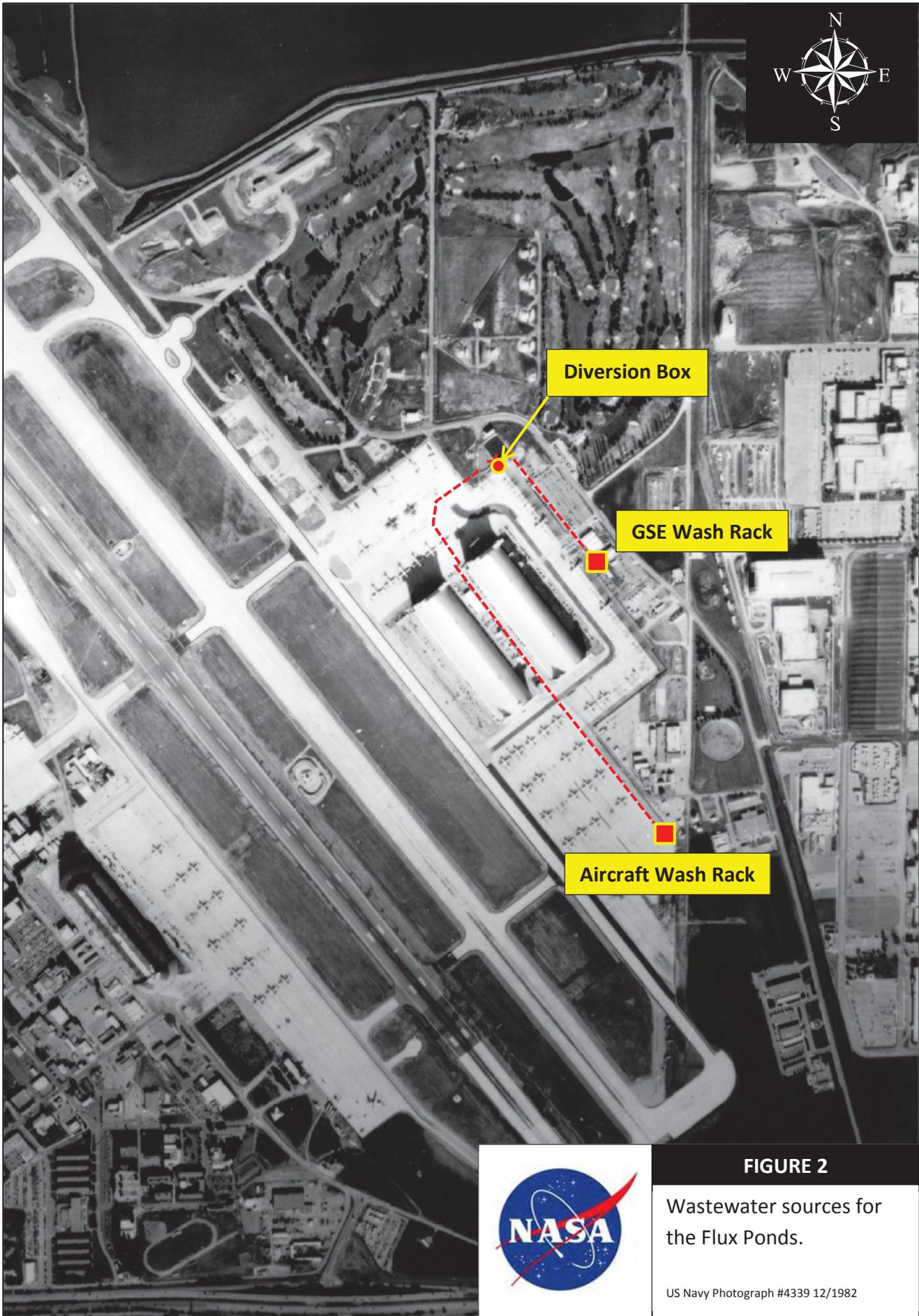
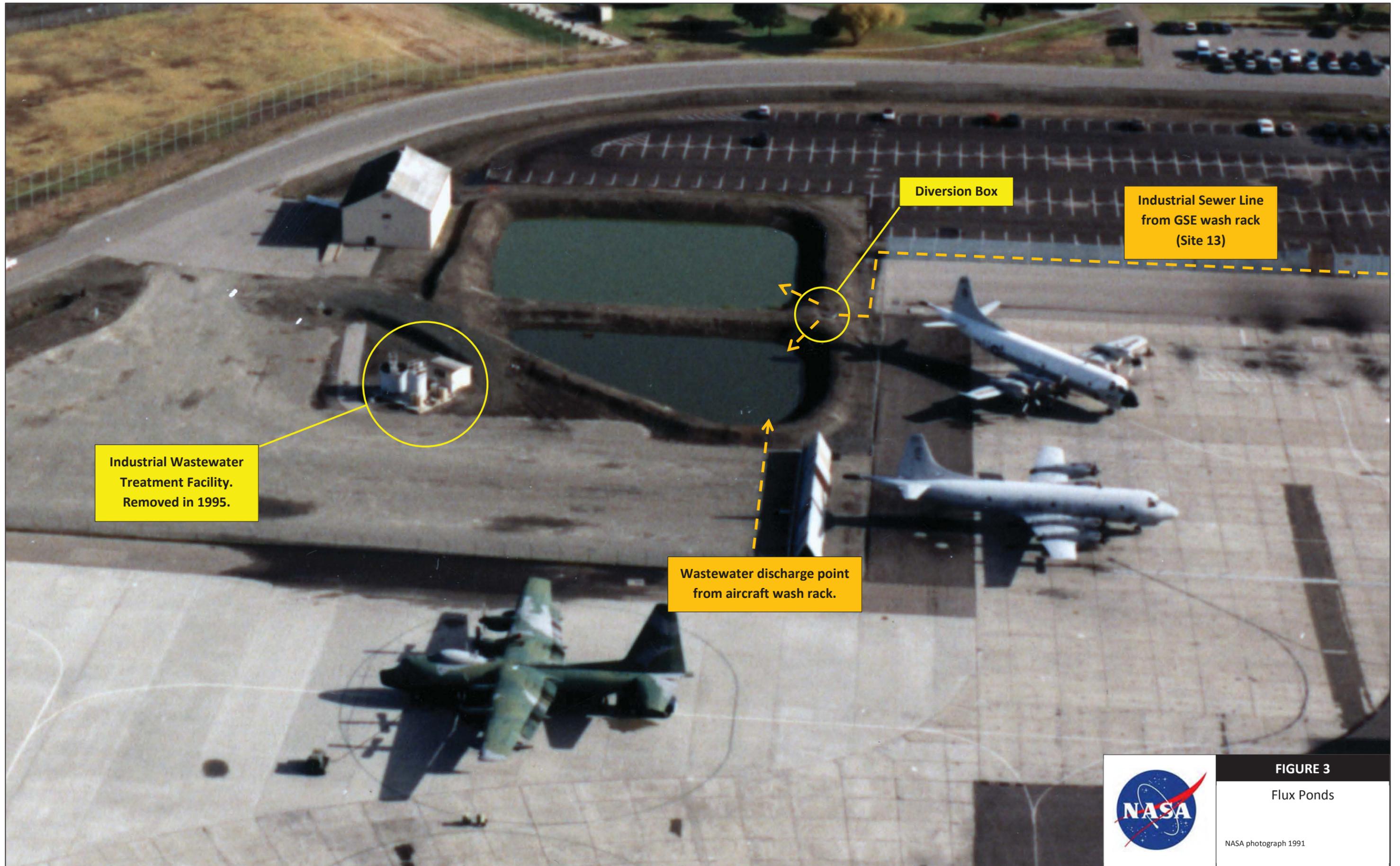


FIGURE 2

Wastewater sources for the Flux Ponds.

US Navy Photograph #4339 12/1982



Industrial Wastewater Treatment Facility. Removed in 1995.

Diversion Box

Industrial Sewer Line from GSE wash rack (Site 13)

Wastewater discharge point from aircraft wash rack.

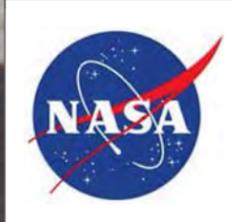


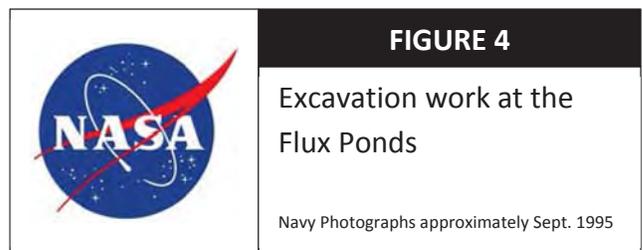
FIGURE 3
Flux Ponds
NASA photograph 1991



Excavation of western pond.



Excavation of eastern pond.



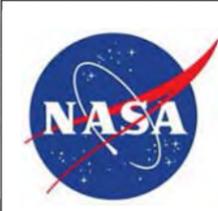


FIGURE 5
2011 View of the sites of the Former Flux Ponds and the former IWTF along with soil borings SBSW-4 through -6.
Google Earth Photograph 9/26/2011

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