N00236.001296
ALAMEDA POINT
SSIC NO. 5090.3

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN I)
Northern and Central California, Nevada, and Utah
Contract Number N62474-88-D-5086
Contract Task Order 0121
Modfication No. 0001

Prepared For

DEPARTMENT OF THE NAVY
George Kikugawa, Remedial Project Manager
Engineering Field Activity West
Naval Facilities Engineering Command
San Bruno, California

DATA SUMMARY REPORT BACKGROUND AND TIDAL INFLUENCE STUDIES AND ADDITIONAL WORK AT SITES 4 AND 5 NAVAL AIR STATION ALAMEDA ALAMEDA, CALIFORNIA

VOLUME 1 OF 2
FINAL

October 16, 1995

Prepared By

PRC ENVIRONMENTAL MANAGEMENT, INC.
10670 White Rock Road, Suite 100
Rancho Cordova, CA 95670
(916) 852-8300

and

MONTGOMERY-WATSON CONSULTING ENGINEERS, INC.
365 Lennon Lane
Walnut Creek, CA 94598
510/975-3400

Duane C. Balch, Project Manager

TABLE OF CONTENTS

Section			Page
1.0	INTRODUCTION		1-1
	1.1	PURPOSE	1-2
	1.2	REPORT ORGANIZATION	1-3
2.0	BACKGROUND SOIL AND GROUNDWATER SAMPLING		2-1
	2.1	BACKGROUND	2-1
	2.2	SCOPE OF WORK	2-1
	2.3	GEOLOGY/HYDROGEOLOGY	2-2
	2.4	ANALYTICAL RESULTS FOR SOIL SAMPLES	2-3
		2.4.1 Volatile Organic Compounds	2-3
		2.4.2 Semivolatile Organic Compounds	2-4
		2.4.3 Herbicides/Pesticides/PCBs	2-5
		2.4.4 Metals	2-5
	2.5	ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES	2-5
		2.5.1 Volatile Organic Compounds	2-6
		2.5.2 Semivolatile Organic Compounds	2-6
		2.5.3 Herbicides/Pesticides/PCBs	2-6
		2.5.4 Oil and Grease	2-6
		2.5.5 Metals	2-7
		2.5.6 General Chemicals	2-7
	2.6	STATISTICAL ANALYSIS OF METALS CONCENTRATIONS IN SOIL	2-7
	2.7	STATISTICAL ANALYSIS OF METALS CONCENTRATIONS IN GROUNDWATER	2-9
3.0	TIDAL INFLUENCE STUDY		3-1
	3.1	BACKGROUND	3-1
	3.2	METHODS	3-1
	3.3	RESULTS	3-2
		3.3.1 Site 7A	3-2
		3.3.2 Sites 7B and 11	3-3
		3.3.3 Site 10A	3-4
		3.3.4 Site 14	3-4
		3.3.5 Site 15	3-5
	3.4	CONCLUSIONS	3-6

TABLE OF CONTENTS (con't)

Section **Page**

4.0 SITE 4 - BUILDING 360 - ADDITIONAL WORK 4-1

4.1 SITE DESCRIPTION AND BACKGROUND 4-1
4.2 PREVIOUS INVESTIGATION RESULTS 4-1
4.3 CURRENT INVESTIGATION - SCOPE OF WORK 4-2
4.4 CURRENT INVESTIGATION - RESULTS 4-2
4.5 CONCLUSIONS 4-3

5.0 SITE 5 - BUILDING 5 - ADDITIONAL WORK 5-1

5.1 SITE DESCRIPTION AND BACKGROUND 5-1
5.2 PREVIOUS INVESTIGATION - RESULTS 5-3
5.3 CURRENT INVESTIGATION - SCOPE OF WORK 5-3

5.3.1 Plating Shop 5-3
5.3.2 Selective Plating Shop 5-4
5.3.3 Wastewater Treatment Area 5-5
5.3.4 Hazardous Waste Storage Area 5-5
5.3.5 Battery Storage Area 5-6

5.4 GEOLOGY/HYDROGEOLOGY 5-6
5.5 CURRENT INVESTIGATION - RESULTS 5-6

5.5.1 Plating Shop 5-6
5.5.2 Selective Plating Shop 5-11
5.5.3 Wastewater Treatment Area 5-12
5.5.4 Former Hazardous Waste Storage Area 5-14
5.5.5 Battery Storage Area 5-16

5.6 CONCLUSIONS 5-18

5.6.1 Plating Shop 5-18
5.6.2 Selective Plating Shop 5-19
5.6.3 Wastewater Treatment Area 5-19
5.6.4 Former Hazardous Waste Storage Area 5-19
5.6.5 Battery Storage Area 5-19

6.0 REFERENCES 6-1

APPENDICES

A BORING LOGS
B SURVEY~~OR'S~~ DATA
C ANALYTICAL QUALITY CONTROL PROGRAM
D QUALITY CONTROL DATA
E ~~SOURCE AND~~ ALHAMBRA WATER RESULTS
F CHAINS OF CUSTODY
G REPORTING LIMITS
H SECOND ROUND BACKGROUND ~~GROUNDWATER~~ SAMPLING RESULTS AND RESAMPLE RESULTS FOR SITES 4 AND 5
I ADDITIONAL SITE INVESTIGATION, SITE 5 PLATING SHOP

LIST OF FIGURES

Figure	Title	Follows Section
1-1	RI Sites Location Map	1.0
2-1	Background Boring Locations	2.0
3-1	Tidal Influence Study Areas	3.0
3-2	Hydrograph for Site 7A	3.0
3-3	Hydrograph for Sites 7B and 11	3.0
3-4	Hydrograph for Site 10A	3.0
3-5	Hydrograph for Site 14	3.0
3-6	Hydrograph for Site 15	3.0
3-7	Site 7A Groundwater Contour Map - 1-31-92 (1800 Hours)	3.0
3-8	Sites 7B and 11 Groundwater Contour Map - 1-30-92 Low Tide (2000 Hours)	3.0
3-9	Sites 7B and 11 Groundwater Contour Map - 1-31-92 High Tide (1130 Hours)	3.0
3-10	Sites 7B and 11 Groundwater Contour Map - Filtered Data (Average)	3.0
3-11	Site 10A Groundwater Contour Map - Filtered Data (Average)	3.0
3-12	Site 14 Groundwater Contour Map - 1-30-92 Low Tide (1600 Hours)	3.0
3-13	Site 14 Groundwater Contour Map - 1-30-92 High Tide (1000 Hours)	3.0
3-14	Site 14 Groundwater Contour Map - Filtered Data (Average)	3.0
3-15	Site 15 Groundwater Contour Map - 1-30-92 Low Tide (1600 Hours)	3.0
3-16	Site 15 Groundwater Contour Map - 1-31-92 High Tide (0900 Hours)	3.0
3-17	Site 15 Groundwater Contour Map - Filtered Data (Average)	3.0
4-1	Site 4 Plating Shop Location Map	4.0
4-2	Site 4 Plating Shop Site Map	4.0
5-1	Site 5 Site Map	5.0
5-2	Site 5 Plating Shop	5.0

LIST OF TABLES

Table	Title	Follows Section
2-1	Laboratory Analyses - Background Samples	2.0
2-2	Background Borings - Soil Analytical Results - Organic Compounds	2.0
2-3	Background Borings - Soil Analytical Results - Inorganic Constituents	2.0
2-4	Ranges of Metal Concentrations Found in Soils	2.0
2-5	Background Borings - Groundwater Analytical Results - Organic Compounds	2.0
2-6	Background Borings - Groundwater Analytical Results - Metals	2.0
2-7	Background Borings - Groundwater Analytical Results - Inorganic Constituents	2.0
2-8	Background Borings - Statistical Analysis of Metals Results for Soil Samples	2.0
2-9	Background Borings - Statistical Analysis of Metals Results for Groundwater Samples	2.0
4-1	Site 4 Plating Shop Previous Surface Scrape Sample Analytical Results - Inorganic Constituents	4.0
4-2	Site 4 Plating Shop Surface Scrape and Wipe Sample Analytical Results - Inorganic Constituents	4.0
5-1	Site 5 Plating Shop Surface Scrape and Wipe Sample Analytical Results - Inorganic Constituents	5.0
5-2	Site 5 Plating Shop Soil Sample Analytical Results - Organic Compounds	5.0
5-3	Site 5 Plating Shop Soil Sample Analytical Results - Inorganic Constituents	5.0
5-4	Site 5 Plating Shop Groundwater Analytical Results - Organic Compounds	5.0
5-5	Site 5 Plating Shop Groundwater Analytical Results - Inorganic Constituents	5.0
5-6	Site 5 Selective Plating Shop Soil Sample Analytical Results - Inorganic Constituents	5.0
5-7	Site 5 Wastewater Treatment Area Soil Analytical Results - Organic Compounds	5.0
5-8	Site 5 Wastewater Treatment Area Soil Analytical Results - Inorganic Constituents	5.0
5-9	Site 5 Wastewater Treatment Area Groundwater Analytical Results - Organic Compounds	5.0
5-10	Site 5 Wastewater Treatment Area Groundwater Analytical Results - Inorganic Constituents	5.0
5-11	Site 5 Former Hazardous Waste Storage Area Soil Analytical Results - Organic Compounds	5.0
5-12	Site 5 Former Hazardous Waste Storage Area Soil Analytical Results - Inorganic Constituents	5.0
5-13	Site 5 Former Hazardous Waste Storage Area Groundwater Analytical Results - Organic Compounds	5.0
5-14	Site 5 Former Hazardous Waste Storage Area Groundwater Analytical Results - Inorganic Constituents	5.0
5-15	Site 5 Battery Storage Area Soil Analytical Results - Organic Compounds	5.0
5-16	Site 5 Battery Storage Area Soil Analytical Results - Inorganic Constituents	5.0
5-17	Site 5 Battery Storage Area Groundwater Analytical Results - Organic Compounds	5.0
5-18	Site 5 Battery Storage Area Groundwater Analytical Results - Inorganic Constituents	5.0

1.0 INTRODUCTION

James M. Montgomery, Consulting Engineers, Inc., and PRC Environmental Management, Inc., herein referred to as the PRC team, have been conducting remedial investigation/feasibility study (RI/FS) activities at 20 sites at Naval Air Station (NAS) Alameda, Alameda, California. These 20 sites were identified in a Remedial Action Order (Order) received by the Navy from the California Department of Health Services (DHS), now known as the Department of Toxic Substances Control (DTSC). The 20 sites identified in the Order are illustrated on Figure 1-1.

The 20 sites, which are comprised of 23 buildings or areas at NAS Alameda, are being investigated in a phased approach. Eight sites identified in the Order (part of Site 4, and Sites 3, 7C, 9, 10B, 13, 16, and 19) were investigated in 1990 by Canonie Environmental Services Corp. (Canonie) as part of Phase 1 and 2A activities. Results of Canonie's investigations are currently being reviewed by the PRC team and will be included in a future data summary report. Eleven of the sites were included in the Phases 2B and 3 investigation, conducted by the PRC team (part of Site 4, and Sites 5, 6, 7A, 7B, 8, 10A, 11, 12, 14, and 15). Two offshore areas (Sites 17 and 20) identified in the Order will be included in a future ecological assessment investigation that is being performed as Phase 4. The two landfills identified in the Order (Sites 1 and 2) are currently undergoing solid waste assessment test (SWAT) investigations that will be reported separately under Phases 5 and 6. Phases 7 and 8 will consist of the comprehensive RI/FS reports.

This report serves as an addendum to the Phases 2B and 3 Data Summary Report submitted to the Navy in April 1992 (PRC/JMM, 1992). This addendum includes (1) the results of background soil and groundwater sampling at four locations, (2) the results of a tidal influence study conducted at six of the Phases 2B and 3 sites (Sites 7A, 7B, 11, 10A, 14, and 15), and (3) the results of additional work performed at two sites included in the Phases 2B and 3 investigation (Sites 4 and 5).

A work plan describing the proposed background sampling program was submitted to the DTSC by the Navy on December 19, 1991. DTSC comments on the proposed background sampling program were received in a letter dated January 29, 1992. The Navy submitted a revised background sampling plan to the DTSC in a letter dated February 25, 1992. In a letter dated March 16, 1992, DTSC granted approval to perform the work (DTSC, 1992a)

A work plan describing the tidal influence study was submitted to the Navy in January 1992. The DTSC gave verbal approval of the plan in January 1992.

The plan for proposed additional work at Sites 4 and 5 was described in a letter from the Navy to the DTSC dated March 13, 1992. DTSC comments on the proposed additional work were received in a letter dated April 14, 1992. A response to the DTSC comments was submitted by the Navy on May 5, 1992 and approved by the DTSC in a letter dated May 7, 1992 (DTSC, 1992b).

1.1 PURPOSE

The purpose of the background sampling was to provide a basis for evaluating naturally-occurring levels of inorganic constituents in soil and groundwater in the vicinity of NAS Alameda. The tidal influence study was performed at six of the Phases 2B and 3 sites in order to assess the magnitude of tidal influence on groundwater levels at these sites.

Additional work was conducted at the two Phases 2B and 3 sites (Sites 4 and 5) in order to further define the extent of metals on interior plating shop surfaces identified in the Phases 2B and 3 investigation (Site 4) and to investigate areas that were not included in the Phases 2B and 3 work (Site 5). Investigation at Site 4 included the collection of wipe and scrape samples from the floor and walls of the plating shop in order to develop health and safety requirements for personnel conducting future investigations. Additional work at Site 5 included soil and groundwater sampling underneath a plating shop, a selective plating shop, a wastewater treatment area, a former hazardous waste storage area, and a battery storage area that had not been previously investigated.

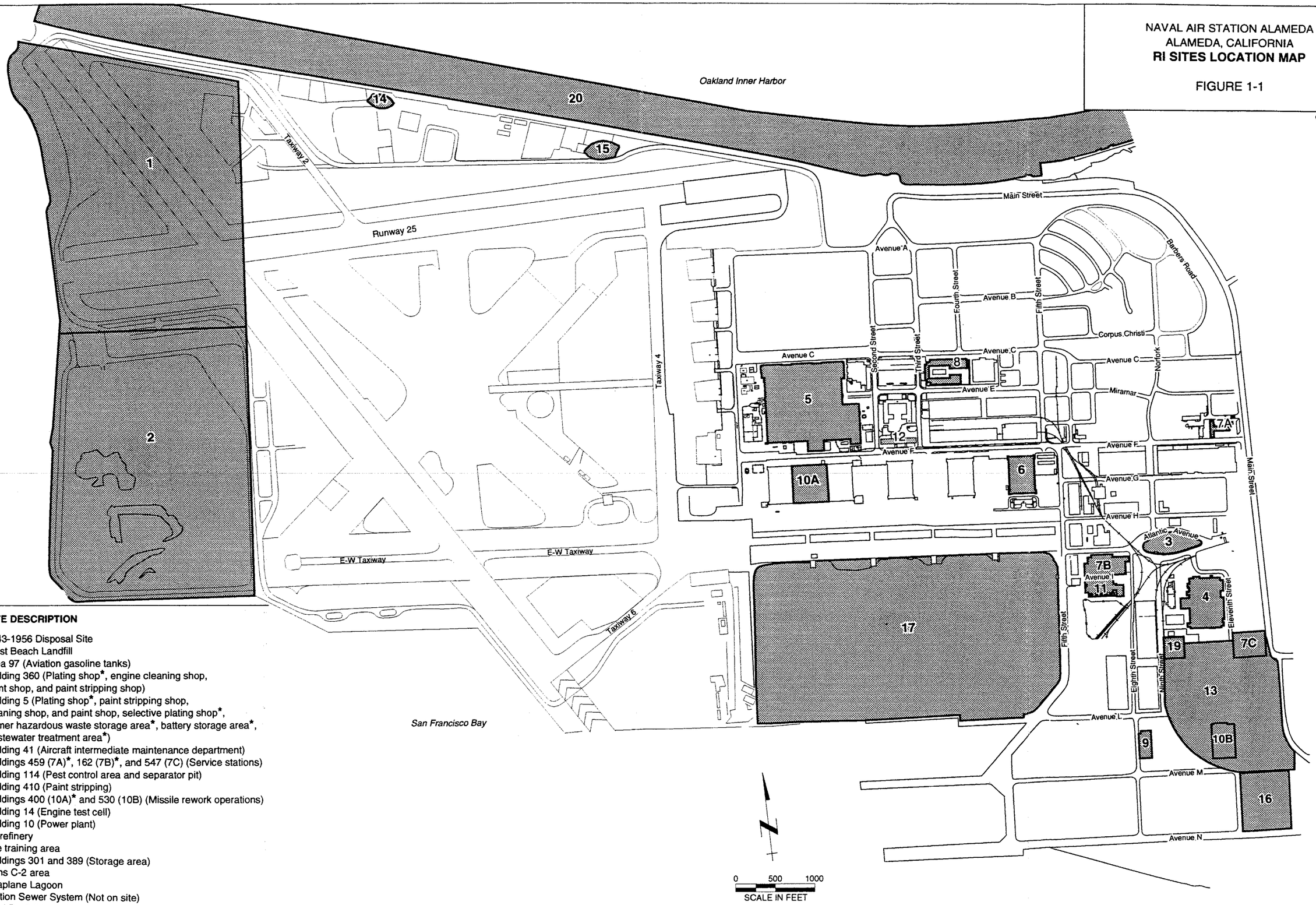
1.2 REPORT ORGANIZATION

Section 2.0 of this report presents the results of background soil and groundwater sampling. The results of the tidal influence study performed at Sites 7A, 7B, 10A, 11, 14, and 15 are presented in Section 3.0. Section 4.0 discusses the results of additional sampling within the Building 360 (Site 4) plating shop. Results of sampling at Site 5 are presented in Section 5.0. References used in preparation of this report are listed in Section 6.0.

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
RI SITES LOCATION MAP

FIGURE 1-1

CTO121.M1/A-18



LEGEND:

SITE NO.	SITE DESCRIPTION
1	1943-1956 Disposal Site
2	West Beach Landfill
3	Area 97 (Aviation gasoline tanks)
4	Building 360 (Plating shop*, engine cleaning shop, paint shop, and paint stripping shop)
5	Building 5 (Plating shop*, paint stripping shop, cleaning shop, and paint shop, selective plating shop*, former hazardous waste storage area*, battery storage area*, wastewater treatment area*)
6*	Building 41 (Aircraft intermediate maintenance department)
7	Buildings 459 (7A)*, 162 (7B)*, and 547 (7C) (Service stations)
8*	Building 114 (Pest control area and separator pit)
9	Building 410 (Paint stripping)
10	Buildings 400 (10A)* and 530 (10B) (Missile rework operations)
11*	Building 14 (Engine test cell)
[illegible]*	Building 10 (Power plant)
[illegible]	Oil refinery
[illegible]*	Fire training area
15*	Buildings 301 and 389 (Storage area)
16	Cans C-2 area
17	Seaplane Lagoon
18	Station Sewer System (Not on site)
19	Yard D-13 (Hazardous waste solvents)
20	Estuary (Oakland Inner Harbor)

* Sites presented in this Addendum Phase 2B/3 Summary Report

2.0 BACKGROUND SOIL AND GROUNDWATER SAMPLING

2.1 BACKGROUND

Background borings were installed at four locations within NAS Alameda (Figure 2-1). Borings MBG-1 and MBG-2 were located within the base housing area. Boring MBG-4 was located within the area currently used as athletic fields and a parade ground. Both the housing area and the parade ground appear in historic aerial photos from 1947, and do not appear to have been used for other purposes since construction of NAS Alameda (Pacific Aerial Surveys). Background boring MBG-3 was located outside the fenced boundary of NAS Alameda, at the intersection of Atlantic Avenue and Main Street. Historical aerial photos indicate this area has not been used by the Navy for industrial purposes (Pacific Aerial Surveys).

2.2 SCOPE OF WORK

At each boring location, soil samples for chemical analysis were collected at the ground surface, at 2 feet below ground surface (bgs), at the interface between fill material and native sediments (approximately 3 to 8 feet bgs), and at 2 feet below the fill/native sediment interface (approximately 5 to 10 feet bgs). A total of 16 soil samples were collected. Drilling and sampling were conducted in accordance with the existing work plan and health and safety plan (Canonie, 1990a, PRC/JMM, 1991a, b). Boring logs for the background borings are included as Appendix A. Boring locations were surveyed relative to the California Coordinate System by a state-licensed surveyor. Top-of-casing elevations for monitoring wells were surveyed relative to U.S.Coast and Geodetic Survey mean lower low water. Survey data are included on boring logs and are summarized in Appendix B.

Upon the completion of soil sampling, groundwater monitoring wells were constructed in the borings. Wells were constructed of 2-inch diameter polyvinyl chloride casing and screen, using methods detailed in the existing work plan (Canonie, 1990a, PRC/JMM, 1991a). Each well was constructed such that the screened interval intercepts the first water-bearing zone.

The wells were developed and sampled using methods described in the work plan. An initial round of groundwater samples was collected on June 11 and 12, 1992 from the four background wells. Results of the June sampling are presented in this report. A second round of groundwater samples was collected on July 13 and 14. Results of the second round sampling will be reported separately in September 1992.

Background soil and groundwater samples were analyzed for the constituents listed in Table 2-1. A summary of laboratory quality control (QC) results for the background samples is included in Appendix C.

2.3 GEOLOGY/HYDROGEOLOGY

At the locations of borings MBG-1, MBG-2, and MBG-3, approximately 3 feet of fill material was encountered. Borings MBG-2 and MBG-3 are located in the portion of the base that was mapped as a tidal flat in 1856; MBG-1 is located immediately adjacent to this area. At the location of boring MBG-4, 7.5 feet of fill material was present. Boring MBG-4 is located in a portion of the base that was mapped as mud flat to shallow open water prior to construction of NAS Alameda (Radbruch, 1957).

The fill/native sediment contact was identified on the basis of visual observations. Generally, the contact was marked by an abrupt change in soil type, often with pervasive iron oxide staining. Material identified as fill often contained fragments of lumber and other man-made materials which were not present in native sediments. Native sediments were identified on the basis of their "undisturbed" appearance (in-place vertical roots; horizontal laminations related to deposition, and others)

Fill material encountered at background locations MBG-1 through MBG-4 consists of gravelly sand, sand, silty sand, and silty to sandy clay. At the locations of MBG-2 and MBG-3, native sediments present beneath the fill material consist of interbedded silty sand, sandy clay, and clay. Native sediments at these locations contain well-preserved plant material and roots in their growth positions (i.e., roots and stems oriented vertically). A strong hydrogen sulfide odor was associated with these sediments. These sediments were

deposited in the marsh to tidal flat environment that existed prior to filling for construction of NAS Alameda (Radbruch, 1957).

At the location of boring MBG-1, fill material overlies approximately 5.5 feet of interbedded marsh to tidal flat deposits. The marsh to tidal flat deposits overlie a clean, loose, medium to fine-grained, green sand unit that was present to the total depth of the boring (15 feet). The sand contains small shell fragments and thin clay lenses. The sand unit may represent shallow water deposits that were just offshore from the former tidal flat /marsh areas.

At the location of boring MBG-4, fill material directly overlies the green sand unit. Boring MBG-4 is located in a portion of the base that was formerly shallow open water prior to filling for construction of NAS Alameda.

Groundwater was first encountered at 3 to 4 feet below ground surface in each boring. This is consistent with results from the Phases 2B and 3 investigation (PRC/JMM, 1992).

2.4 ANALYTICAL RESULTS FOR SOIL SAMPLES

Four soil samples were collected from each of the four background borings. Additionally, one duplicate sample was collected from a depth of 5 feet in boring MBG2. Each background sample was analyzed for the complete set of analyses listed in Table 2-1. Analytical results for organic analyses and pesticides/PCBs are presented in Table 2-2. Table 2-2 lists only those compounds which were detected in at least one sample from the background borings. If a target compound for the analyses was not detected in any of the samples, it is not included in the summary tables. Analytical results for inorganic constituents are presented in Table 2-3

2.4.1 Volatile Organic Compounds

Acetone and tetrachloroethene were the only VOC detected in background soil samples. Acetone was detected in 13 of the 17 samples. After review of laboratory QA/QC, all of

the acetone detections were qualified as not detected due to method blank contamination. Tetrachloroethene (PCE) was detected in the surface samples from borings M-BG1 and M-BG2 at concentrations of 5.5 and 16 micrograms per kilogram (μg/kg). Soil samples collected below the surface did not contain detectable levels of PCE. These two borings are located in the base housing area. No known sources have been identified for the PCE detected in the background soil samples.

2.4.2 Semivolatile Organic Compounds

Two classes of SVOC were detected in background soil samples; twelve polycyclic aromatic hydrocarbons (PAH) and one phthalate were detected. The suite of PAH includes acenapthylene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, fluoranthene, ideno(1,2,3-cd)pyrene, napthalene, phenanthrene, and pyrene. Bis(2-ethylhexyl)phthalate was the only phthalate detected.

PAH were detected in only two of the background borings. In boring M-BG1, low concentrations were detected in the surface sample and the 2-foot sample. Both of these samples were collected in fill. PAH were not detected in the deeper samples from this boring. In boring M-BG2, low concentrations of PAH were detected in the two samples from the fill and significantly higher concentrations were detected in the deeper samples collected from native material. The sample collected from 2 feet below the fill/native interface (at a depth of 5 feet) contained the highest concentration of PAH detected in boring MBG-2. The PAH compounds detected in background soil samples were detected basewide during the Phases 2B and 3 investigation (PRC/JMM, 1992). These PAH are thought to have been present on the native sediments prior to deposition of the fill material and subsequent construction of NAS Alameda. The source of the PAH compounds is thought to have been a refinery that operated on the island prior to 1930 (PRC/JMM, 1992).

Bis(2-ethylhexyl)phthalate was detected in four of the samples from borings M-BG1 and M-BG2 and in the duplicate sample from MBG-2. After data qualification, four of the

detections are considered valid. No known sources of bis(2-ethylhexyl)phthalate have been identified. Bis (2-ethylhexyl)phthalate is a common laboratory contaminant.

2.4.3 Herbicides/Pesticides/PCBs

Pesticides were detected in only one of the background soil samples. The surface sample from boring M-BG2 contained 4,4'-DDE and 4,4'-DDT at concentrations of 7.19 and 30.6 μg/kg, respectively. M-BG2 is located in a grassy planter adjacent to a sidewalk in the base housing area. No PCBs or herbicides were detected in background soil samples.

2.4.4 Metals

Results of metals analyses for background soil samples are presented in Table 2-3. Table 2-4 presents ranges for metal concentrations in "typical" and "extreme" soils (Dragun, 1988). All of the background soil metals concentrations are below the upper limit of the "typical" range of metals concentrations. Fourteen of the aluminum and sixteen of the barium samples have concentrations less than the lower limit of the "typical" range.

As discussed in Section 2.6, the results of these samples were used to calculate the estimated range of naturally occurring background metals found in soil at NAS Alameda. The estimated ranges are compared to results for soil samples and used to assess which metals are present at levels in excess of background levels. The significance of analytical results in excess of background levels will be evaluated during the risk assessment performed as part of Phase 7, the comprehensive RI.

2.5 ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES

Analytical results for the first round of groundwater samples are presented in Tables 2-5 for organic compounds, 2-6 for metals, and 2-7 for inorganic constituents. Table 2-5 lists only the organic compounds that were detected in at least one of the groundwater samples; if a target compound for the analysis was not detected in any of the samples, it was not included in the summary tables.

2.5.1 Volatile Organic Compounds

Volatile organic compounds were not detected in any of the background groundwater samples.

2.5.2 Semivolatile Organic Compounds

Five PAH compounds and one phthalate were detected in background groundwater samples. The PAH acenapthene, anthracene, fluoranthene, phenanthrene, and pyrene were detected in well M-BG2. The soil sample collected at a depth of 5 feet from M-BG2 contained detectable levels of the same PAH compounds as the groundwater sample. Pyrene was detected at a concentration of 1.3 μg/L in well M-BG1. Soil samples from M-BG1 collected from the surface and a depth of 2.0 feet bgs contained pyrene. PAH were not detected in the other two wells. As discussed in Section 16.0 of the Phases 2B and 3 Data Summary Report (PRC/JMM, 1992a), PAH have very low solubilities in water and a high soil/water partition coefficient, indicating they will strongly partition into the soil and not into groundwater. It is likely that the compounds detected in the background groundwater samples are actually sorbed to particulates in the unfiltered samples.

Bis(2-ethylhexyl)phthalate was detected in M-BG2, M-BG3, and M-BG4. After review of laboratory QA/QC data, all of the results were qualified as non-detected estimates due to method blank contamination.

2.5.3 Herbicides/Pesticides/PCBs

The herbicide Monuron was detected in M-BG2 at a concentration of 0.227 μg/L. No other pesticides or PCBs were detected in the background groundwater samples.

2.5.4 Oil and Grease

Oil and grease was found only in M-BG4 at a concentration of 1.6 mg/L (Table 2-5). The oil and grease measurement technique used for this study (EPA Method 413.1) is not

compound-specific and may register naturally occurring organic material related to plant and animal remains.

2.5.5 Metals

The results of metals analyses for the background groundwater samples are found in Table 2-6. As discussed in Section 2.7, the results of these samples were used to calculate the estimated range of naturally occurring background metals found in the groundwater at NAS Alameda. The estimated ranges are compared to results for groundwater samples and used to assess which metals are present at levels in excess of background levels. The significance of analytical results in excess of background levels will be evaluated during the risk assessment performed as part of Phase 7, the comprehensive RI.

2.5.6 General Chemicals

The results of general chemical analyses for the background groundwater samples are found in Table 2-7. The California State Water Resources Control Board's total dissolved solids criteria for drinking water is 3,000 mg/L (SWRCB, 1988). Based on this criteria, the groundwater in M-BG1 and M-BG2 is too saline to be classified as drinking water; the groundwater found in the other two wells is below the 3,000 mg/L criteria. The hardness and acidity in wells M-BG1 and M-BG2 is significantly higher than the other two wells.

Total organic carbon (TOC) levels ranged from 34.6 mg/L in M-BG4 to 60.0 in M-BG1. The wells screened mostly in marshy deposits have the highest TOC among the four wells.

Nitrate was detected only in M-BG4 at a concentration of 1.26 mg/L.

2.6 STATISTICAL ANALYSIS OF METALS CONCENTRATIONS IN SOIL

This section presents the results of a statistical analysis designed to estimate the background metals concentrations in soil at NAS Alameda The 95%/95% statistical tolerance interval was calculated for soil samples collected from the four background wells drilled on the base

(Figure 2-1). The 95%/95% statistical tolerance interval is the range within which 95 percent of background soil samples collected on the base are expected to fall 95 percent of the time. Samples with concentrations outside of this range may be below or above background concentrations.

Background borings were located in areas where there is no history of chemical use or industrial operations. These areas were chosen to approximate natural conditions. Because of the nature of NAS Alameda's construction, all of the background borings are located in areas where fill has been placed over native sediments. Much of the fill is locally derived nearshore sediment, but some may be imported. Approximately one-half of the background samples were collected from the fill.

In general, population distributions of naturally occurring inorganic soil constituents, including metals, are best described by a normal distribution curve (Gilbert, 1987). Therefore, this statistical analysis of metals was conducted assuming that the background populations for the NAS Alameda follow a normal distribution.

The procedures used to determine the 95%/95% statistical tolerance interval are as follows. Metal concentrations of the background samples were treated as constituents of a normal population. The detection limit divided by two was substituted for nondetected values (Hornung and Reed, 1990). Arithmetic means and standard deviations were calculated for each metal. Lower and upper limits of the 95%/95% statistical tolerance interval were calculated by adding and subtracting the standard deviation multiplied by a statistical tolerance factor (k) to the mean. K is a variable dependent of the proportion of the population one wishes to include in the tolerance interval, the probability of inclusion in the interval, and the number of samples on which the standard deviation is based (Taylor, 1990).

Statistical data for the background soil samples is presented in Table 2-8. In the Phase 7 Comprehensive RI Report, currently scheduled for submittal to DTSC by the Navy in early 1994, samples collected at the RI sites throughout the base in the phased investigations will be compared to the 95%/95% statistical tolerance interval. A discussion of whether or not

they may be above background concentrations and the significance of the reported concentrations exceeding background concentrations will be addressed in a preliminary risk assessment to be performed as part of the Phase 7 RI report.

2.7 STATISTICAL ANALYSIS OF METALS CONCENTRATIONS IN GROUNDWATER

With two limitations, the same basic statistical procedure is used for both soil and groundwater samples. The first limitation is that the data set for groundwater samples is much smaller than the data set for soil samples so that the 95%/95% statistical tolerance interval is wider. Second, in order to account for seasonal fluctuations of naturally occurring metals in groundwater, tolerance intervals should be computed separately for each round of groundwater samples collected from the background wells. Statistical data for the background groundwater samples collected in June 1992 is presented in Table 2-9.

As discussed above for soils, concentrations of metals in groundwater samples collected during the phased investigations will be compared to the calculated range of naturally occurring metals in background groundwater samples. A discussion of the significance of the reported concentrations exceeding background concentrations will be addressed in a preliminary risk assessment to be performed as part of the Phase 7 comprehensive RI.

TABLE 2-1
LABORATORY ANALYSES
BACKGROUND SAMPLES

Analysis	Method
SOIL	
VOC	CLP/RAS
SVOC	CLP/RAS
Pesticides/PCBs	CLP/RAS
TAL Metals	CLP/RAS
Total Cyanide	CLP/RAS
Total Organic Carbon	EPA 9060
Total Petroleum Hydrocarbons	EPA 418.1
Ethylene Dibromide	EPA 504
pH	EPA 9040
Total Solids	CLP/RAS
GROUNDWATER	
VOC	CLP/SAS
SVOC	CLP/RAS
TAL Metals	CLP/RAS
General Minerals	Various
Ethylene Dibromide	Modified 504
Pesticides/PCBs	CLP/RAS
Herbicides	EPA 8150
Organophosphorus Pesticides	EPA 8140
Oil and Grease	EPA 413.2
Total Petroleum Hydrocarbons	EPA 418.1
Total Cyanide	CLP/RAS
Total Organic Carbon	EPA 415.2
Hardness	EPA 130.2
Alkalinity	SM403
Total Dissolved Solids	EPA 160.1
pH*	EPA 150.1
Acidity	EPA 305.1
Specific Conductance*	EPA 120.1
Chemical Oxygen Demand	EPA 410.1
Biochemical Oxygen Demand	EPA 405.1

Notes:
*Field measurement
TAL Metals include Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb Mn, Mg, Hg, Ni, K, Se, Ag, Na, Tl, V, and Zn
VOA - volatile organic compounds
SVOC - semivolatile organic compounds
TOC - total organic carbon
TDS - total dissolved solids
CLP - contract laboratory program
RAS - routine analytical services
SAS - special analytical services

TABLE 2-2
NAS ALAMEDA - BACKGROUND BORINGS
SOIL ANALYTICAL RESULTS - ORGANIC COMPOUNDS

Sample Number	MBG-1			MBG-1			MBG-1			MBG-1			MBG-2		
Depth (feet)	0.0			2.0			3.0			5.0			0.0		
Date Sampled	5/27/92			5/27/92			5/27/92			5/27/92			5/28/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Volatile Organic Compounds (μg/kg)															
Acetone	<10.0			43	UJ	a	140	UJ	a	27	UJ	a	<11		
Tetrachloroethene	5.5			<6.4			<7.8			<6.3			16		
Semivolatile Organic Compounds (μg/kg)															
Acenaphthylene	<83			<100			<120			<100			<87		
Benzo(a)anthracene	<100			<130			<160			<130			<110		
Benzo(b)fluoranthene	<100			<130			<160			<130			<110		
Benzo(k)fluoranthene	<100			<130			<160			<130			<110		
Benzo(a)pyrene	<150			<180			<220			<180			<150		
Benzo(g,h,i)perylene	<170			<210			<250			<200			<170		
Bis(2-ethylhexyl)phthalate	<100			<130			500			250			300		
Chrysene	<100			<130			<160			<130			<110		
Fluoranthene	<83			350			<120			<100			110		
Indeno(1,2,3-cd)pyrene	<170			<210			<250			<200			<170		
Naphthalene	<83			<100			<120			<100			<87		
Phenanthrene	<83			240			<120			<100			<87		
Pyrene	140			590			<120			<100			180		
Herbicides/Pesticides/PCBs (μg/kg)															
4,4'-DDE	<3.45			<4.28			<5.17			<4.23			7.19		
4,4'-DDT	<6.91			<8.57			<10.3			<8.46			30.6		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

TABLE 2-2
NAS ALAMEDA - BACKGROUND BORINGS
SOIL ANALYTICAL RESULTS - ORGANIC COMPOUNDS

Sample Number	MBG-2			MBG-2			MBG-2			Duplicate MBG-2			MBG-3		
Depth (feet)	2.0			3.0			5.0			5.0			0.0		
Date Sampled	5/28/92			5/28/92			5/28/92			5/28/92			5/29/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Volatile Organic Compounds (μg/kg)															
Acetone	<11			37	UJ	a	50	UJ	a	17	UJ	a	12	UJ	a
Tetrachloroethene	<5.4			<6.3			<6.1			<6.0			<5.2		
Semivolatile Organic Compounds (μg/kg)															
Acenaphthylene	<86			<100			150			<96			<83		
Benzo(a)anthracene	<110			320			1600			160			<100		
Benzo(b)fluoranthene	<110			390			2300			460			<100		
Benzo(k)fluoranthene	<110			130			620			<120			<100		
Benzo(a)pyrene	<150			370			2600			<170			<140		
Benzo(g,h,i)perylene	<170			<200			1700			<190			<170		
Bis(2-ethylhexyl)phthalate	<110			170			<120			250	UJ	a	<100		
Chrysene	<110			260			1500			270			<100		
Fluoranthene	<86			1000			3600			770			<83		
Indeno(1,2,3-cd)pyrene	<170			<200			1800			<190			<170		
Naphthalene	<86			<100			99			<96			<83		
Phenanthrene	<86			<100			2200			280			<83		
Pyrene	210			1300			6100			1100			<83		
Herbicides/Pesticides/PCBs (μg/kg)															
4,4'-DDE	<3.58			<4.17			<4.05			<3.99			<3.45		
4,4'-DDT	<7.16			<8.34			<8.10			<7.97			<6.89		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

TABLE 2-2
NAS ALAMEDA - BACKGROUND BORINGS
SOIL ANALYTICAL RESULTS - ORGANIC COMPOUNDS

Sample Number	MBG-3			MBG-3			MBG-3			MBG-4			MBG-4		
Depth (feet)	2.0			4.0			6.0			0.0			2.0		
Date Sampled	5/29/92			5/29/92			5/29/92			5/29/92			5/29/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Volatile Organic Compounds (μg/kg)															
Acetone	22	UJ	a	28	UJ	a	35	UJ	a	10.0	UJ	a	<11		
Tetrachloroethene	<5.5			<5.7			<6.2			<5.2			<5.3		
Semivolatile Organic Compounds (μg/kg)															
Acenaphthylene	<88			<92			<100			<83			<85		
Benzo(a)anthracene	<110			<110			<120			<100			<110		
Benzo(b)fluoranthene	<110			<110			<120			<100			<110		
Benzo(k)fluoranthene	<110			<110			<120			<100			<110		
Benzo(a)pyrene	<150			<160			<170			<150			<150		
Benzo(g,h,i)perylene	<180			<180			<200			<170			<170		
Bis(2-ethylhexyl)phthalate	<110			<110			<120			<100			<110		
Chrysene	<110			<110			<120			<100			<110		
Fluoranthene	<88			<92			<100			<83			<85		
Indeno(1,2,3-cd)pyrene	<180			<180			<200			<170			<170		
Naphthalene	<88			<92			<100			<83			<85		
Phenanthrene	<88			<92			<100			<83			<85		
Pyrene	<88			<92			<100			<83			<85		
Herbicides/Pesticides/PCBs (μg/kg)															
4,4'-DDE	<3.65			<3.83			<4.16			<3.46			<3.54		
4,4'-DDT	<7.31			<7.66			<8.32			<6.92			<7.08		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

TABLE 2-2
NAS ALAMEDA - BACKGROUND BORINGS
SOIL ANALYTICAL RESULTS - ORGANIC COMPOUNDS

Sample Number	MBG-4			MBG-4		
Depth (feet)	7.5			10.0		
Date Sampled	5/29/92			5/29/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Volatile Organic Compounds (μg/kg)						
Acetone	17	UJ	a	27	UJ	a
Tetrachloroethene	<5.8			<5.8		
Semivolatile Organic Compounds (μg/kg)						
Acenaphthylene	<92			<93		
Benzo(a)anthracene	<120			<120		
Benzo(b)fluoranthene	<120			<120		
Benzo(k)fluoranthene	<120			<120		
Benzo(a)pyrene	<160			<160		
Benzo(g,h,i)perylene	<180			<190		
Bis(2-ethylhexyl)phthalate	<120			<120		
Chrysene	<120			<120		
Fluoranthene	<92			<93		
Indeno(1,2,3-cd)pyrene	<180			<190		
Naphthalene	<92			<93		
Phenanthrene	<92			<93		
Pyrene	<92			<93		
Herbicides/Pesticides/PCBs (μg/kg)						
4,4'-DDE	<3.84			<3.88		
4,4'-DDT	<7.69			<7.76		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

TABLE 2-3
NAS ALAMEDA - BACKGROUND BORINGS
SOIL SAMPLE ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample I.D.	MBG-1			MBG-1			MBG-1			MBG-1			MBG-2			MBG-2		
Depth (feet)	0.0			2.0			3.0			5.0			0.0			2.0		
Date Sample	05/27/92			05/27/92			05/27/92			05/27/92			05/28/92			05/28/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Metals (mg/kg)																		
Aluminum	10600			8510			19000			6180			8890			600		
Antimony	<7.8	UJ	e	<9.5	UJ	e	<11	UJ	e	<9.5	UJ	e	<8.1	UJ	e	<8.0	UJ	e
Arsenic	1.48			2.11			3.7			1.74			2.66			1.92		
Barium	54.5			46.3			49.2			33.9			86.5			32.5		
Beryllium	0.591			0.792			<0.763			<0.632			<0.540			<0.535		
Cadmium	<0.806	UJ	h	<0.987	UJ	h	<1.19	UJ	h	<0.985	UJ	h	<0.842	UJ	h	<0.834	UJ	h
Calcium	4310	J	f	2940	J	f	5210	J	f	2290	J	f	4920	J	f	2790	J	f
Chromium	26.7			42.8			66.7			29.2			44.1			31.2		
Cobalt	5.81	J	h	6.26	J	h	9.62			<4.35			6.59			4.38		
Copper	14.3	J	e,f,h	10	J	e,f,h	25.7	J	e,f,h	5.6	J	e,f,h	21.5	J	e,f,h	5.92	J	e,f,h
Iron	18800			13800			27900			9270			16000			8640		
Lead	20			19.8			6.51			3.39			58.7			8.87		
Magnesium	5890			3480			8800			2240			3280			2050		
Manganese	330			179			268			99.5			254			116		
Mercury	<0.077			<0.095			<0.104			<0.091			0.084			<0.073		
Nickel	19			43			53.5			24.6			29.1			23.1		
Potassium	979	J	e,h	947	J	e,h	2480	J	e,h	850	J	e,h	1360	J	e,h	742	J	e,h
Selenium	<0.405			<0.484			<0.587			<0.485			1.34			<0.400		
Silver	<0.993			<1.21			<147			<1.21			<1.04			<1.03		
Sodium	433	J	e,h	520	J	e,h	1430	J	e,h	615	J	e,h	352	J	e,h	299	J	e,h
Thallium	<0.344			<0.412			<0.499			<0.412			<0.367			<0.340		
Vanadium	40.2			28.6			51.1			20.3			52.8			20		
Zinc	54.3			34.4			61.8			20.7			87.3			22.2		
Cyanide (mg/kg)	<0.1			<0.2			<0.2			<0.1			<0.1			<0.1		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

TABLE 2-3
NAS ALAMEDA - BACKGROUND BORINGS
SOIL SAMPLE ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample I.D.	MBG-2			MBG-2			Duplicate MBG-2			MBG-3			MBG-3			MBG-3		
Depth (feet)	3.0			5.0			5.0			0.0			2.0			4.0		
Date Sample	05/28/92			05/28/92			05/28/92			05/29/92			05/29/92			05/29/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Metals (mg/kg)																		
Aluminum	9750			5710			6230			8120			6400			4450		
Antimony	<9.3	UJ	e	<9.1	UJ	e	<8.9	UJ	e	<7.7	UJ	e	<8.2	UJ	e	<8.6	UJ	e
Arsenic	4.45			1.84	J	g	1.23			3.14			1.68			1.63		
Barium	37.7			37.8			42.8			74.5			53.7			52		
Beryllium	0.68			<0.604			<0.591			<0.516			<0.546			<0.572		
Cadmium	<0.968	UJ	h	<0.942	UJ	h	<0.922	UJ	h	0.815	UJ	h	<0.852	UJ	h	<0.893	UJ	h
Calcium	3940	J	f	2630	J	f	3070	J	f	4240	J	f	2130	J	f	1480	J	f
Chromium	35.5			28.4			33.1			43.1			28.7			22.9		
Cobalt	5.64			<4.16			4.82			5.42			4.55			<3.94		
Copper	7.7	J	e,f,h	7.24	J	e,f,h	6.73	J	e,f,h	20.1	J	e,f,h	6.61	J	e,f,h	5.17	J	e,f,h
Iron	14300			8520			9430	J	c	14900			9930			6220		
Lead	7.54			29.4			6.72	J	f	27.9			9.5			8.09		
Magnesium	4600			2290			2450			2900			2410			1520		
Manganese	145			77.9			84			186			151			50		
Mercury	<0.068			<0.089			<0.085			<0.059			<0.065			<0.065		
Nickel	32.5			27.4			29.2			42.2			21.3			14.5		
Potassium	1530	J	e,h	882	J	e,h	967	J	e,h	1010	J	e,h	1030	J	e,h	778	J	e,h
Selenium	<0.461			<0.465	UJ	g	<0.454			<0.385			<0.431			<0.425		
Silver	<1.19			<1.16			<1.13			<0.990			<1.05			<1.10		
Sodium	494	J	e,h	441	J	e,h	397	J	e,h	302	J	e,h	448	J	e,h	337	J	e,h
Thallium	<0.392			<0.395	UJ	g	<0.386	UJ	g	<0.327	UJ	g	<0.366			<0.361		
Vanadium	26			21.5			23.3			31.7			25			18.2		
Zinc	32.1			24.6			24.5			316			22.3			31.5		
Cyanide (mg/kg)	<0.2			<0.1			<0.1			<0.1			<0.1			<0.1		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

TABLE 2-3
NAS ALAMEDA - BACKGROUND BORINGS
SOIL SAMPLE ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample I.D.	MBG-3			MBG-4			MBG-4			MBG-4			MBG-4		
Depth (feet)	6.0			0.0			2.0			7.5			10.0		
Date Sample	05/29/92			05/29/92			05/29/92			05/29/92			05/29/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Metals (mg/kg)															
Aluminum	5380			11700			4750			7490			5230		
Antimony	<9.2	UJ	e	<7.7	UJ	e	<7.9	UJ	e	<8.6	UJ	e	<8.6	UJ	e
Arsenic	1.8			2.99			1.29			1.48			1.4		
Barium	53.1			107			33.2			39.2			30.7		
Beryllium	<0.613			<0.515			<0.527			0.607			<0.576		
Cadmium	<0.957	UJ	h	<0.803	UJ	h	<0.823	UJ	h	<0.897	UJ	h	<0.898	UJ	h
Calcium	1870	J	f	5590	J	f	2670	J	f	2730	J	f	3000	J	f
Chromium	24.4			37.2			30.6			30.2			31.2		
Cobalt	<4.22			7.22			3.86			4.76			<3.96		
Copper	4.92	J	e,f,h	26.6	J	e,f,h	5.13	J	e,f,h	6.5	J	e,f,h	3.79	J	e,f,h
Iron	7560			16300			8100			13400			8590		
Lead	6.59			43.1			2.48			3.89			5.34		
Magnesium	1580			4870			2090			3120			2330		
Manganese	112			277			94.6			169			134		
Mercury	<0.086			<0.078			<0.063			0.644			<0.077		
Nickel	15.8			33.2			22.4			24.9			22.2		
Potassium	790	J	e,h	1610	J	e,h	756	J	e,h	943	J	e,h	540	J	e,h
Selenium	<0.499			<0.410			<0.424			<0.434			<0.452		
Silver	<1.18			<0.988			<1.01			<1.10			<1.11		
Sodium	379	J	e,h	396	J	e,h	235	J	e,h	537	J	e,h	466	J	e,h
Thallium	<0.424			<0.348			<0.361			<0.369			<0.385		
Vanadium	18.5			38.2			20.9			25			22.2		
Zinc	27.4			80.3			17.2			29			19.1		
Cyanide (mg/kg)	<0.1			<0.1			<0.1			<0.1			<0.1		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

TABLE 2-4

RANGES OF METAL CONCENTRATIONS FOUND IN SOILS

Metal	Typical Range (mg/kg)	Extreme Range (mg/kg)
Aluminum	10,000 to 300,000	--
Antimony	--	--
Arsenic	1.0 to 4.0	0.1 to 500
Barium	100 to 3,500	10 to 10,000
Beryllium	0.1 to 40	0.1 to 100
Cadmium	0.01 to 7	0.01 to 45
Chromium	5 to 3,000	0.5 to 10,000
Cobalt	1 to 40	0.01 to 500
Copper	2 to 100	0.1 to 14,000
Lead	2 to 200	0.1 to 3,000
Mercury	0.01 to 0.08	--
Nickel	5.0 to 1,000	0.8 to 6,200
Selenium	0.1 to 2	0.01 to 400
Silver	0.1 to 5	0.1 to 50
Thallium	0.1 to 12	--
Vanadium	20 to 500	1 to 1,000
Zinc	10 to 300	3 to 10,000

(Dragun, 1988)

TABLE 2-5
NAS ALAMEDA - BACKGROUND BORINGS
GROUNDWATER ANALYTICAL RESULTS - ORGANIC COMPOUNDS

Sample I.D. Date Sampled	MBG-1-GW 06/11/92			MBG-2-GW 06/12/92			MBG-3-GW 06/12/92			MBG-4-GW 06/12/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Volatile Organic Compounds (μg/L)												
Semivolatile Organic Compounds (μg/L)												
Acenaphthene	<1.0			17			<1.0			<1.0		
Anthracene	<1.0			1			<1.0			<1.0		
Bis (2-Ethylhexyl) phthalate	<2.0			2.4	UJ	a	5.4	UJ	a	7.1	UJ	a
Fluoranthene	<1.0			3.1			<1.0			<1.0		
Phenanthrene	<1.0			3.4			<1.0			<1.0		
Pyrene	1.3			3.7			<1.0			<1.0		
Herbicides/Pesticides/PCB (μg/L)												
Monuron	<0.197			0.227			<0.197			<0.197		
Oil and Grease (mg/L)	<0.2			0.2	UJ	a	<0.2			1.6		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

TABLE 2-6
NAS ALAMEDA - BACKGROUND BORINGS
GROUNDWATER ANALYTICAL RESULTS - METALS

Sample I.D.	MBG-1-GW			MBG-2-GW			MBG-3-GW			MBG-4-GW		
Date Sample	06/11/92			06/12/92			06/12/92			06/12/92		
PARAMETER REPORTED	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl
Metals (µg/L)												
Aluminum	58.7			<40.7			<40.7			<40.7		
Antimony	37.9			<37.5			<37.5			<37.5		
Arsenic	11.4			<1.9			5.5			<1.9		
Barium	679			150			96.4			54.7		
Beryllium	<2.5			<2.5			<2.5			<2.5		
Cadmium	<3.9			<3.9			<3.9			<3.9		
Calcium	117000			114000			34000			68900		
Chromium	<6.3			<6.3			<6.3			<6.3		
Cobalt	<17.2			<17.2			<17.2			<17.2		
Copper	<3.8			<3.8			9.4			<3.8		
Iron	2040	J	f	2370	J	f	25.3	J	f	<7.7		
Lead	<2.0	UJ	g	<2.0			<2.0			<2.0		
Magnesium	331000			55600			47100			11300		
Manganese	1760			1090			489			227		
Mercury	<0.2			<0.2			<0.2			<0.2		
Nickel	<13.2			<13.2			<13.2			<13.2		
Potassium	101000			33400			21300			5090		
Selenium	<2.0	UJ	g	<2.0	UJ	g	<2.0			<2.0		
Silver	<4.8			<4.8			<4.8			<4.8		
Sodium	3710			720000			201000			15800		
Thallium	<1.7			<1.7			<1.7			<1.7		
Vanadium	24.5			7.6			8.3			<6.0		
Zinc	<4.6			<4.6			<4.6			9.1		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = laboratory indicated questionable data

TABLE 2-7
NAS ALAMEDA - BACKGROUND BORINGS
GROUNDWATER ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample I.D.	MBG-1-GW			MBG-2-GW			MBG-3-GW			MBG-4-GW		
Date Sample	06/11/92			06/12/92			06/12/92			06/12/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Physical Parameters - Lab												
Alkalinity, Carbonate - mg/L CaCO3	<5.0			<5.0			<5.0			<5.0		
Alkalinity, Bicarbonate - mg/L CaCO3	143			126			125			106		
Alkalinity, Hydroxide - mg/L CaCO3	<5.0			<5.0			<5.0			<5.0		
Alkalinity, Phenolphaline - mg/L	<5.0			<5.0			<5.0			<5.0		
Alkalinity, Total - mg/L CaCO3	143			126			125			106		
Acidity, Total - mg/L CaCO3	170			107			18.7			13.8		
Hardness - mg/L CaCO3	2280			1120			352			300		
Total Dissolved Solids - mg/L	13800			5360			1130			13.8		
Biological Oxygen Demand, 5-day - mg/L	45.6			16.2			1.0			1.9		
Chemical Oxygen Demand - mg/L	417			201			141			264		
Total Organic Carbon - mg/L	60			35.4			51.2			34.6		
Anions - mg/L												
Chloride	5290			3305			35.10			14.45		
Sulfate	227.7			6.760			8.201			12.34		
Fluoride	0.98			0.48			0.90			0.21		
Nitrate/Nitrite, NO3+NO2, as N	<0.010			<0.160			<0.010			1.26		
Cyanide - μg/L	<10.0			<10.0			<10.0			<10.0		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = laboratory indicated questionable data

TABLE 2-8
NAS ALAMEDA - BACKGROUND BORINGS
STATISTICAL ANALYSIS OF METALS RESULTS FOR SOIL SAMPLES

	Average Concentration (mg/kg)	Standard Deviation (mg/kg)	Statistical Tolerance Factor	95%/95% Statistical Tolerance Interval Lower Limit (mg/kg)*	Upper Limit (mg/kg)
Aluminum	7588	3950	2.870	0	18925
Antimony	4.3	0.4	2.870	3.1	5.6
Arsenic	2.15	0.92	2.870	0	4.80
Barium	50.9	20.8	2.870	0	110.5
Beryllium	0.379	0.172	2.870	0	0.873
Cadmium	0.477	0.099	2.870	0.194	0.761
Calcium	3283	1206	2.870	0	6744
Chromium	34.5	10.4	2.870	4.6	64.35
Cobalt	4.66	2.16	2.870	0	10.87
Copper	10.79	7.74	2.870	0	33.01
Iron	12451	5424	2.870	0	28017
Lead	15.75	15.82	2.870	0	61.15
Magnesium	3288	1856	2.870	0	8614
Manganese	160	80	2.870	0	390
Mercury	0.077	0.147	2.870	0	0.498
Nickel	28.1	10.3	2.870	0	57.6
Potassium	1070	459	2.870	0	2386
Selenium	0.291	0.271	2.870	0	1.070
Silver	4.838	17.694	2.870	0	55.62
Sodium	475	264	2.870	0	1233
Thallium	0.19	0.02	2.870	0.13	0.25
Vanadium	28.4	10.9	2.870	0	59.7
Zinc	53	71	2.870	0	257

Background soil samples collected June 1992.
Tolerance Interval = Average ± (Standard Deviation * Statistical Tolerance Factor) (Taylor, 1990)
* - negative concentrations are reported as zero.

TABLE 2-9
NAS ALAMEDA - BACKGROUND BORINGS
STATISTICAL ANALYSIS OF METALS RESULTS FOR GROUNDWATER SAMPLES

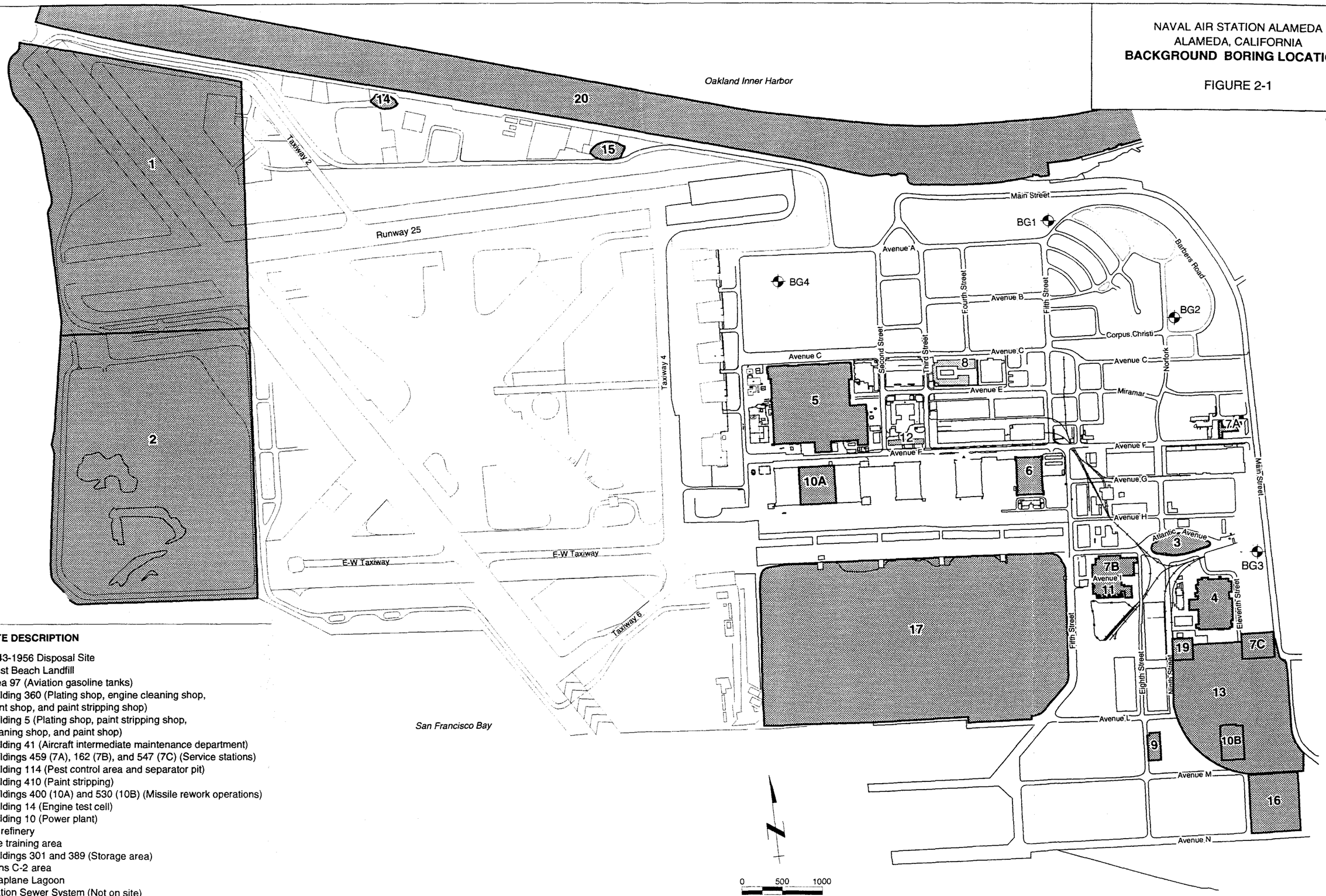
	Average Concentration (μg/L)	Standard Deviation (μg/L)	Statistical Tolerance Factor	95%/95% Statistical Tolerance Interval Lower Limit (μg/L)*	Upper Limit (μg/L)
Aluminum	29.9	19.2	6.37	0	152.1
Antimony	23.5	9.6	6.37	0	84.5
Arsenic	4.7	5.0	6.37	0	36.3
Barium	245	292	6.37	0	2105
Beryllium	1.3	0.0	6.37	1.25	1.3
Cadmium	2.0	0.0	6.37	2.0	2.0
Calcium	83475	39648	6.37	0	336033
Chromium	3.2	0.0	6.37	3.2	3.2
Cobalt	8.60	0.00	6.37	8.60	8.60
Copper	3.8	3.8	6.37	0	27.7
Iron	1110	1272	6.37	0	9211
Lead	1.0	0.0	6.37	1.0	1.0
Magnesium	111250	147752	6.37	0	1052432
Manganese	892	682	6.37	0	5239
Mercury	0.1	0.0	6.37	0.10	0.1
Nickel	6.6	0.0	6.37	6.60	6.6
Potassium	40198	42162	6.37	0	308767
Selenium	1.0	0.0	6.37	1.00	1.0
Silver	2.4	0.0	6.37	2.40	2.4
Sodium	235128	335621	6.37	0	2373034
Thallium	0.9	0.0	6.37	0.85	0.9
Vanadium	10.9	9.4	6.37	0	70.7
Zinc	4.0	3.4	6.37	0	25.7

Background groundwater samples collected June 1992.
Tolerance Interval = Average ± (Standard Deviation * Statistical Tolerance Factor) (Taylor, 1990)

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
BACKGROUND BORING LOCATIONS

FIGURE 2-1

CTO121.M1/A-18



LEGEND:

SITE NO.	SITE DESCRIPTION
1	1943-1956 Disposal Site
2	West Beach Landfill
3	Area 97 (Aviation gasoline tanks)
4	Building 360 (Plating shop, engine cleaning shop, paint shop, and paint stripping shop)
5	Building 5 (Plating shop, paint stripping shop, cleaning shop, and paint shop)
6	Building 41 (Aircraft intermediate maintenance department)
7	Buildings 459 (7A), 162 (7B), and 547 (7C) (Service stations)
8	Building 114 (Pest control area and separator pit)
9	Building 410 (Paint stripping)
10	Buildings 400 (10A) and 530 (10B) (Missile rework operations)
11	Building 14 (Engine test cell)
12	Building 10 (Power plant)
	Oil refinery
	Fire training area
	Buildings 301 and 389 (Storage area)
16	Cans C-2 area
17	Seaplane Lagoon
18	Station Sewer System (Not on site)
19	Yard D-13 (Hazardous waste solvents)
20	Estuary (Oakland Inner Harbor)

BG4 Background Soil Boring Location

3.0 TIDAL INFLUENCE STUDY

3.1 BACKGROUND

A tidal influence study was performed at Sites 7A (Building 459), 7B and 11 (Buildings 162 and 14), 10A (Building 400), 14 (Fire Training Area), and 15 (Buildings 301 and 389, Storage Area) (Figure 3-1). The objective of the study was to evaluate the influence of tidal fluctuations in San Francisco Bay on groundwater in the first water-bearing zone beneath these sites. These sites were selected for inclusion in the tidal influence study on the basis of groundwater level measurements collected during the initial Phases 2B and 3 field activities (PRC/JMM, 1992). Where significant variations in groundwater levels within a well were measured over the course of a day, or where measurements taken on different days within the same well varied significantly, further study was proposed.

3.2 METHODS

Water levels in four wells at Site 7A, five wells at Sites 7B and 11, and three wells each at Sites 10A, 14 and 15 were monitored for the tidal influence study. In addition, water levels in the Seaplane Lagoon and at Pier 4 in the Oakland Inner Harbor were monitored. Water levels were monitored using pressure transducers connected to electronic data recorders. Data were collected at 15 minute intervals over a period of 4 to 5 days, during the maximum high tide for the month of January 1992.

Water levels were measured manually with an electronic probe to the nearest 0.01 feet at the beginning and the end of the monitoring period in each well. The manual measurements were used to calibrate the equipment and provide reference measurements. Data collected from each well were trimmed to a 72-hour period, from 1200 hours on January 30, to 1200 hours on February 2, 1992. For each site, a time versus water level plot (i.e., a hydrograph) was generated in order to compare water levels between all wells monitored at the site. The water level in either the Seaplane Lagoon or the Inner Harbor (whichever is closest to the site) was included on each hydrograph so that the lag time

between maximum water levels in the bay and in the wells could be estimated. Figures 3-2 through 3-6 are hydrographs for Sites 7A, 7B and 11, 10A, 14, and 15, respectively.

Groundwater contour maps were constructed for each site from data collected during this study. At sites where wells appeared to be tidally influenced (Sites 7B and 11, 14, and 15), three maps were created. Two of the maps represent the groundwater surface at the maximum high and low tides. The third map illustrates the average groundwater levels and flow direction for the entire 72-hour monitoring period. These maps are presented in the following discussion of results.

Average groundwater elevation data were prepared according to the filtering method described in Serfes (1991). The filtering method consists of collecting 72 hours of consecutive readings and applying three moving averages to the measurements to yield a mean. The filtered mean is equivalent to the 35th hour of sample data.

At sites where no tidal influence on groundwater levels was apparent (Sites 7A and 10A), only one groundwater map was created (Figures 3-7 and 3-11). The map represents the average groundwater levels and flow direction for the duration of the tidal influence study. Contour maps generated for these sites at the maximum high and low tides did not differ in flow direction and gradient and thus are not included in this report.

3.3 RESULTS

A discussion of the results of the tidal influence study for the six sites included are presented below.

3.3.1 Site 7A

Monitoring well M-07A-03 exhibited the largest water level fluctuations at Site 7A (Figure 3-2), increasing from a low of 6.71 feet to a high of 7.48 feet over the course of the tidal influence study. However, this increase occurred over a period of approximately 40 hours, and does not appear to be related to tidal influences. Monitoring well M-07A-02 also

exhibited a gradual increase in water level over the course of the study. The water level increased from an elevation of 6.38 feet to 6.47 feet over the same 40-hour period, with no apparent relation to tidal activity. The water level in well M-07A-04 remained relatively constant over the course of the study with the exception of a 0.2 foot increase during a 4-hour period on February 1, 1992. This increase is probably related to recharge by infiltration of precipitation. The Naval Oceanography Command Detachment at NAS Alameda recorded 0.43 inches of precipitation on this date (Finney, 1992). The water level in monitoring well M-07A-01 remained relatively constant for the duration of the study.

Multiple groundwater contour maps keyed to the tidal cycle were not prepared for this site because the groundwater does not appear to be tidally indluenced. Figure 3-7 illustrates groundwater flow conditions at 1800 hours on January 31, 1992. These conditions are similar to those measured during the majority of the tidal influence study. In the northern portion of the site groundwater flows north-northwest under a hydraulic gradient of approximately 0.0017 feet per foot (fpf). In the southern portion of the site groundwater apparently flows in a southwesterly direction under a hydraulic gradient of approximately 0.0056 fpf. Previous water level measurements collected at the site indicated that the flow direction varied from southeast to northwest (PRC/JMM 1992).

3.3.2 Sites 7B and 11

Figure 3-3 is the hydrograph for the five wells at Sites 7B and 11 that were monitored during the tidal influence study. Cyclical water level fluctuations related to tidal activity were measured in only one well, M11-01. Water level fluctuations in well M11-01 lag approximately 2.5 to 3.5 hours behind tidal fluctuations in the Seaplane Lagoon. Well M11-01 is located immediately adjacent to a storm drain which empties into the Seaplane Lagoon. The relatively permeable backfill material around the storm drain may be in good hydraulic communication with the Seaplane Lagoon, and thus groundwater in the immediate vicinity of the backfill material may be more influenced by tidal activity than groundwater underneath the remainder of the site.

The increase of approximately 2.25 feet in groundwater elevation measured in well M11-02 on February 1, 1992 may be related to recharge by precipitation. The NAS Alameda Naval Oceanography Command Detachment recorded 0.43 inches of precipitation on this date (Finney 1992). The relatively instantaneous increase in water level may indicate that the surface seal placed over the well casing during the tidal influence study failed and allowed rainwater collected in the Christy box to enter the well.

Figures 3-8, 3-9, and 3-10 illustrate the groundwater surface configuration and flow direction at Sites 7B and 11 during low tide, high tide, and for the average groundwater elevation over the course of the tidal study, respectively. Flow during all portions of the tidal cycle is toward well M11-01; fluctuations in the groundwater elevation in the vicinity of well M11-01 alter only the hydraulic gradient over the course of the tidal cycle. The gradient ranges from 0.005 at low tide to 0.003 at high tide. This flow pattern suggests that the storm drain may be serving as a preferential path for groundwater to flow from the site to the Seaplane Lagoon.

3.3.3 Site 10A

Groundwater monitoring wells at Site 10A showed no response to tidal activity in the nearby Seaplane Lagoon (Figure 3-4). The flow direction and gradient remained relatively constant over the course of the 72-hour study. As shown on Figure 3-11, groundwater at Site 10A flows east-northeast across the site, approximately parallel to the Seaplane Lagoon boundary. The hydraulic gradient across the site is approximately 0.0077 fpf.

Groundwater elevation data collected during the Phases 2B and 3 investigation indicated that the flow direction across Site 10A varied between east-northeast and east-southeast (PRC/JMM, 1992).

3.3.4 Site 14

Water levels in all wells at Site 14 fluctuated in response to tidal activity in the adjacent Oakland Inner Harbor (Figure 3-5). The lag time between the Inner Harbor and the wells

varied from approximately 1 hour in wells M14-01 and M14-02, to 1.5 to 2 hours in well M14-03.

The largest fluctuation in water level elevation was measured in well M14-01. The water level in this well increased 3.7 feet over the course of one tidal cycle (elevation of 4.31 feet measured at 1704 hours on 1/30/92 to 8.01 feet measured at 1004 hours on 1/31/92). In contrast, the water level in well M14-03 increased 0.68 feet over the course of one tidal cycle (elevation of 5.78 feet measured on 1704 hours on 1/30/92 to an elevation of 6.46 feet measured at 1004 hours on 1/31/92). Well M14-01, which exhibits the quickest response to tidal activity and the largest fluctuation in water elevation, is located closest to the Inner Harbor. Wells M14-02 and M14-03, which exhibit slightly greater lag times and smaller fluctuations in water elevation, are located further inland.

Figures 3-12, and 3-13 illustrate the configuration of the groundwater table during low and high tide, respectively. During low tide, flow at Site 14 is north-northeast towards the Inner Harbor, with a hydraulic gradient of approximately 0.012 fpf. At high tide, the groundwater flow direction is southwest, away from the Inner Harbor, and the gradient is approximately 0.013 fpf. Figure 3-14 illustrates groundwater flow conditions using the average elevation in each well. The average groundwater flow direction for the site is to the southwest, under a hydraulic gradient of approximately 0.00068 fpf, which is essentially flat.

3.3.5 Site 15

As illustrated in the hydrograph for Site 15, two of the monitoring wells at Site 15 exhibit tidal influence (Figure 3-6). Well M15-02, located closest to the Inner Harbor, exhibits an almost immediate response to tidal activity in the Inner Harbor. Well M15-03, located farther inland, exhibits a lag time of approximately 1.5 to 2 hours. The water level in well M15-02 fluctuated a maximum of 2.224 feet over the course of one tidal cycle. The water level in well M15-03 fluctuated a maximum of 0.557 feet over the same tidal cycle. Water levels in well M15-01, located the farthest inland, did not fluctuate in response to tidal activity in the Inner Harbor. The water level remained relatively constant for the first 35

hours of the tidal influence study and then increased 0.605 feet over a 12.5 hour period (elevation of 5.002 feet measured at 2204 hours on 1/31/92 to 5.607 feet measured at 1034 hours on 2/1/92). This increase is probably related to recharge by precipitation during this time period and not tidal influences. The NAS Alameda Naval Oceanography Command Detachment recorded 0.43 inches of precipitation on February 1, 1992 (Finney 1992).

Figures 3-15 and 3-16 illustrate the groundwater table configuration at Site 15 during low and high tide, respectively. During low tide, groundwater flows northeast towards the Inner Harbor under a hydraulic gradient of approximately 0.0083 fpf. During high tide, groundwater flows southeasterly under a gradient of approximately 0.005 fpf. The average groundwater flow direction is east-northeast, towards the Inner Harbor, under a gradient of approximately 0.0015 fpf (Figure 3-17), which is essentially flat. The pre-rainfall elevation of 5.002 feet was used for well M15-01 to generate the groundwater contour map for the filtered data.

3.4 CONCLUSIONS

Groundwater at Sites 7A and 10A does not appear to be influenced by tidal fluctuation in the San Francisco Bay. Previous measurements at these sites indicated that groundwater elevations in monitoring wells at these sites vary over time (PRC/JMM, 1992). The variation in water levels measured during the Phases 2B and 3 activities may have been related to artificial recharge from unknown sources or instrument or operator error during performance of the measurements. Future water level monitoring that will be conducted during the additional groundwater sampling planned for Phases 2B and 3 sites will aid in explaining the discrepancies between previous measurements and the results of the tidal influence study.

Tidal influence at Sites 7B and 11 appears to be restricted to groundwater in the immediate vicinity of the storm drain that empties into the Seaplane Lagoon.

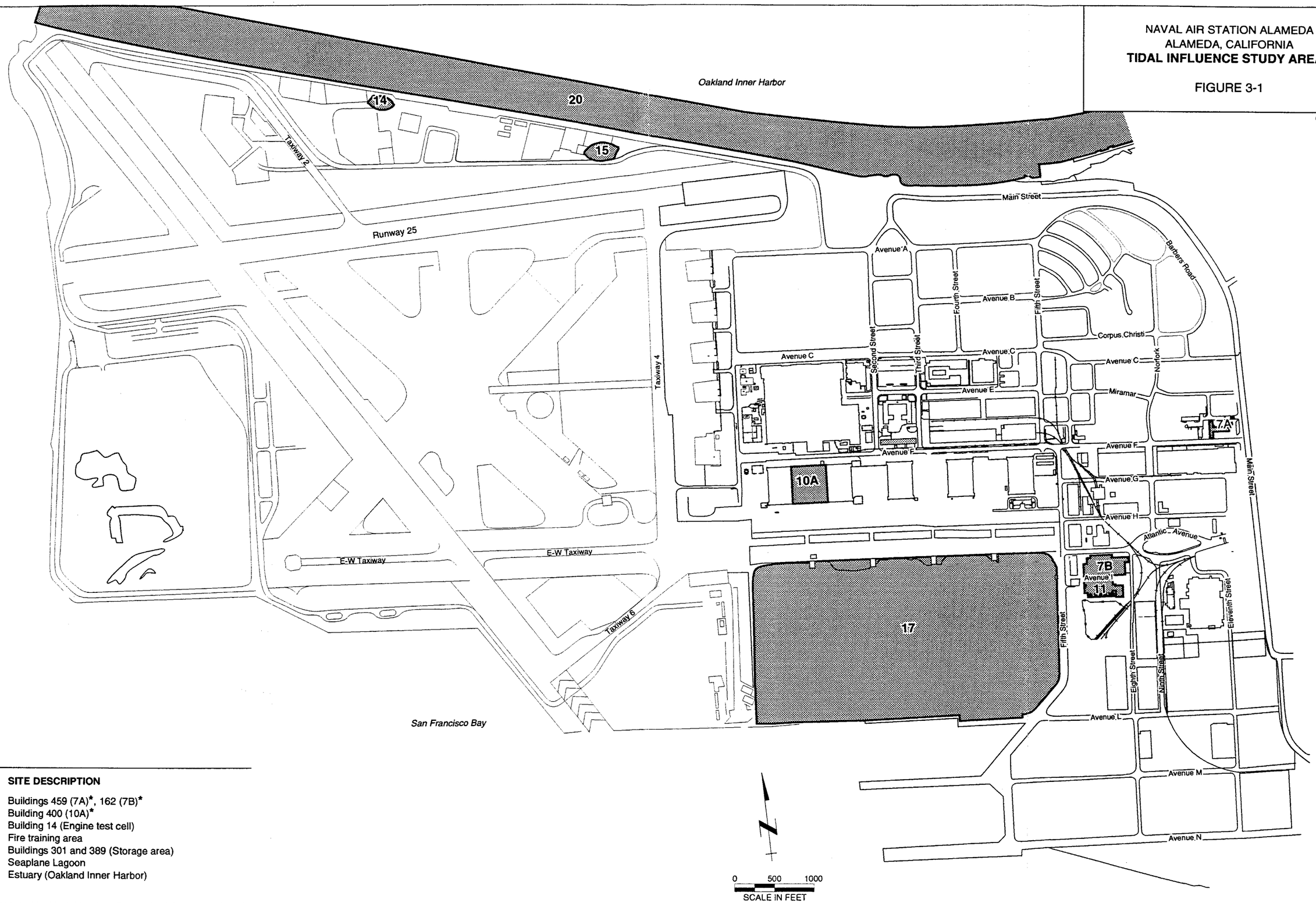
Groundwater at Sites 14 and 15 is significantly influenced by tidal activity in the Oakland Inner Harbor. At both sites, groundwater flows toward the Inner Harbor during low tide

and away from the harbor during high tide. The average gradient for both sites is essentially flat.

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
TIDAL INFLUENCE STUDY AREAS

FIGURE 3-1

CTO121.M1/A-18



LEGEND:

SITE NO.	SITE DESCRIPTION
7	Buildings 459 (7A)*, 162 (7B)*
10	Building 400 (10A)*
11*	Building 14 (Engine test cell)
14*	Fire training area
15*	Buildings 301 and 389 (Storage area)
17	Seaplane Lagoon
20	Estuary (Oakland Inner Harbor)

* Sites presented in this Addendum Phase 2B/3 Summary Report

Figure 3-2 Hyd. _.aph for Site 7A

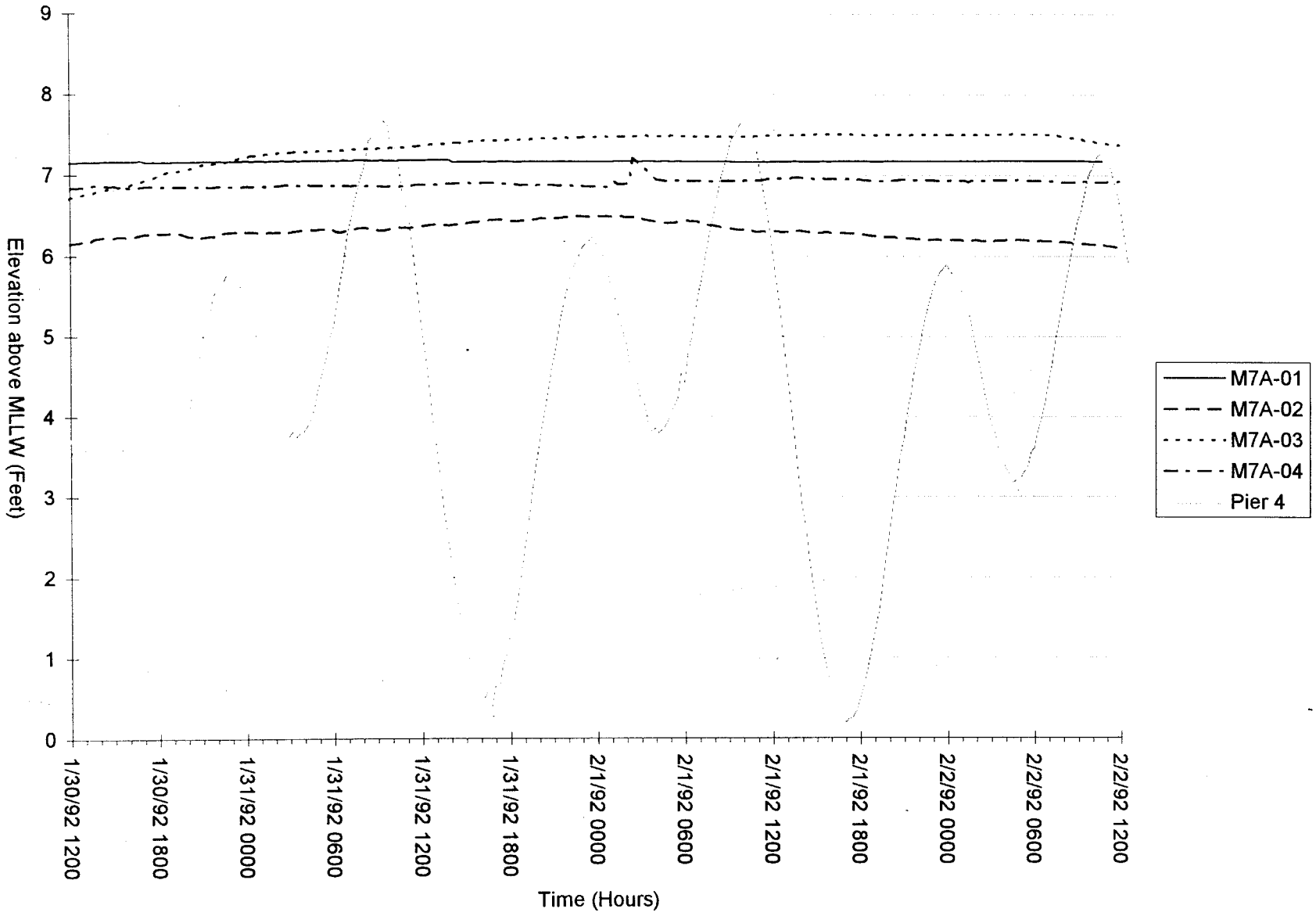


Figure 3-3 Hydrog[illegible] for Sites 7B and 11

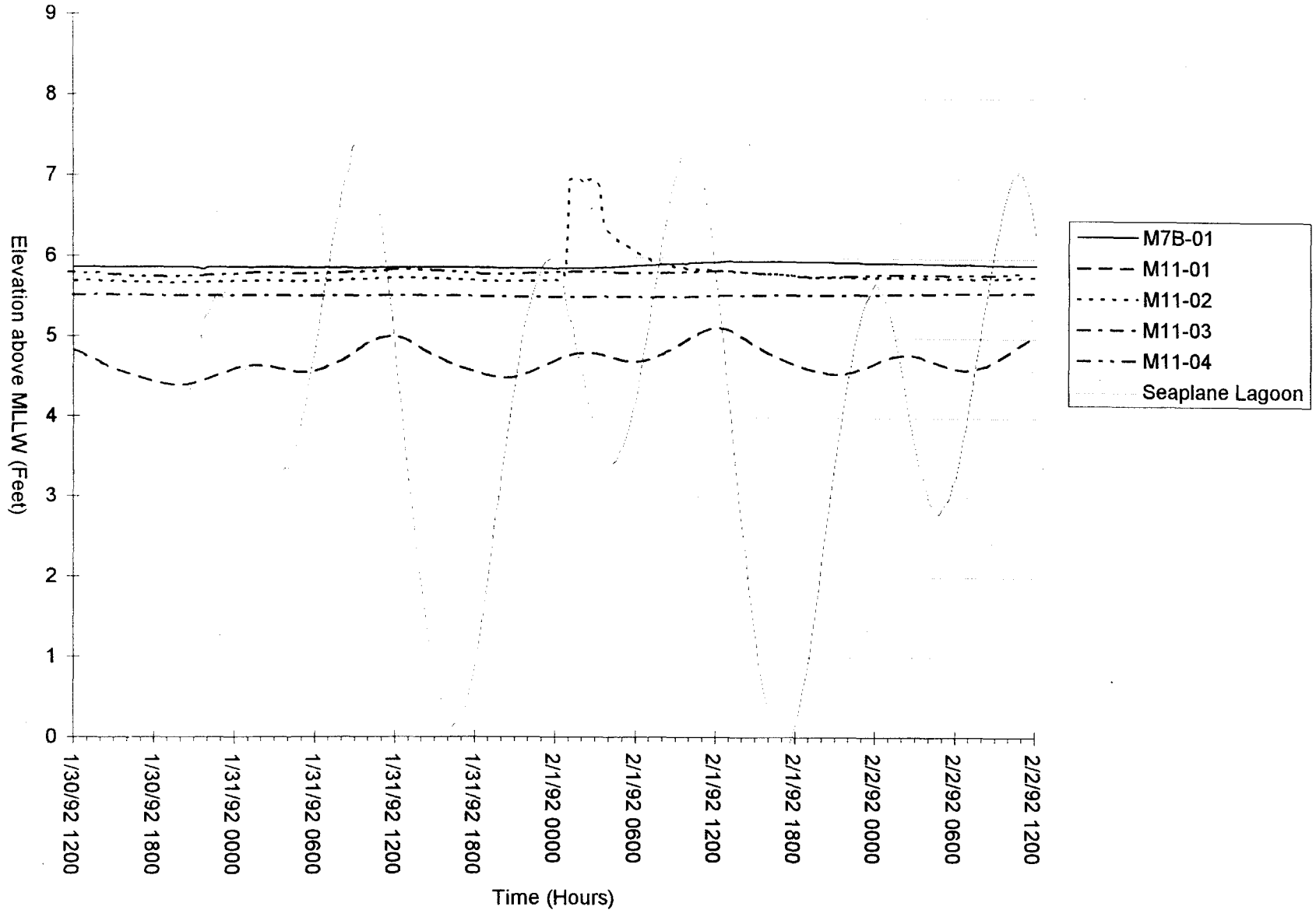


Figure 3-4 Hydrograph for Site 10A

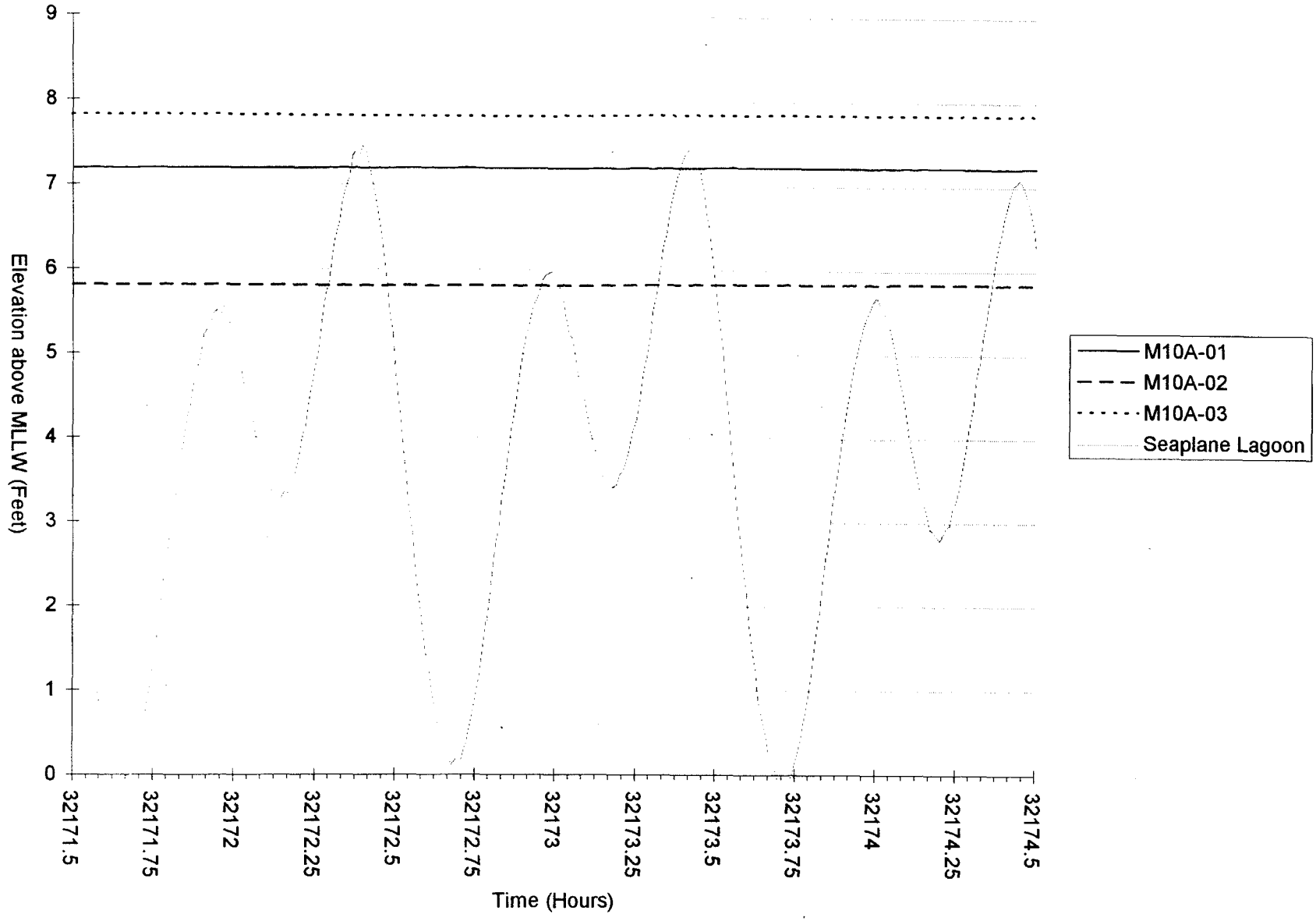


Figure 3-5 Hyd. . .raph for Site 14

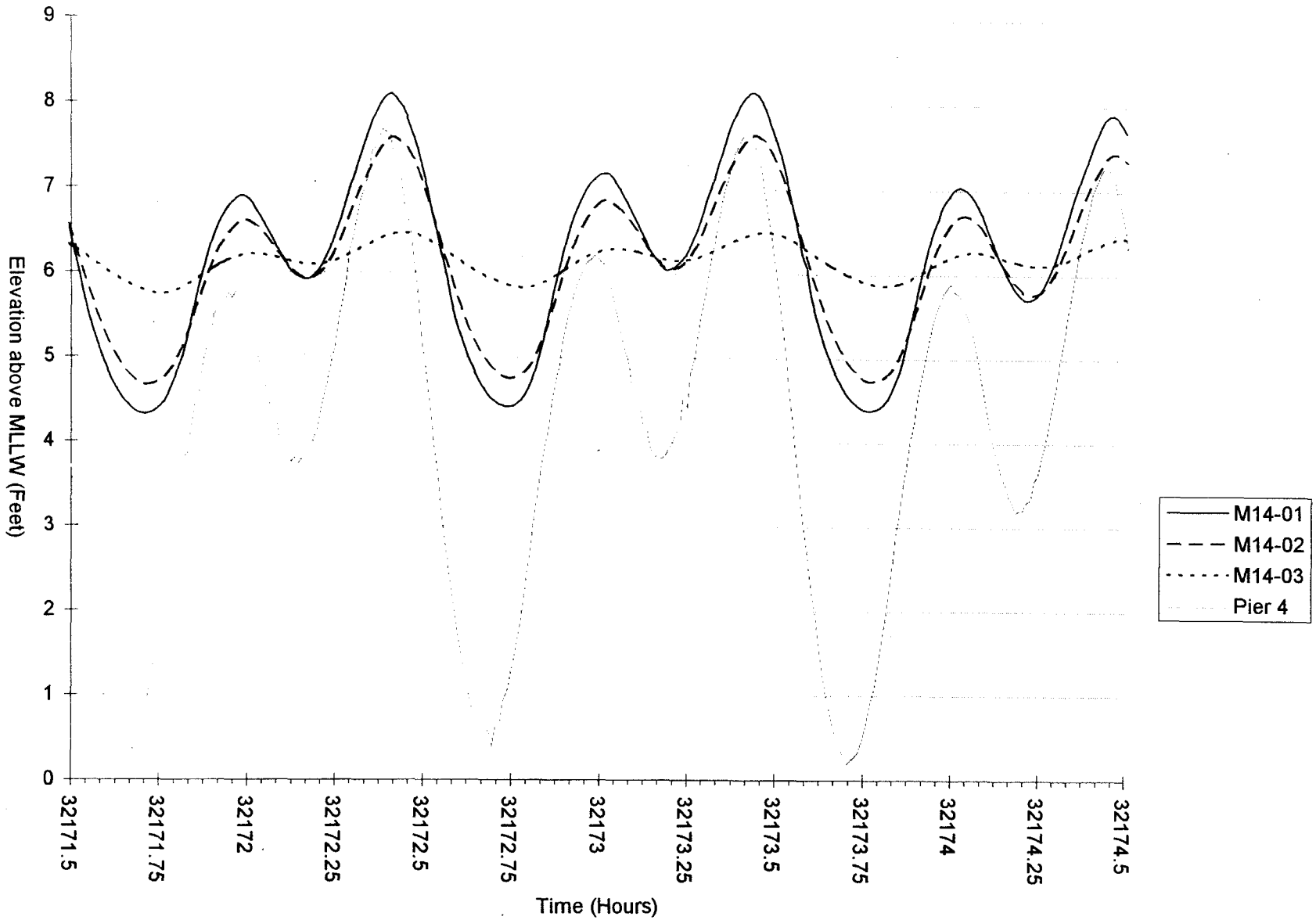
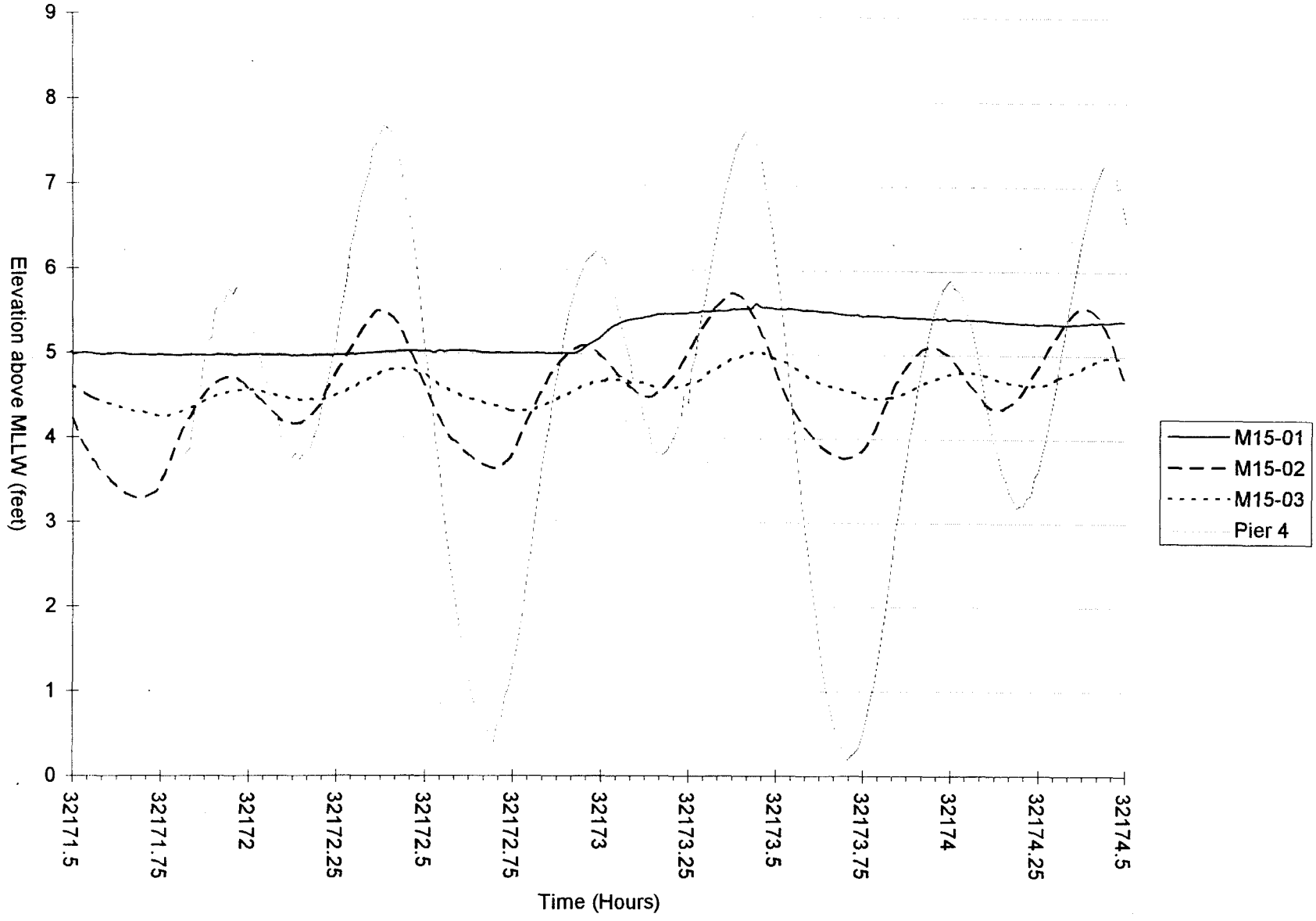
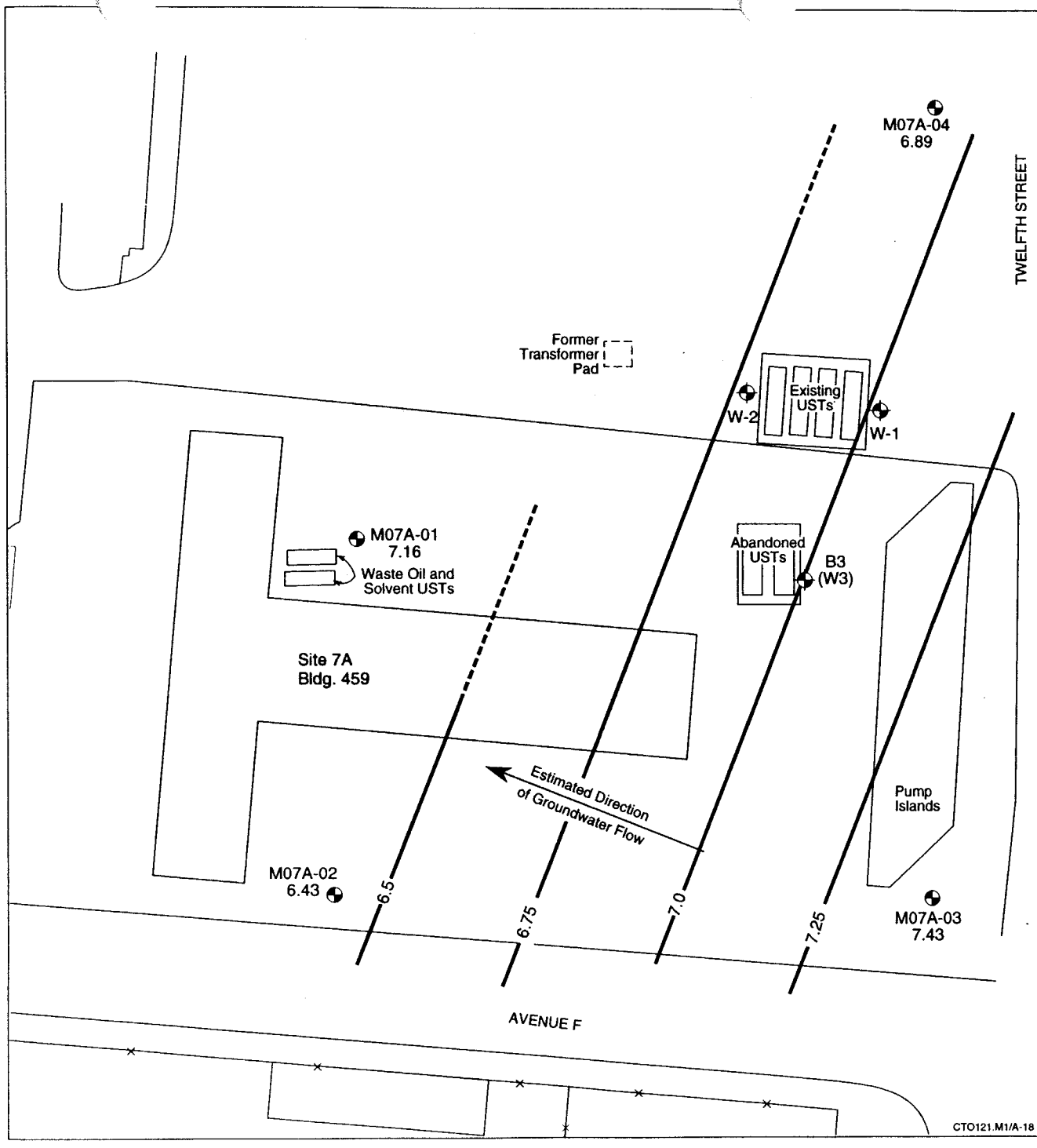
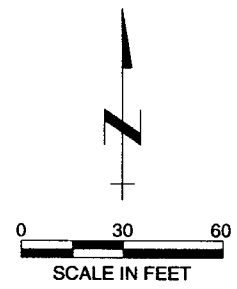


Figure 3-6 Hyd. graph for Site 15







LEGEND:

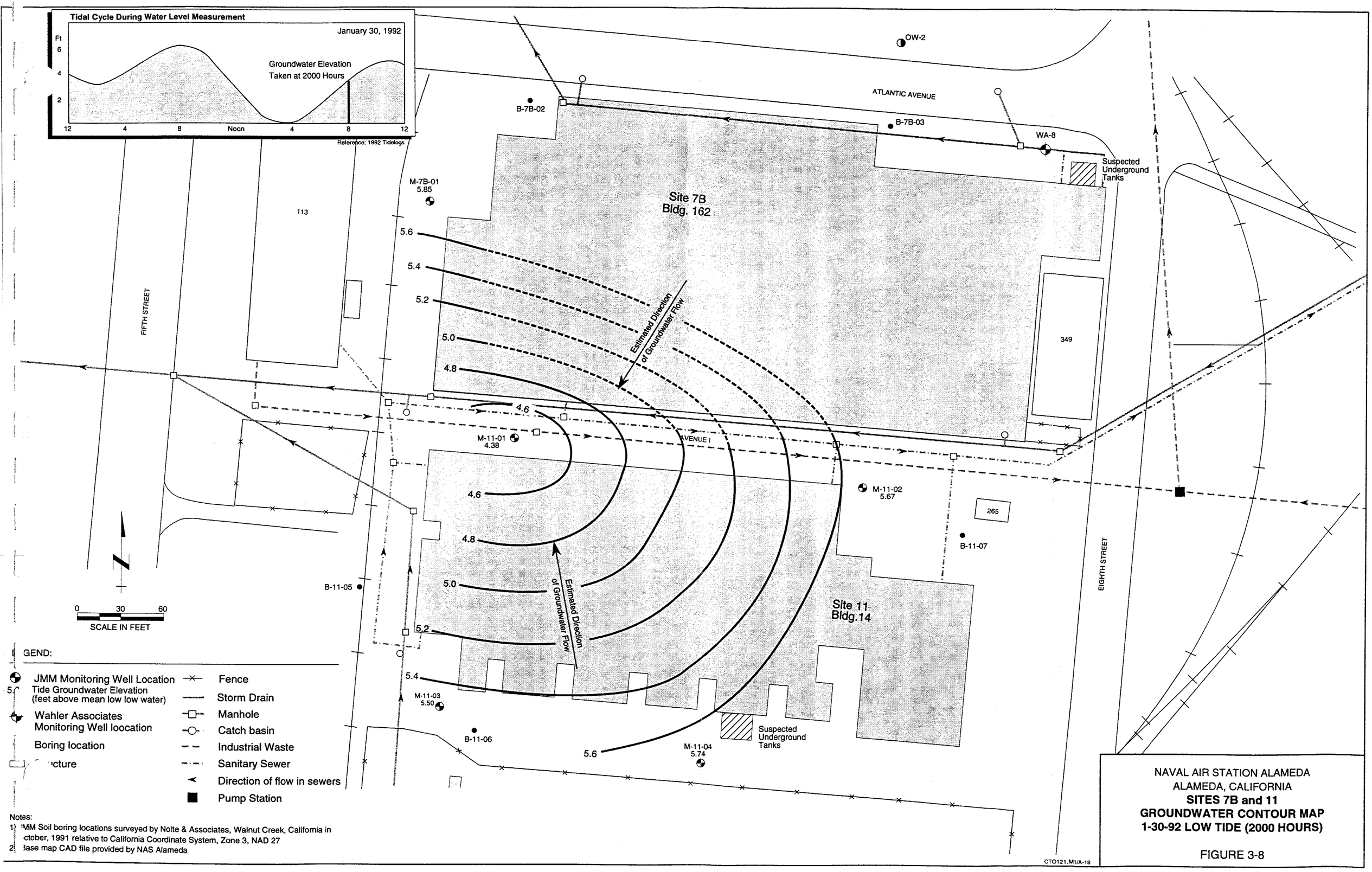
- JMM Monitoring Well Location
- 7.0 Groundwater Elevation (feet above mean low low water)
- Groundwater contour
- ERM Monitoring Well Location
- Site
- Fence

Notes:

1) Soil boring locations surveyed by Nolte & Associates, Walnut Creek, California in October, 1991 relative to California Coordinate System, Zone 3, NAD 27
2) Base map CAD File provided by NAS Alameda
3) All tank locations and dimensions are approximate
4) Monitoring well M-07A-01 not used in groundwater contour delineation

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 7A
GROUNDWATER CONTOUR MAP
1-31-92 (1800 HOURS)

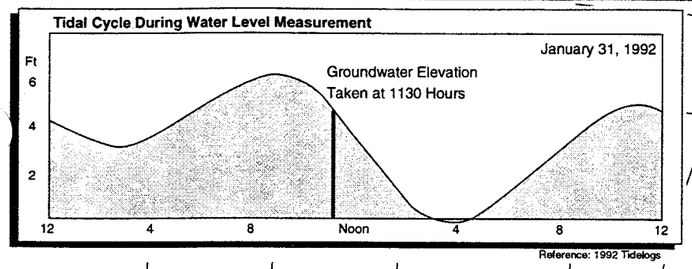
FIGURE 3-7



Notes:
1) JMM Soil boring locations surveyed by Nolte & Associates, Walnut Creek, California in October, 1991 relative to California Coordinate System, Zone 3, NAD 27
2) Base map CAD file provided by NAS Alameda

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITES 7B and 11
GROUNDWATER CONTOUR MAP
1-30-92 LOW TIDE (2000 HOURS)

FIGURE 3-8



ATLANTIC AVENUE

B-7B-02

B-7B-03

WA-8

Suspected Underground Tanks

M-7B-01
5.86

113

Site 7B
Bldg. 162

5.8

5.6

5.4

5.2

Estimated Direction of Groundwater Flow

349

FIFTH STREET

M-11-01
5.0

AVENUE I

M-11-02
5.73

265

B-11-07

EIGHTH STREET

5.2

Site 11
Bldg.14

B-11-05

Estimated Direction of Groundwater Flow

5.4

M-11-03
5.51

5.6

B-11-06

Suspected Underground Tanks

M-11-04
5.83

5.8

0 30 60
SCALE IN FEET

LEGEND:

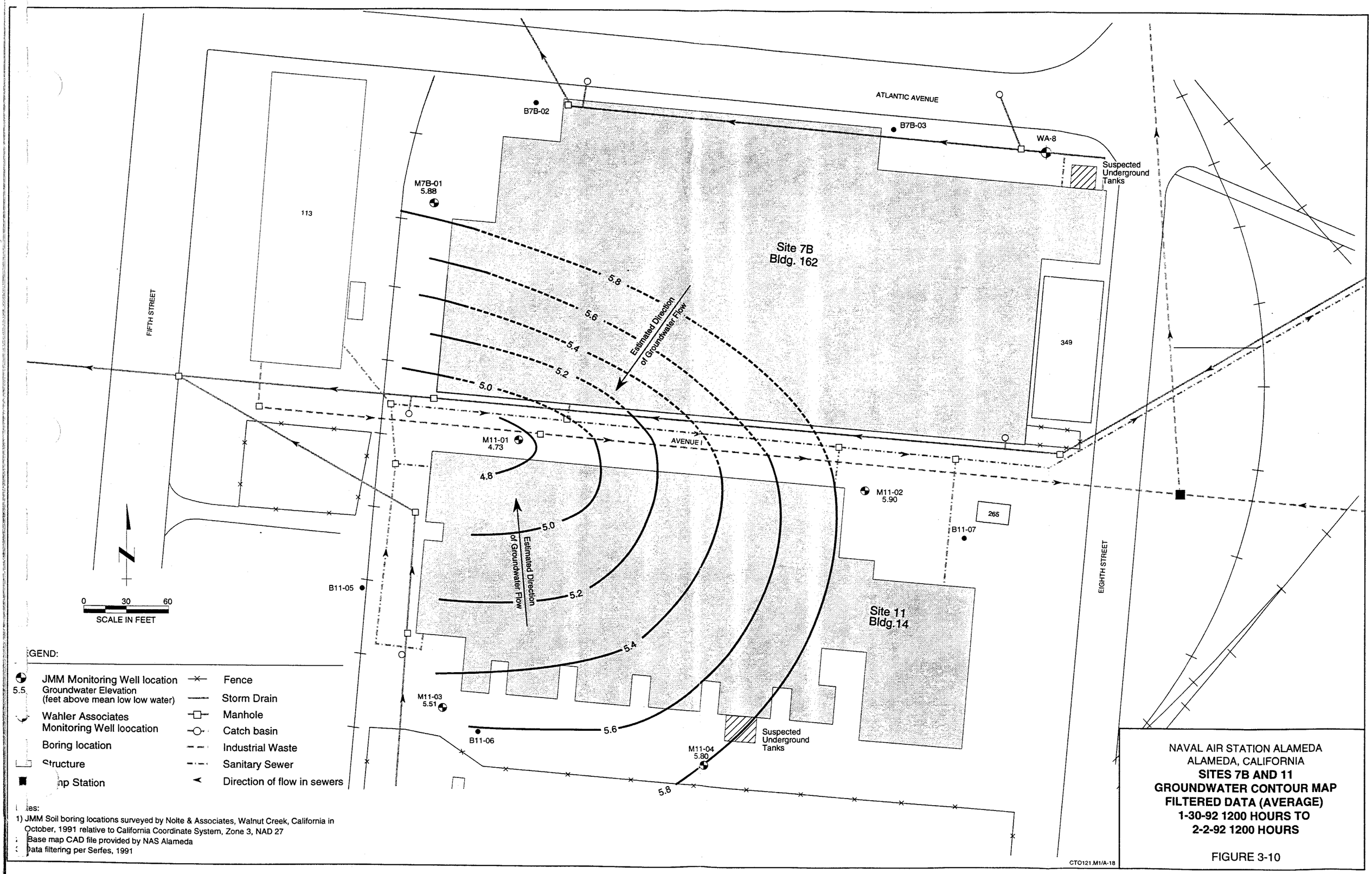
- JMM Monitoring Well Location
- 2 Groundwater Elevation (feet above mean low low water)
- Wahler Associates Monitoring Well loocation
- Boring location
- ucture
- Fence
- Storm Drain
- Manhole
- Catch basin
- Industrial Waste
- Sanitary Sewer
- Direction of flow in sewers
- Pump Station

Notes:
1. JMM Soil boring locations surveyed by Nolte & Associates, Walnut Creek, California in October, 1991 relative to California Coordinate System, Zone 3, NAD 27
2. Base map CAD file provided by NAS Alameda

CTO121.M1/A-18

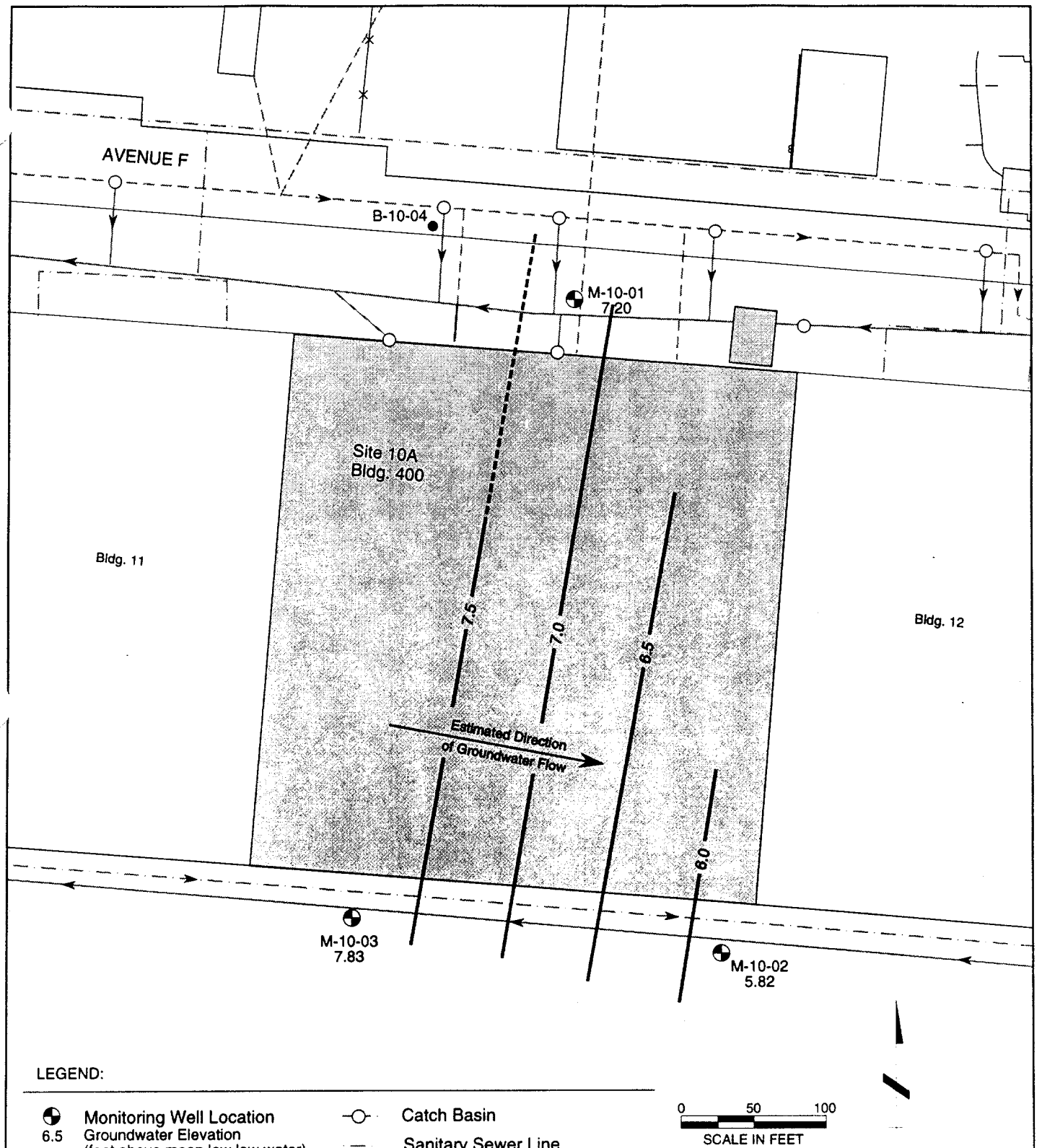
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITES 7B and 11
GROUNDWATER CONTOUR MAP
1-31-92 HIGH TIDE (1130 HOURS)

FIGURE 3-9



NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITES 7B AND 11
GROUNDWATER CONTOUR MAP
FILTERED DATA (AVERAGE)
1-30-92 1200 HOURS TO
2-2-92 1200 HOURS

FIGURE 3-10



LEGEND:

- Monitoring Well Location
- 6.5 Groundwater Elevation (feet above mean low low water)
- Groundwater Contour
- Boring Location
- Structure
- Site
- Catch Basin
- Sanitary Sewer Line
- Storm Sewer Line
- Industrial Sewer Line
- Direction of Flow in Sewer
- Fence

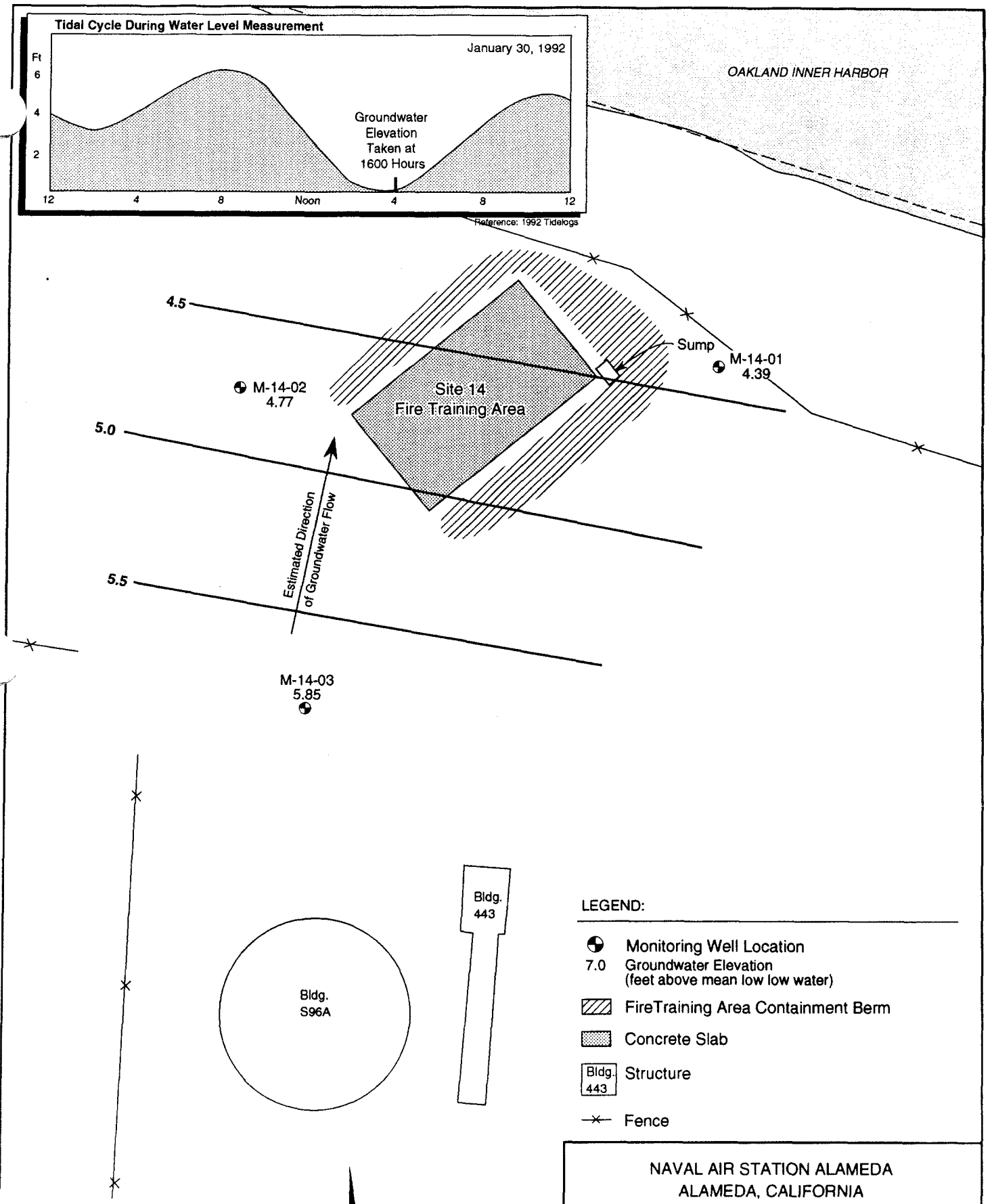
Notes:
1) Soil boring locations surveyed by Nolte & Associates, Walnut Creek, California in October, 1991 relative to California Coordinate System, Zone 3, NAD 27
2) Base map CAD File provided by NAS Alameda
3) Data filtered per Serfes, 1991

CTO121 M1/A-18

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 10A
GROUNDWATER CONTOUR MAP
FILTERED DATA (AVERAGE)
1-30-92 1200 HOURS TO
2-2-92 1200 HOURS

FIGURE 3-11

Reference: 1992 Tidelogs



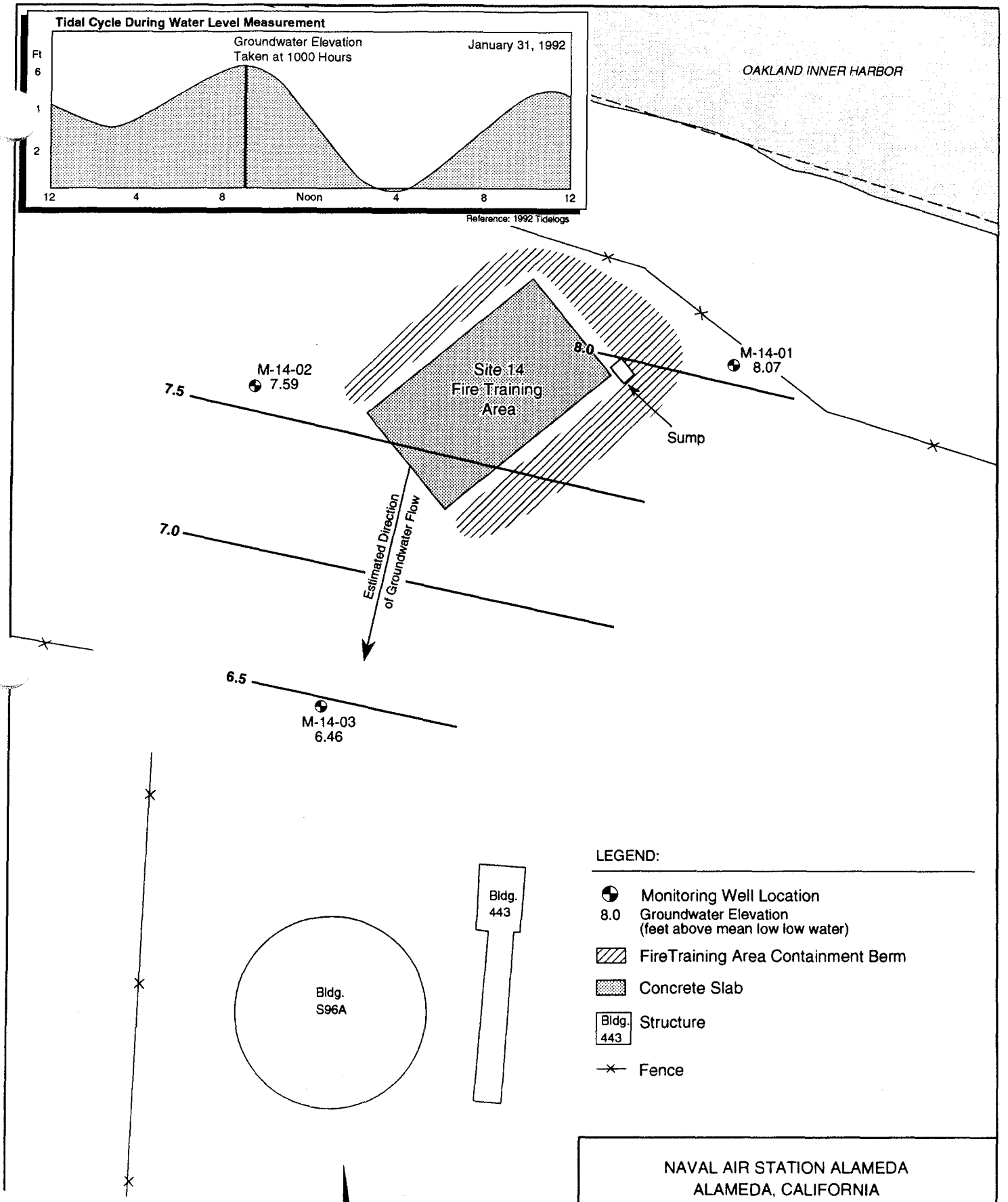
Notes:

1) JMM Soil boring locations surveyed by Nolte & Associates, Walnut Creek, California in October, 1991 relative to California Coordinate System, Zone 3, NAD 27
2) Base map CAD file provided by NAS Alameda

6/93 AL

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 14
GROUNDWATER CONTOUR MAP
1-30-92 LOW TIDE (1600 HOURS)

FIGURE 3-12

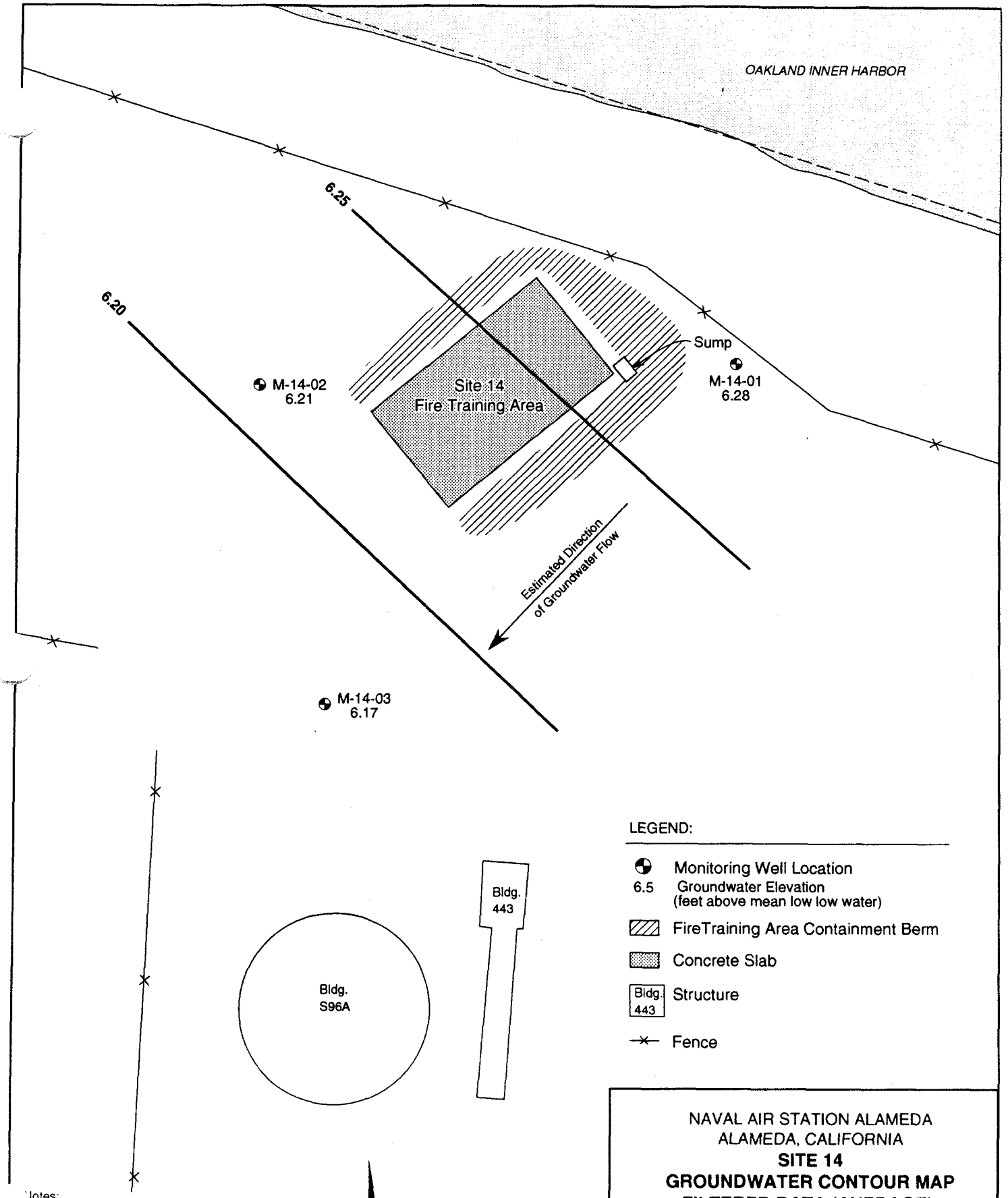


otes:
) JMM Soil boring locations surveyed by Nolte & Associates, Walnut Creek, California in October, 1991 relative to California Coordinate System, Zone 3, NAD 27
2) Base map CAD file provided by NAS Alameda

6/93 Al

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 14
GROUNDWATER CONTOUR MAP
1-31-92 HIGH TIDE (1000 HOURS)

FIGURE 3-13

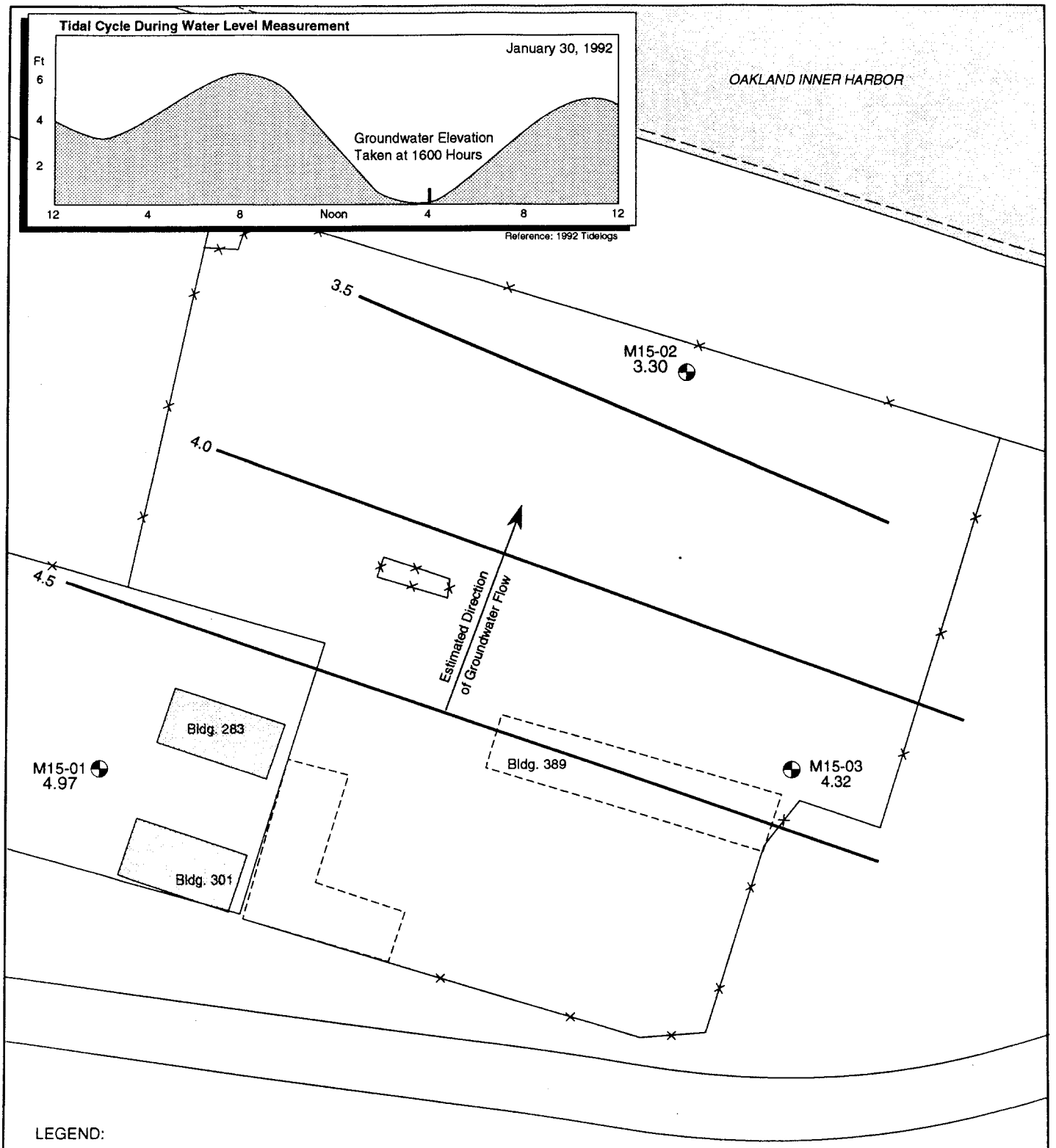


Notes:
1) JMM Soil boring locations surveyed by Nolte & Associates, Walnut Creek, California in October, 1991 relative to California Coordinate System, Zone 3, NAD 27
2) Base map CAD file provided by NAS Alameda
3) Data filtering per Serfes, 1991

6/93.AI

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 14
GROUNDWATER CONTOUR MAP
FILTERED DATA (AVERAGE)
1-30-92 1200 HOURS TO
2-2-92 1200 HOURS

FIGURE 3-14



LEGEND:

- Monitoring Well Location
- 5.0 Groundwater Elevation (feet above mean low low water)
- Site
- Former Structure
- Fence

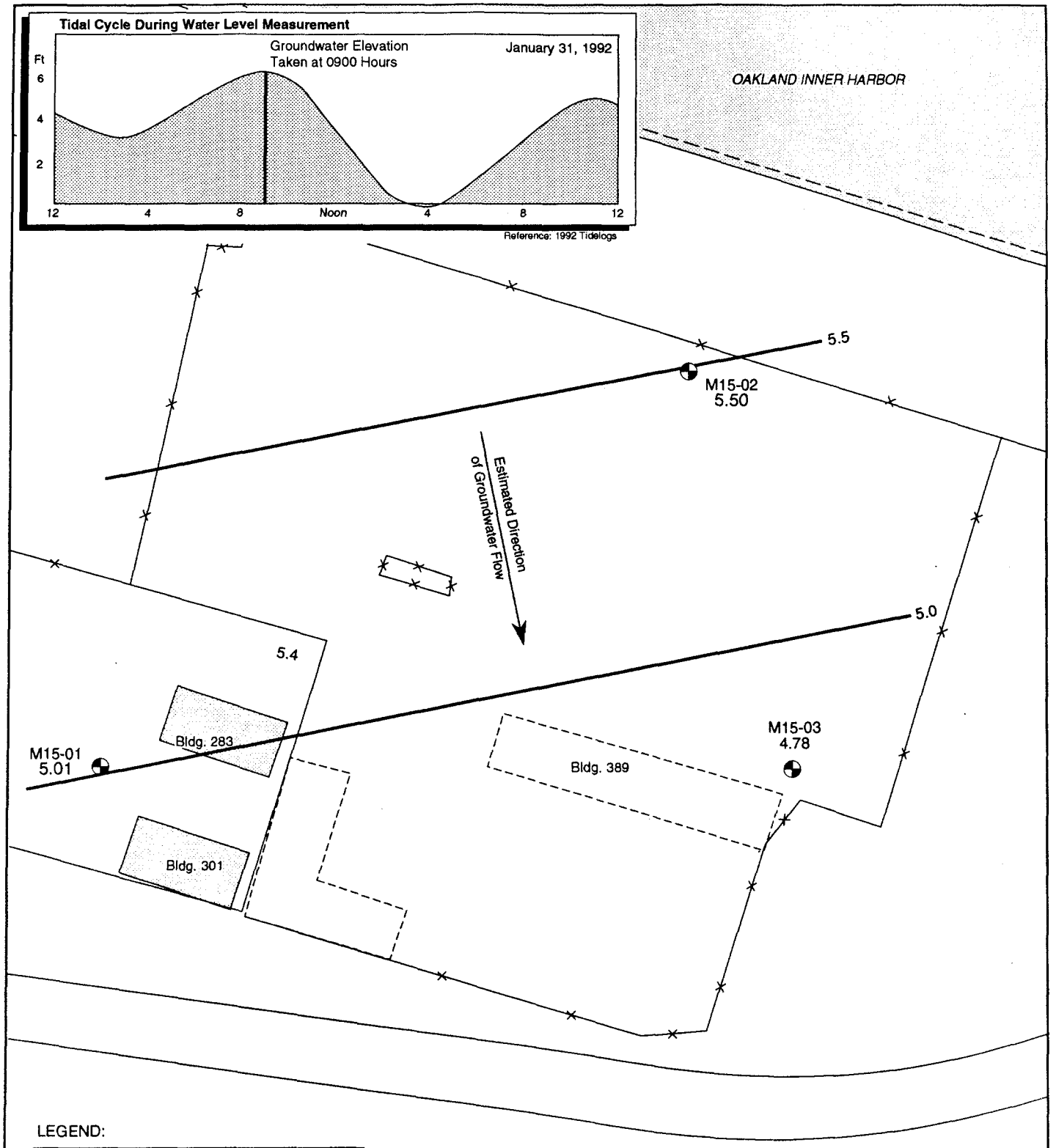
Notes:
1) Soil boring locations surveyed by Nolte & Associates, Walnut Creek, California in October, 1991 relative to California Coordinate System, Zone 3, NAD 27
2) Base map CAD File provided by NAS Alameda

0 25 50
SCALE IN FEET

CTO121.M1/A-18

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 15
GROUNDWATER CONTOUR MAP
1-30-92 LOW TIDE (1600 HOURS)

FIGURE 3-15



LEGEND:

- Monitoring Well Location
- 5.2 Groundwater Elevation (feet above mean low low water)
- Site
- Former Structure
- Fence

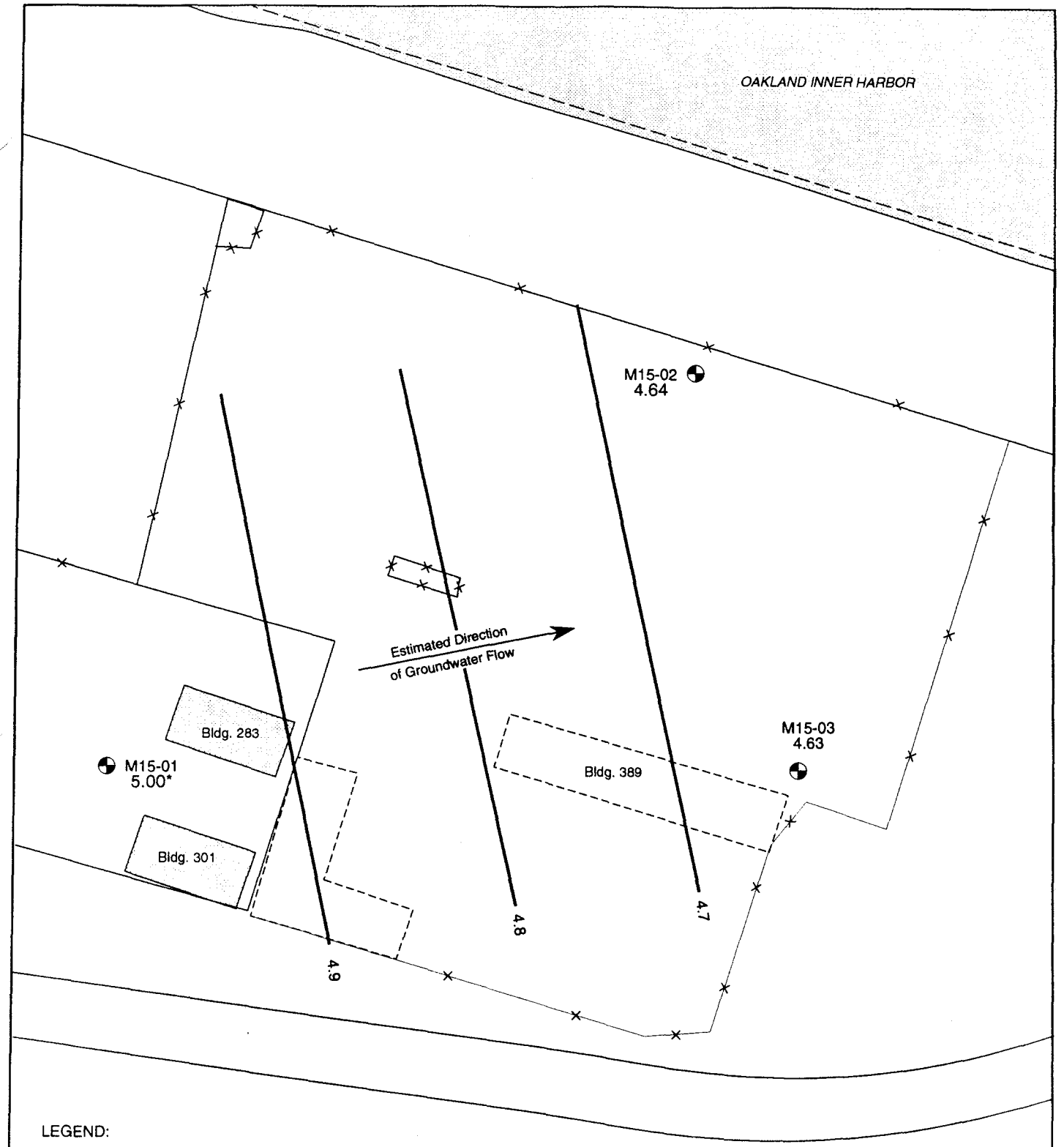
Notes:
1) Soil boring locations surveyed by Nolte & Associates, Walnut Creek, California in October, 1991 relative to California Coordinate System, Zone 3, NAD 27
2) Base map CAD File provided by NAS Alameda

0 25 50
SCALE IN FEET

CTO121 M1/A-18

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 15
GROUNDWATER CONTOUR MAP
1-31-92 HIGH TIDE (0900 HOURS)

FIGURE 3-16



LEGEND:

- Monitoring Well Location
- 5.2 Groundwater Elevation (feet above mean low low water)
- Site
- Former Structure
- Fence

Notes:
1) Soil boring locations surveyed by Nolte & Associates, Walnut Creek, California in October, 1991 relative to California Coordinate System, Zone 3, NAD 27
2) Base map CAD File provided by NAS Alameda
3) Data filtered per Serfes, 1991

0 25 50
SCALE IN FEET

CTO121.M1/A-18

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 15
GROUNDWATER CONTOUR MAP
FILTERED DATA (AVERAGE)
1-30-92 1200 HOURS TO
2-2-92 1200 HOURS

FIGURE 3-17

4.0 SITE 4 - BUILDING 360 - ADDITIONAL WORK

4.1 SITE DESCRIPTION AND BACKGROUND

Site 4 (Initial Assessment Study Site 7) consists of Building 360, located near the eastern perimeter of the base, south of Eleventh Street and north of Avenue K (Figure 4-1). The building occupies approximately 5.5 acres and houses specialized process shops for the repair and testing of aircraft engines. A paint shop, a parts cleaning shop, a plating shop, and machine shops are contained in Building 360. The aircraft engine repair operations have been ongoing at the site since 1954 (Canonie, 1990a). The main portion of the building was investigated in Canonie's Phases 1 and 2A investigation in 1990. The results of Canonie's investigation are currently being reviewed by the PRC team and will be submitted in a separate report. The plating shop area, which was recently closed, was included in the Phases 2B and 3 investigation. On the basis of the Phases 2B and 3 investigation results, additional chemical characterization of the interior of the plating shop was recommended.

4.2 PREVIOUS INVESTIGATION RESULTS

In the Phases 2B and 3 investigation conducted by the PRC team in 1991, one sample of surface dust and one sample of material scraped from the floor were collected inside the plating shop (PRC/JMM 1992). Sampling locations for the scrape sample (W04-01) and the dust sample (W04-02) are shown on Figure 4-2. The dust sample (W04-02) was a composite collected from along the length of the walkway. Both samples were analyzed for metals; analytical results are presented in Table 4-1. Sample results indicated that the metals cadmium, chromium, lead, mercury, nickel, and zinc, which were previously used in the plating and stripping processes, were found on surfaces within the shop.

Total chromium was detected at a concentration of 83,900 mg/kg in the scrape sample and at a concentration of 2,110 mg/kg in the dust sample. The concentration of hexavalent chromium detected in the scrape sample (W04-01) exceeded the total chromium concentration and thus was considered positively biased. Due to the high concentrations of

total chromium present in the scrape and dust samples, the Navy closed the plating shop to personnel working in Building 360 pending further characterization of the plating shop interior.

4.3 CURRENT INVESTIGATION - SCOPE OF WORK

The additional work performed in the plating shop consisted of the collection of 12 wipe and/or scrape samples from surfaces within the plating shop. A total of four scrape samples were collected from the floor, four wipe samples were collected from walls, and four wipe samples were collected from rafters and other fixtures within the plating shop. Samples were collected on June 9, 1992. Due to insufficient sample volume, additional sample was collected at two locations (W04-11 and W04-12) on July 2, 1992. Sampling locations are illustrated on Figure 4-2.

All 12 samples were analyzed for metals plus hexavalent chromium and total cyanide. Analytical results are summarized in Table 4-2. Analytical results for wipe samples are reported as total micrograms per square foot of area wiped ($\mu g/ft^2$).

4.4 CURRENT INVESTIGATION - RESULTS

Samples W04-03 through W04-06 are scrape samples from the floor of the plating shop. All four samples contained apparently elevated concentrations of chromium, lead, and silver. As with previous work at the site, interference from other metals has positively biased the hexavalent chromium results. Many of the reported concentrations for hexavalent chromium are actually greater than the concentrations reported for total chromium. Cadmium, copper, nickel, and zinc concentrations appear to be elevated in samples W04-05 and W04-06. Cyanide was detected in all four of the scrape samples at concentrations ranging from 2.2 to 11.4 mg/kg.

Samples W04-07 through W04-10 are wipe samples from the plating shop walls. Significant concentrations of barium, chromium, nickel, and zinc were detected in all of the samples. As with the scrape samples, interference from other metals has positively biased

the hexavalent chromium data. Cyanide ,was detected in samples W04-07, W04-07Dup, and W04-09 at concentrations ranging from 5,040 to 8,210 $\mu g/ft^2$.

Samples W04-11 through W04-14 are wipe samples from horizontal surfaces found in the plating shop. W04-11 and W04-12 were collected from thick dust deposits found on building structural members located near the ceiling along the western wall of the plating shop. Barium, chromium, copper, lead, nickel, and zinc concentrations appear to be elevated in these samples. Due to insufficient sample volume, cyanide results have not yet been reported for samples W04-11 and W04-12. Additional samples have been collected at these locations and submitted for cyanide analysis. Results for these samples will be submitted with the report documenting the second round of background groundwater sampling.

Sample W04-13 was collected from the top of a light fixture attached to a table located in the northern half of the shop. Sample W04-14 was collected from the work surface of a table located in the center of the shop. As with the samples from the building structural members, these two samples exhibit apparently elevated concentrations of barium, chromium, copper, lead, nickel, and zinc. Cyanide concentrations measured in samples W04-13 and W04-14 are 118,000 and 59,200 $\mu g/ft^2$ respectively.

4.5 CONCLUSIONS

Additional sampling in the plating shop confirmed the previous Phases 2B and 3 findings of elevated levels of metals on surfaces within the inactive shop. In addition, this work indicates cyanide is present on interior surfaces of the plating shop. Sample results will be used to determine appropriate levels of health and safety protection that will be utilized by personnel conducting future work in the shop. These results can also be used by subcontractors working with the Navy in the decommissioning of the shop. Access restrictions previously imposed by the Navy will be maintained.

TABLE 4-1
NAS ALAMEDA - SITE 4 PLATING SHOP
PREVIOUS SURFACE SCRAPE SAMPLE ANALYTICAL RESULTS
INORGANIC CONSTITUENTS

Sample I.D. Date Sampled	Scrape W04-01 09/6/91		Dust W04-02 09/6/91	
PARAMETER REPORTED	**Results**	**DQF**	**Results**	**DQF**
Metals (μg/sq. ft.)				
Aluminum	2280	J	20100	
Antimony	360		200	
Arsenic	6.24		42.2	
Barium	63.3	J	468	J
Beryllium	<0.140		<0.122	
Cadmium	155		1060	
Calcium	8740	J	49800	J
Chromium, Total	839000	J	2110	J
Chromium, Hexavalent	29000000	J	<42.7	
Cobalt	24.8		144	
Copper	948		21400	
Iron	5040	J	37400	J
Lead	13200		1640	
Magnesium	694	J	2190	J
Manganese	59.4	J	244	J
Mercury	0.242		2.54	
Nickel	4920		97200	
Potassium	1520		6760	
Selenium	<0.677	UJ	9.88	J
Silver	28.8		288	
Sodium	20300		6070	
Thallium	<0.290		<0.278	
Vanadium	16.7		51.1	
Zinc	574	J	41500	J

Data from PRC/JMM 1992

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

TABLE 4-2
NAS ALAMEDA - SITE 4 PLATING SHOP
SURFACE SCRAPE AND WIPE SAMPLE ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample I.D.	Scrape W04-03			Scrape W04-04			Scrape W04-05			Scrape W04-06			Wipe W04-07		
Date Sampled	06/9/92			06/9/92			06/9/92			06/9/92			06/9/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Units	**(mg/kg)**			**(mg/kg)**			**(mg/kg)**			**(mg/kg)**			**(μg/sq. ft.)**		
Metals															
Aluminum	5750	J	c,e	2670	J	e	6280	J	e	8010	J	e	8270		
Antimony	3200	J	c,e	2500	J	e	78	J	e	190	J	e	12.7	J	h
Arsenic	8.98	J	c	5.95			13.6			7.41			0.460		
Barium	81.4			81.4			217			230			12300	J	c
Beryllium	<0.501			<0.497			1.47			0.783			<0.500		
Cadmium	38.4	J	c	260			3700			2990			25.1		
Calcium	14300	J	c	2250			26000			13500			4440		
Chromium, Total	28500	J	c	63600			24300			2590			292		
Chromium, Hexavalent	8160000	J	f,i	5720000	J	f,i	53800	J	c,f,i	<205	UJ	f	14000	J	i
Cobalt	67.5			99.4			117			197			46.1		
Copper	438	J	c,e	702	J	e	1360	J	e	1830	J	e	104		
Iron	7390	J	c	19600			158000			35600			1960		
Lead	130000	J	c,f	107000	J	f	5240	J	f	12400	J	f	179		
Magnesium	2720	J	c	564			2600			2090			772		
Manganese	176	J	c	131			1250			319			19.9		
Mercury	0.105			0.789			6.3			1.17			0.04		
Nickel	867			4950			6520			17200			2380		
Potassium	697	J	e,h	304	J	e,h	779	J	e,h	1750	J	e,h	6480		
Selenium	<4.01	UJ	c	<0.404			6.27			23.2			<0.400		
Silver	56.5	J	c	122			714			849			17.6		
Sodium	4670	J	c	1290			1400			11400			20600		
Thallium	<1.70	UJ	g	<1.72	UJ	g	<1.75			<0.344			<21.8	J	h
Vanadium	17.9			38.9			14.7			20.3			1.88	J	h
Zinc	198	J	f	702	J	f	11300	J	f	3840	J	f	8440	J	c
Cyanide	5.2			5.4			2.2			11.4			5040		

Notes:

N/A = Not Analyzed
< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution
i = exceeds total chromium value

E 4-2
NAS ALAMEDA - SITE 4 PLATING SHOP
SURFACE SCRAPE AND WIPE SAMPLE ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample I.D.	Duplicate W04-07			Wipe W04-08			Wipe W04-09			Wipe W04-10			Wipe W04-11		
Date Sampled	06/9/92			06/9/92			06/9/92			06/9/92			06/9/92		
PARAMETER REPORTED	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl
Units	(µg/sq. ft.)			(µg/sq. ft.)			(µg/sq. ft.)			(µg/sq. ft.)			(µg/sq. ft.)		
Metals															
Aluminum	9050			9940			7920			5950			16100		
Antimony	<7.50	J	h	10.6	J	h	19	J	h	<7.50	J	h	115	J	h
Arsenic	<0.380			0.78			<0.380			<0.380			9.72		
Barium	13900			14400			10500			9400			5160		
Beryllium	<0.500			<0.500			<0.500			<0.500			<0.500		
Cadmium	13.9			5.48			31.5			4.66			1530		
Calcium	4710			7960			4510			3180			45600		
Chromium, Total	168			610			3290			716			101000		
Chromium, Hexavalent	<200			1010	J	i	8220	J	i	31000	J	i	136000	J	i
Cobalt	20.4			24.2			216			13.9			190		
Copper	55.2			93.5			183			81.9			3360		
Iron	1110			1970			2960			784			62800		
Lead	93			135			265			148			5020		
Magnesium	781			866			879			548			4300		
Manganese	11.8			19.2			45.7			9.13			4540		
Mercury	0.046			0.395			0.117			0.018			4.39		
Nickel	993			3550			8840			682			23700		
Potassium	7120			7550			5740			5090			5400		
Selenium	<0.400			<0.400	UJ	g	<0.400			1.08			12		
Silver	17.2			10.5			10.9			11.3			914		
Sodium	23100			24200			21100			16600			48900		
Thallium	<21.8	J	h	<21.8	J	h	<21.8	J	h	<21.8	J	h	120	J	h
Vanadium	<1.20	J	h	1.6	J	h	3.66	J	h	<1.20	J	h	53.7	J	h
Zinc	9270			9700			7970			6550			16500		
Cyanide	7680	J	c	<5000			8210			<5000			N/A		-

Notes:

N/A = Not Analyzed
< = Analyte reported below detection limit
DQF = Data qualification flags, defined bel
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution
i = exceeds total chromium value

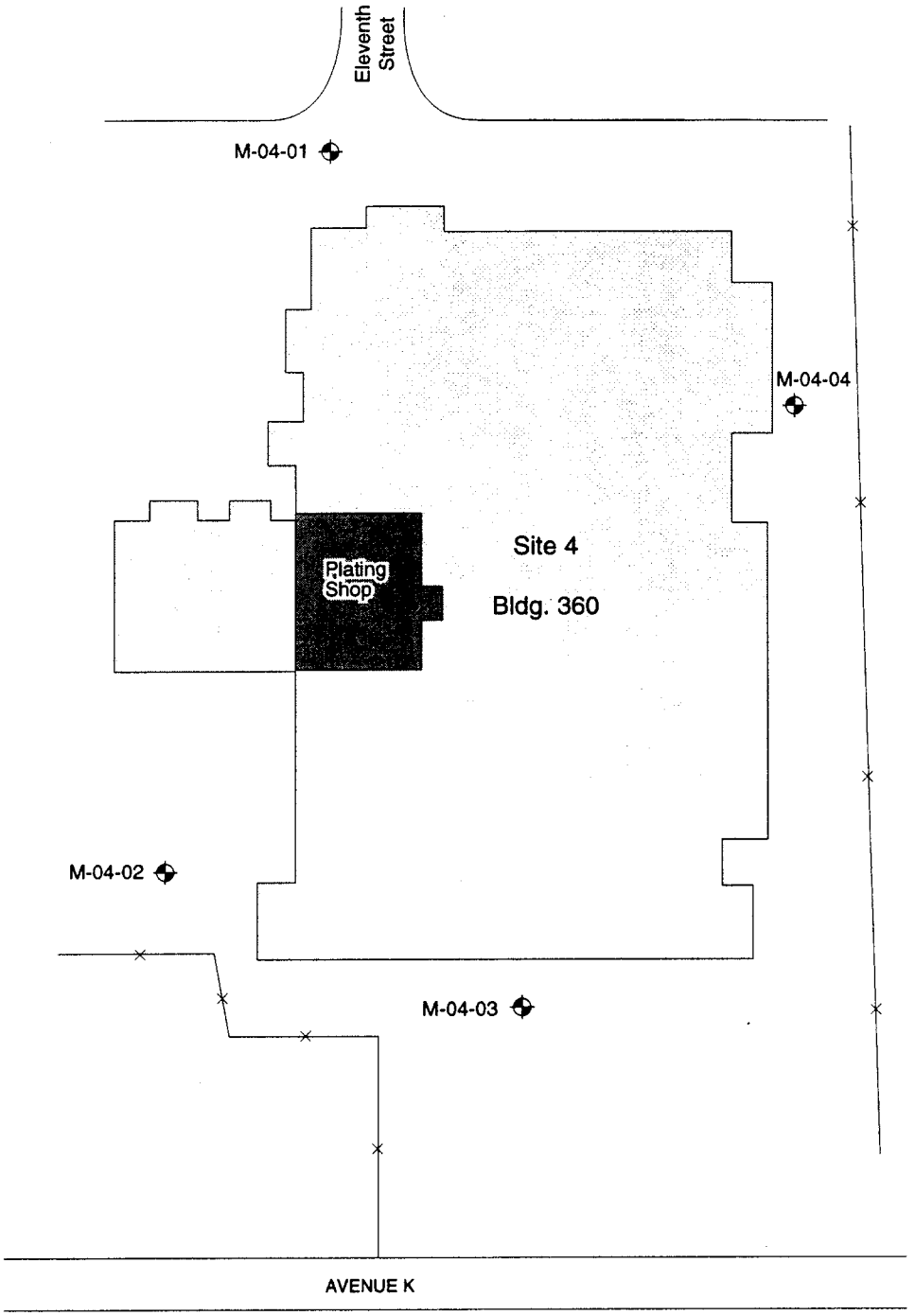
.BLE 4-2
NAS ALAMEDA - SITE 4 PLATING SHOP
SURFACE SCRAPE AND WIPE SAMPLE ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample I.D.	Wipe W04-12			Wipe W04-13			Wipe W04-14		
Date Sampled	06/9/92			06/9/92			06/9/92		
PARAMETER REPORTED	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl
Units	(µg/sq. ft.)			(µg/sq. ft.)			(µg/sq. ft.)		
Metals									
Aluminum	77800			36200			22000		
Antimony	2420	J	h	253	J	h	107	J	h
Arsenic	46.8			7.9			2.84		
Barium	554			4790			10900		
Beryllium	0.576			<0.500			<0.500		
Cadmium	4430			570			6450		
Calcium	252000			16200			13400		
Chromium, Total	47600			24000			13900		
Chromium, Hexavalent	312			16700			32400	J	i
Cobalt	1450			646			363		
Copper	11800			3840			2290		
Iron	174000			48400			36200		
Lead	22600			7670			6010		
Magnesium	13700			4590			3350		
Manganese	2100			573			490		
Mercury	2.55			0.858			0.579		
Nickel	145000			111000			36600		
Potassium	11700			5290			8400		
Selenium	11.1	J	g	3.74			<2.00		
Silver	854			265			829		
Sodium	98100			164000			42800		
Thallium	218	J	h	73.8	J	h	28.7	J	h
Vanadium	138	J	h	45.7	J	h	29.1	J	h
Zinc	79600			15500			13600		
Cyanide	N/A			118000			59200		

Notes:

N/A = Not Analyzed
< = Analyte reported below detection limit
DQF = Data qualification flags, defined bel
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

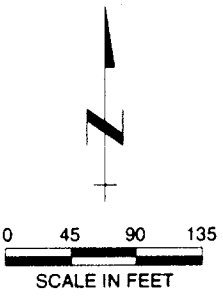
Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution
i = exceeds total chromium value



LEGEND:

Fence

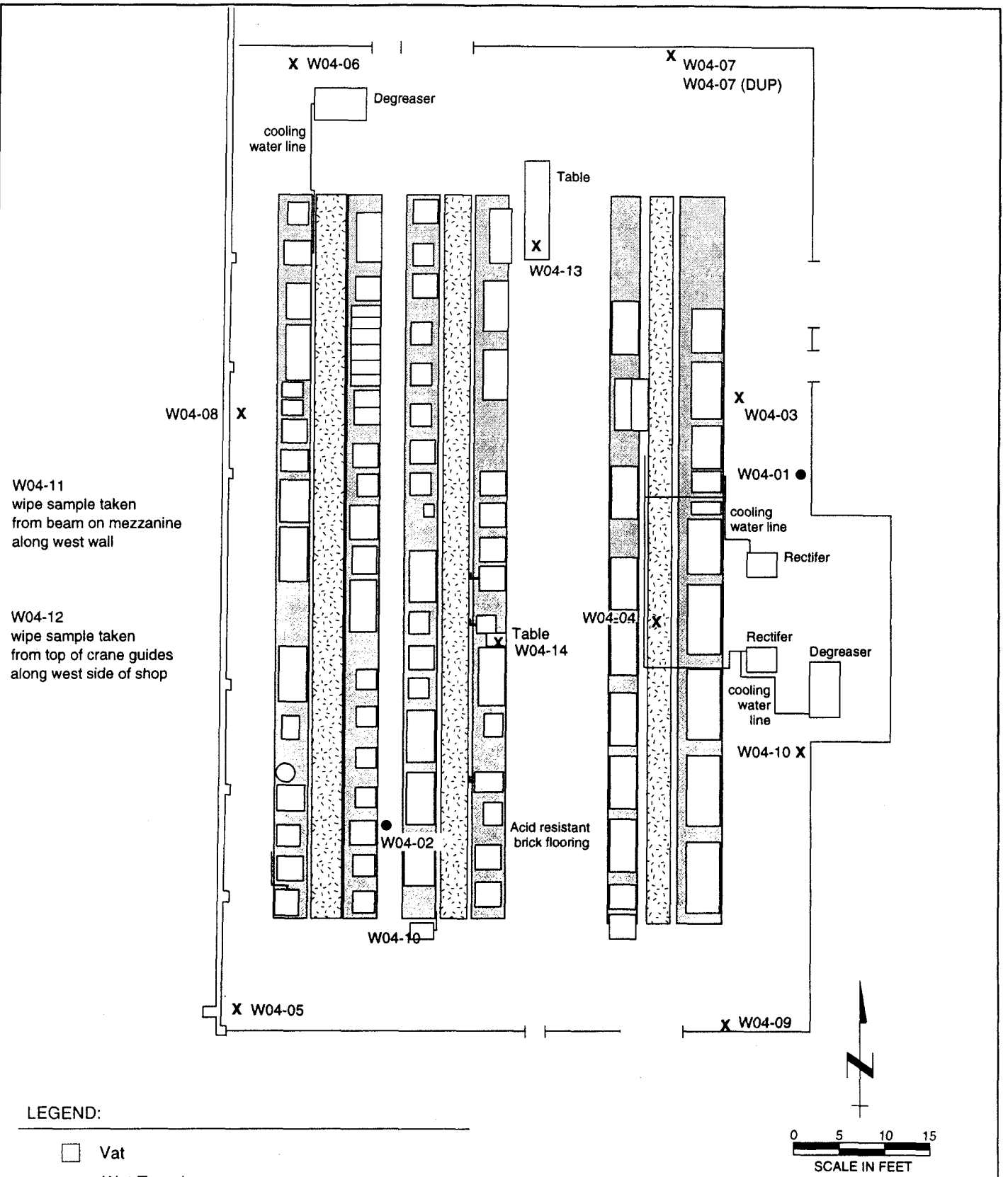
Canonie Monitoring Well Location



A-4

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 4
PLATING SHOP LOCATION MAP

FIGURE 4-1



LEGEND:

- Vat
- Wet Trench
- Dry Trench
- X Wipe or Scrape Sample (Current Study)
- ● Wipe or Scrape Sample (Previous Study)
- Door

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 4
PLATING SHOP
SITE MAP

FIGURE 4-2

CTO121/A-18

5.0 SITE 5 - BUILDING 5 - ADDITIONAL WORK

5.1 SITE DESCRIPTION AND BACKGROUND

Site 5 consists of Building 5 and is located between First and Second Streets, and Avenues C and F (Figure 5-1). The building is the largest on base and covers approximately 18.5 acres. The building has been in operation since 1942 and houses shops used for cleaning, reworking, and manufacturing metal parts; tool maintenance; plating; and painting operations (Canonie 1990a). The paint shop contains two paint bays and several smaller paint spray booths. Processes in the plating shop include degreasing, caustic and acid etching, metal stripping and cleaning, and chrome, nickel, silver, cadmium, and copper plating.

Prior to 1972, the wastewater from operations in Building 5 was discharged without pretreatment to the base industrial sewers, the bulk of which emptied into the Sea Plane Lagoon. From 1972 until 1991, the wastewater from the plating shop was split into two waste streams, one from the alkaline tanks and one from the cyanide tanks. The wastewater streams were kept separate until the cyanide stream was treated in a cyanide destruction unit. The two waste streams were then routed together to a treatment plant.

The Phases 2B and 3 investigation conducted in 1991 included the investigation of soil and groundwater quality around the perimeter of Building 5. After completion of the Phases 2B and 3 work, five areas in or around Building 5 were identified for detailed investigation. These areas are a plating shop, a selective plating shop, the wastewater treatment area, a former hazardous waste storage area, and a battery storage area. The locations of these areas and the borings installed in them are shown on Figure 5-1.

The plating shop is an area where aircraft parts were plated using both cyanide and chromium processes. It was closed in June of 1990, when a replacement facility was opened in another part of the base. The plating shop is currently inactive with the exception of two rinse tanks. These tanks are used to rinse parts that have been plated by

hand in the selective plating shop. The plating shop is locked and generally the only personnel in the plating shop are selective plating shop employees using the rinse tanks.

The selective plating shop is an area where individual small items, or selected portions of larger items, are plated by hand. Bulk plating is not done at this shop. A floor drain in the selective plating shop was formerly used to discharge spent fluids to the sewer system. The spent fluids entered the industrial waste sewer system without pretreatment. The selective plating shop is still active. Spent plating fluids are no longer discharged to the floor drain.

The wastewater treatment area contains sumps which were used to store cyanide and chrome-containing wastewaters prior to pretreatment. In the past, the area served the plating shop, the cleaning shop, and the conversion coating area. The wastewater streams from the cyanide and chrome process lines in the plating shop were held in separate sumps until the cyanide wastewater stream was treated in a cyanide destruction unit. Since the plating shop was closed in June of 1990, the wastewater treatment area serves only the cleaning shop and the conversion coating area. The inactive cyanide destruction unit is still located in the wastewater treatment area.

The former hazardous waste storage area was closed in mid-1988. Drummed wastes formerly stored in the area included spent solvents, waste paint, and waste oil. This area is currently used to store drummed hydraulic fluid and lubricating oils. The site is fenced and access is restricted to maintenance personnel.

Lead/acid and nickel/cadmium batteries are serviced in the battery storage area. In the past, battery fluids were discharged to a sink located in the storage area. The sink discharged to the base industrial sewer system. Base personnel indicate that the corrosive fluids resulted in deterioration of the piping in the sink and drain that led to the sewer system (Fetherston 1992). Battery fluids are currently collected on site for proper disposal.

5.2 PREVIOUS INVESTIGATION - RESULTS

The Phases 2B and 3 investigation in the vicinity of Building 5 included the installation of 13 borings and the construction of monitoring wells in 5 of the borings. The VOC carbon disulfide, 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethane (1,1-DCA), chloroethane, tetrachloroethene (PCE), trichloroethene (TCE), vinyl chloride, methyl ethyl ketone, methylene chloride, toluene, ethylbenzene, and xylenes as well as SVOC classified as PAH were detected in Site 5 soils. Groundwater samples from Site 5 wells contained the VOC TCA, DCA, 1,1-dichloroethylene, 1,2-dichloroethene, TCE, vinyl chloride, chloroethane, and the fuel constituents ethylbenzene, toluene, and xylenes. SVOC detected in Site 5 wells included PAH, 2,4-dimethylphenol, bis(2-chloroethyl)ether, and bis(2-ethylhexyl)phthalate. The results of the Phases 2B and 3 investigation were submitted by the Navy to the regulatory agencies in April 1992 (PRC/JMM 1992).

5.3 CURRENT INVESTIGATION - SCOPE OF WORK

The scope of work for each of the five areas in and around Building 5 is described below. This section also describes modifications to the approved scope of work and explains the changes. Boring logs for borings at Site 5 are included as Appendix A. Survey data are included as Appendix B.

5.3.1 Plating Shop

The Building 5 plating shop is constructed with a raised wooden floor approximately 3 feet above a concrete sub-floor. A dividing wall in the concrete sub-floor separates the cyanide process line from the chrome process line. Two 18-foot deep sumps, one located on either side of the dividing wall, were used to collect wastewater discharged from the plating process lines. Sump pumps are located in each of the sumps. The pumps discharge to the base industrial sewer system via the Building 5 wastewater treatment area, which formerly treated the waste stream in a cyanide destruction unit.

The scope of work for investigation in the plating shop included drilling ten boreholes through the Building 5 plating shop floor; five on each side of the dividing wall separating the cyanide processes from the chromium processes. Eight of the boreholes were to be advanced to a depth of 5 feet (anticipated to correspond to the capillary zone above the water table). The two remaining boreholes were to be drilled to a depth of 23 feet adjacent to the 18-foot deep sumps used to drain the concrete sub-floor.

At the time of the investigation in the Building 5 plating shop, the pump in the cyanide process line sump was not functioning. Approximately 6 inches of water and/or plating fluids were present on the concrete sub-floor on the cyanide side of the dividing wall. Repeated attempts to start the pump failed. Since cutting the sub-floor to allow soil sampling would have resulted in the water and/or plating fluids draining into soils below the building, sampling underneath the cyanide process line was eliminated. Thus, only four shallow borings and one deep boring were installed on the chrome process line side of the plating shop. Boring locations are shown on Figure 5-2. All soil samples were analyzed for target analyte list (TAL) metals plus hexavalent chromium, cyanide, pH, and VOC.

One grab groundwater sample was collected from each of the five borings (four 5-feet deep and one 18-feet deep). The groundwater samples were analyzed for TAL metals plus hexavalent chromium, cyanide, and VOC.

Twelve samples were collected from the interior of the Building 5 plating shop. Four discrete scrape samples were collected from the floors, four wipe samples were collected from the walls, and four wipe samples were collected from piping and other overhead fixtures. All 12 samples were analyzed for TAL metals plus hexavalent chromium, and cyanide.

5.3.2 Selective Plating Shop

One subsurface soil sample was collected from a borehole drilled adjacent to the floor drain used to discharge spent fluids. The sample was collected from a depth approximately equal to the bottom of the elbow beneath the drain (6 inches below the concrete floor). The

sample was analyzed for TAL metals plus hexavalent chromium, cyanide, pH, total solids, TOC, and VOC.

5.3.3 Wastewater Treatment Area

The scope of work originally included drilling two boreholes adjacent to the sumps used to store wastewater prior to pretreatment. One borehole was to be drilled adjacent to the cyanide wastewater sump; one borehole was to be drilled adjacent to the chromium wastewater treatment sump. The borings were to be drilled to a depth of approximately 15 feet in the wastewater treatment area, estimated to be the depth of the sumps.

Due to the presence of numerous underground utilities, and the presence of aboveground water treatment equipment, drilling immediately adjacent to the sumps was not possible. The borings were instead located approximately 20 feet downgradient of the sumps, based on groundwater flow data gathered during the Phases 2B and 3 investigation (Figure 5-1; PRC/JMM 1992). In addition, inspection of the sumps at the time of drilling indicated that they were approximately 10 feet deep rather than 15 feet. Thus, the borings were terminated at a depth of 10 feet.

One soil sample was collected from each borehole at a depth equal to the depth of the bottom of the sumps (10 feet). The soil samples were analyzed for TAL metals plus hexavalent chromium, cyanide, VOC, SVOC, and pH. One soil sample was analyzed for TOC. A grab groundwater sample was collected from the open boreholes. Groundwater samples were analyzed for TAL metals plus hexavalent chromium, cyanide, VOC, SVOC, and total dissolved solids (TDS).

5.3.4 Former Hazardous Waste Storage Area

Two borings were drilled in the former hazardous waste storage area (Figure 5-1). A monitoring well was constructed in the boring located at the downgradient side of the area. Four soil samples from each boring (8 total) were submitted for analysis of TAL metals plus hexavalent chromium, cyanide, pH, VOC, and SVOC. The groundwater sample

collected from the downgradient monitoring well was analyzed for TAL metals plus hexavalent chromium, cyanide, VOC, SVOC, and TDS.

5.3.5 Battery Storage Area

One borehole was drilled outside the battery storage area where the sink discharges to the industrial sewer (Figure 5-1). Four soil samples were collected from the boring. One additional soil sample was collected inside the battery storage area, immediately adjacent to where the piping from the sink enters the floor. All soil samples were analyzed for TAL metals plus hexavalent chromium, cyanide, pH, VOC, and SVOC. One of the soil samples from the boring was analyzed for TOC. The monitoring well constructed in the borehole was sampled and analyzed for TAL metals plus hexavalent chromium, cyanide, VOC, SVOC, and TDS.

5.4 GEOLOGY/HYDROGEOLOGY

Sediments encountered during drilling at Building 5 consisted of medium- to coarse-grained silty sand to sand. Clay to silty clay was encountered at approximately 13 feet in borings in the former hazardous waste storage area, the battery storage area, and in the plating shop. These units are consistent with those previously identified in the vicinity of Building 5 during the Phases 2B and 3 investigation (PRC/JMM 1992).

Groundwater was encountered at a depth of approximately 5 feet below ground surface at all locations, consistent with Phases 2B and 3 investigation results (PRC/JMM, 1992).

5.5 CURRENT INVESTIGATION - RESULTS

This section presents the results of the current investigation.

5.5.1 Plating Shop

Results for samples collected in the Building 5 plating shop are discussed below. Results

for scrape samples are reported in units of mg/kg. Results for wipe samples are reported in units of $\mu g/ft^2$.

5.5.1.1 Wipe and Scrape Samples.

Analytical results for scrape and wipe samples collected in the Building 5 plating shop are summarized in Table 5-1. Samples W05-01 through W05-04 are scrape samples collected from the elevated wooden floor of the plating shop. All four of the samples have apparently elevated concentrations of total chromium and hexavalent chromium. Sample W05-01 contained the highest total chromium concentration detected in scrape samples (12,100 mg/kg). This sample was collected from flooring immediately adjacent to a tank labeled "Hot Chrome Strip (Caustic Soda)" on engineering drawings of the shop.

Hexavalent chromium was detected in samples W05-02, W05-03, and W05-04 at concentrations ranging from 186 mg/kg to 799 mg/kg. The hexavalent chromium result for sample W05-01 exceeds the total chromium result, probably as the result of interference from other metals. The result is qualified as an estimate.

In addition, cadmium, lead, nickel, and zinc were detected in all four scrape samples. The highest levels of cadmium were detected in samples W05-03 and W05-04. Sample W05-03 was collected adjacent to a tank labeled "Cadmium Plate;" sample W-05-04 was collected 21 feet west of sample W05-03. These samples (W05-03 and W05-04) also contained the highest levels of lead detected in scrape samples. Sample W05-01 contained nickel at a concentration of 15,100 mg/kg. This sample was collected approximately 10 feet west of a tank labeled "Nickel Strike" and 12 feet west of a tank labeled "Hot Nickel Plate." Zinc was detected in all four scrape samples at concentrations ranging from 92.9 to 1,850 mg/kg.

Samples W05-03 and W05-04 were collected from the wooden flooring underneath the cyanide process line. These samples contained cyanide at concentrations of 138 and 65.5 mg/kg, respectively. Sample W05-02, collected from flooring on the chrome process line portion of the shop, contained 1.6 mg/kg of cyanide. No cyanide result was reported for

sample W05-01 due to insufficient sample volume. Additional sample was collected at this location and results will be reported later with the second round of background groundwater sample results.

Samples W05-05 through W05-08 are wipe samples collected from the four plating shop walls. All four samples contained cadmium, chromium, lead, nickel, and zinc. The highest levels of lead, nickel, and zinc detected in wipe samples were found in sample W05-08. This sample was collected from the northern wall of the plating shop. Sample W05-06, collected along the eastern wall of the shop adjacent to a doorway, contained total chromium at a concentration of 4,500 $\mu g/ft^2$. Sample W05-05 contained the highest concentration of cadmium detected in wipe samples (370 $\mu g/ft^2$). Hexavalent chromium was identified in three of the four wipe samples collected from the plating shop walls. In sample W05-07, the hexavalent chromium concentration exceeds the total chromium concentration and the result is considered a positively biased estimate.

Cyanide was detected in sample W05-05 at a concentration of 5,570 $\mu g/ft^2$. This sample was collected from the southwestern corner of the plating shop, in the portion of the shop where cyanide processes were performed.

Samples W05-09 through W05-12 are wipe samples collected from the top surfaces of overhead duct work related to the ventilation system in the plating shop. The highest concentrations of cadmium, total chromium, lead, nickel, and zinc detected in wipe samples from the ducts were found in sample W05-11. This sample was collected from duct work located in the south-central portion of the shop, in the vicinity of tanks labeled "Cadmium Plate," "Silver Strike," and "Cad Plate Barrel." This sample also contained the highest levels of aluminum, antimony, arsenic, cobalt, copper, iron, magnesium, manganese, mercury, silver, thallium, and vanadium detected in the 12 samples collected within the interior of the plating shop. This was also the only sample collected in the interior of the plating shop in which selenium was detected.

Cyanide was detected in all four samples collected from the duct work at concentrations ranging from 9,260 to 541,000 $\mu g/ft^2$. The highest concentrations were identified in

samples W05-11 (541,000 $\mu g/ft^2$) and W05-12 (83,900 $\mu g/ft^2$) which were collected from duct work above the former cyanide process line.

5.5.1.2 Volatile Organic Compounds - Soil Samples

Eleven soil samples and one duplicate sample (duplicate of the 18-foot sample from boring B-05PS) were collected from the Site 5 plating shop. The results of VOC analyses of these soil samples are found in Table 5-2. Only compounds that were detected in at least one of the samples are listed on the table. Compounds that are not listed were not detected in any of the samples.

Acetone was detected in all 12 soil samples. After data validation, all of the detections are considered non-detected estimates due to method blank contamination. Chloroethane was detected only in the duplicate of the 18-foot sample from boring B-05PS-01, at a concentration of 16 $\mu g/kg$. 1,1,1-Trichloroethane was detected only in the surface sample of boring B-05PS-02, at a concentration of 27 $\mu g/kg$.

5.5.1.3 Inorganic Constituents - Soil Samples.

The results of inorganic analyses of soil samples collected from the Site 5 plating shop are found in Table 5-3. All of the soil samples were analyzed for TAL metals and cyanide.

The concentrations of metals in the soil samples from the Site 5 plating shop were compared to the upper limit of the 95%/95% statistical tolerance interval computed for the background soil samples discussed in Section 2.6. Samples with concentrations greater than the upper limit of the statistical tolerance interval may represent elevated concentration with respect to background. Beryllium concentrations exceed the upper limit in the surface samples from borings B-05PS-04 and B-05PS-05. Cadmium concentrations exceed the upper limit in nine of the samples. At least one sample from each boring has a cadmium concentration that exceeds the limit. The highest cadmium concentration is found in the sample from 18-feet in boring B-05PS-01. Chromium concentrations also exceed the upper limit in nine samples, though not the same nine as cadmium. As with cadmium, each

boring has at least one chromium sample that exceeds the upper limit, and the highest concentration of chromium was found in the sample from 18-feet in B-05PS-01. Lead and mercury concentrations exceed the upper limit in only the surface sample of boring B-05PS-01. Vanadium concentrations exceed the upper limit in only the surface samples of borings B-05PS-03, B-05PS-04, and B-05PS-05. The significance of these results will be evaluated in the risk assessment conducted as part of Phase 7.

Cyanide was detected in 10 of the 12 samples at a concentration ranging from 0.2 mg/kg to 2.9 mg/kg.

5.5.1.4 Volatile Organic Compounds - Groundwater Samples

Grab groundwater samples were collected from each of the five borings in the Site 5 plating shop. Additionally a duplicate of sample B-05PS-01 was collected. The results of the organic analyses for groundwater samples are found in Table 5-4. The table lists only those compounds detected in at least one sample

The chlorinated hydrocarbons chloroethane, 1,1-dichloroethane, 1,1-dichloroethylene, 1,1,1-trichloroethane were detected in groundwater samples from the Site 5 plating shop. Chloroethane was detected in B-05PS-01 and B-05PS-05 at a concentration of 1,500 μg/L and 160 μg/L, respectively. It was not detected in the other samples. 1,1-Dichloroethane and 1,1,1-trichloroethane were detected in all of the samples. The 1,1-dichloroethane concentration ranged from 56 μg/L to 13,000 μg/L and the 1,1,1-trichloroethane concentration ranged from 59 μg/L to 790,000 μg/L. The lowest concentration of both compounds was found in B-05PS-05 and the highest concentration was found in B-05PS-04. 1,1-Dichloroethylene was detected in all of the samples except B-05PS-01 and its duplicate. The concentration ranged from 6.6 μg/L in B-05PS-05 to 9,200 μg/L in B-05PS-04.

Vinyl chloride was detected only in B-05PS-05 at a concentration of 5.9 μg/L.

5.5.1.5 Inorganic Constituents - Groundwater Samples.

The results of the inorganic analyses of the groundwater samples collected at the Site 5 plating shop are found in Table 5-5. The groundwater samples were analyzed for TAL metals, cyanide, and TDS.

The concentration of metals found in the groundwater beneath the Site 5 plating shop were compared to the upper limit of the 95%/95% statistical tolerance interval for background groundwater samples computed in Section 2.7. Background concentrations appear to be exceeded for aluminum, cadmium, chromium, lead, nickel, and zinc in all of the groundwater samples. Concentrations exceed the upper limit of the tolerance interval for arsenic and silver in one sample, beryllium in two samples, cobalt in three samples, mercury in four samples, and vanadium in three samples.

Cyanide was detected in all of the samples. The concentration ranged from 166 μg/L in the duplicate of B-05PS-01 to 4,550 μg/L in both B-05PS-04 and B-05PS-05.

When compared to the State Water Resources Control Board's limit of 3,000 mg/L, only samples B-05PS-03 and B-05PS-04 are considered saline.

5.5.2 Selective Plating Shop

The single soil sample collected from the selective plating shop was analyzed for VOC, metals, and cyanide. VOC and cyanide were not detected in the soil sample. The results of inorganic analyses are presented in Table 5-6. Metals results were compared to the 95%/95% statistical tolerance interval of the background soil samples, described in Section 2.6 of this report. Only cadmium, at a concentration of 113 mg/kg, and chromium, at a concentration of 110 mg/kg, appear to be above background concentrations. The significance of these results will be evaluated in the risk assessment conducted as part of Phase 7. The hexavalent chromium result appears to be positively biased because it is greater than the result reported for total chromium.

5.5.3 Wastewater Treatment Area

Two soil samples were collected and analyzed for VOC, SVOC, metals and cyanide. Analytical results for VOC and SVOC in soil are summarized in Table 5-7. Only compounds that were detected in at least one of the samples are listed in the summary table. Target compounds for the VOC and SVOC analyses that were not identified in either of the samples were omitted from the table. Analytical results for inorganic constituents in soil are presented in Table 5-8.

Two grab groundwater samples were collected from the borings drilled in the wastewater treatment area. Analytical results for organic analyses on groundwater samples are summarized in Table 5-9. Only compounds that were detected in one or both of the samples are listed on the summary table. Target VOC or SVOC compounds not listed on the table were not detected in either sample. The laboratory missed the holding time for the SVOC analyses for sample B-05WT-02. The sample has been recollected and results will be submitted with the results of the second round of background groundwater sampling. Analytical results for inorganic constituents in groundwater are presented in Table 5-10.

5.5.3.1 Volatile Organic Compounds - Soil Samples.

Acetone was the only VOC detected. It was detected in both samples. After data qualification both of the results were qualified as non-detected estimates to method blank contamination.

5.5.3.2 Semivolatile Organic Compounds - Soil Samples.

SVOC detected included three PAH (naphthalene, phenanthrene, and 2-methylnaphthalene) and two phthalates [bis(2-ethylhexyl) phthalate and di-n-butylphthalate]. Bis(2-ethylhexyl) phthalate was detected in both samples. After review of laboratory QA/QC data, both of the detections are qualified as non-detected estimates. The PAH compounds and

di-n-butylphthalate were only detected in the 10-foot sample from boring B-05WT-01. Strong hydrocarbon odors were noted during drilling of this boring.

5.5.3.3 Inorganic Constituents - Soil Samples.

When compared to the 95%/95% statistical tolerance interval for the background soil samples, described in Section 2.6, none of the metals appear to be present in concentrations significantly above background concentrations. Cyanide was not detected in either sample.

5.5.3.4 Volatile Organic Compounds - Groundwater Samples.

Ten VOC were detected in grab groundwater samples from the wastewater treatment area (Table 5-9). The solvents chlorobenzene, chloroethane, 1,1-dichloroethane, 1,2-dichloroethene, ethylbenzene, vinyl chloride, and xylene were detected in both samples at concentrations ranging from 12 to 660 μg/L. Methylene chloride was only detected in sample B-05WT-02 at a concentration of 25 μg/L. Toluene was only detected in sample B-05WT-01 at a concentration of 30 μg/L. Acetone was detected in sample B-05WT-01 at a concentration of 17 μg/L. After review of laboratory QA/QC data, acetone was qualified as a non-detected estimate on the basis of method blank contamination.

5.5.3.5 Semivolatile Organic Compounds - Groundwater Samples.

Six SVOC were detected in sample B-05WT-01. They are bis(2-ethylhexyl)phthalate, di-n-butylphthalate, 1,2-dichlorobenzene, 2,4-dimethylphenol, 4-methylphenol, and napthalene. The bis(2-ethylhexyl)phthalate result was qualified as a non-detected estimate on the basis of method blank contamination. The maximum concentration detected was for the SVOC 2,4-dimethylphenol, present at 8.5 μg/L.

5.5.3.6 Inorganic Constituents - Groundwater Samples.

The results for inorganic analyses of groundwater samples from the wastewater treatment area are found in Table 5-10. Based upon a comparison with the 95%/95% statistical

tolerance interval of background groundwater samples, described in Section 2.6, several metals appear to be present in groundwater at concentrations greater than background. Chromium and zinc in B-05WT-01 appear to be above background concentration. Aluminum, beryllium, chromium, cobalt, lead, nickel, vanadium, and zinc in sample B-05WT-02 appear to be above background concentration. The significance of these results will be evaluated in the risk assessment conducted under Phase 7. Cyanide was detected in both samples.

5.5.4 Former Hazardous Waste Storage Area

Four soil samples were collected from each of two borings drilled in the former hazardous waste storage area. Additionally, a duplicate of the 10-foot sample from B-05HW-02 was collected. Organic compounds detected in the soil samples are found in Table 5-11. This table only lists compounds that were detected in at least one sample from the site. Target compounds that are not listed on the table were not detected in any of the samples. Analytical results for inorganic constituents in soil are summarized in Table 5-12. Analytical results for organic compounds detected in the groundwater sample are summarized in Table 5-13; inorganic analyses results are presented in Table 5-14.

5.5.4.1 Volatile Organic Compounds - Soil Samples

Acetone, tetrachloroethene, and vinyl chloride were the only VOC that were detected in the soil samples. Acetone was detected in eight of the nine samples. After data validation all of the detections were qualified as non-detected estimates on the basis of method blank contamination. Tetrachloroethene was detected only in the surface sample from boring M-05HW-01 and vinyl chloride was detected only in the 10-foot sample from boring M-05HW-01.

5.5.4.2 Semivolatile Organic Compounds - Soil Samples

With the exception of bis(2-ethylhexyl)phthalate all of the SVOC detected in the soil samples are PAH. PAH were only detected in the 10-foot sample from boring

M-05HW-01. Bis(2-ethylhexyl)phthalate was detected in six samples. After data validation, all of the detections are considered non-detected estimates due to method blank contamination.

5.5.4.3 Inorganic Constituents - Soil Samples

The results of inorganic soil analyses are presented in Table 5-12. Cyanide was not detected in any of the samples. When compared to the 95%/95% statistical tolerance interval of the background soil samples, no metals appear to be above background.

5.5.4.4 Volatile Organic Compounds - Groundwater Samples

Analytical results for VOC in the groundwater sample from the hazardous waste storage area are summarized in Table 5-13. Six VOC were detected in the groundwater sample and the duplicate groundwater sample collected from monitoring well B-05HW-01. The VOC detected are common solvents including chlorobenzene, 1,1-dichloroethane, 1,1-dichloroethylene, tetrachloroethene, trichloroethene, and vinyl chloride. These compounds were detected at concentrations ranging from 2.1 to 97 μg/L.

5.5.4.5 Semivolatile Organic Compounds - Groundwater Samples

Bis(2-ethylhexyl)phthalate was detected in both the sample and the duplicate. After review of laboratory QA/QC data, the result was considered a non-detected estimate due to method blank contamination.

The PAH pyrene was identified at low concentrations in both the sample and the duplicate. Pyrene was also detected in soil samples collected from this boring. Bis(2-chloroisopropyl)ether, and 1,2-, 1,3-, and 1,4-dichlorobenzene were detected at concentrations ranging from 1.2 to 44 μg/L.

5.5.4.6 Inorganic Constituents - Groundwater Samples

Analytical results for inorganic constituents in groundwater are presented in Table 5-14. Only nickel was present at levels in excess of the 95%/95% statistical tolerance interval. The significance of this result will be evaluated in the risk assessment performed for Phase 7.

5.5.5 Battery Storage Area

Five soil samples were collected from two borings drilled at the battery storage area. Four samples were collected from M-05BS-01, in which a groundwater monitoring wall was later constructed. A surface sample was collected from B-05BS-02, located inside Building 5 near the drain used to discharge spent battery fluids.

Analytical results for organic compounds in the battery storage area soil samples are summarized in Table 5-15. Target compounds that were not detected in soil samples are not listed on the table. Analytical results for inorganic constituents in soils are presented in Table 5-16. Tables 5-17 and 5-18 present the results of organic and inorganic constituents in groundwater, respectively.

5.5.5.1 Volatile Organic Compounds - Soil Samples

Acetone was the only VOC detected in battery storage area soil samples. It was detected in three of the five samples. After data validation, all of the acetone results are qualified as non-detected estimates on the basis of method blank contamination.

5.5.5.2 Semivolatile Organic Compounds - Soil Samples

Two SVOC were detected in the soil samples. Bis(2-ethylhexyl)phthalate was detected in four samples. After data validation, all of the bis(2-ethylhexyl)phthalate results were qualified as non-detected estimates on the basis of method blank contamination. The PAH

pyrene was detected in the sample collected from a depth of 15-feet in boring M-05BS-01 at a concentration of 260 μg/kg.

5.5.5.3 Inorganic Constituents - Soil Samples

The results of inorganic analyses for soil samples collected at the battery storage area are found in Table 5-16. The lead result for 3-foot sample in boring M-05BS-01 appears to be above background when compared to the 95%/95% statistical tolerance interval computed for the background soil samples. The significance of this result will be evaluated in the risk assessment performed for Phase 7. All other metals results appear to be within background levels. Cyanide was not detected in any of the soil samples.

5.5.5.4 Volatile Organic Compounds - Groundwater Samples

One groundwater sample was collected from well M-05BS-01. The results of organic analyses for groundwater samples are found in Table 5-17. The VOC benzene, 1,1-dichloroethane, 1,1-dichloroethylene, 1,2-dichloroethene, trichloroethene, and vinyl chloride were detected at concentrations ranging from 1.2 μg/L to 98 μg/L.

5.5.5.5 Semivolatile Organic Compounds - Groundwater Samples

The SVOC bis(2-chloroethyl)ether, bis(2-ethylhexyl)phthalate, and dimethylphthalate were detected in the groundwater sample from M-05BS-01. The bis(2-ethylhexyl)phthalate result was qualified as a non-detected estimate on the basis of method blank contamination. Bis(2-chloroethyl)ether and dimethylphthalate were present at concentrations of 4.7 and 2.2 μg/L, respectively.

5.5.5.6 Inorganic Constituents - Groundwater Samples

Inorganic analytical results for the groundwater sample are found in Table 5-18. None of the metals results appear to be above background levels when compared to the upper limit of the 95%/95% statistical tolerance interval computed for background water samples.

5.6 CONCLUSIONS

Conclusions for the various areas investigated in Site 5 are presented below.

5.6.1 Plating Shop

Apparently elevated levels of metals were detected on surfaces within the plating shop. These results will be considered when health and safety protection is selected for personnel performing future work in the plating shop. In addition, these results may be used by the Navy and its subcontractor when the plating shop is decommissioned.

Low levels of solvents were detected in soils beneath the plating shop. The metals beryllium, cadmium, chromium, lead, mercury, and vanadium were detected in soils beneath the plating shop at levels in excess of the 95%/95% statistical tolerance interval. These levels may indicate that activities in the plating shop have impacted soil beneath the shop.

Groundwater beneath the plating shop contained relatively high levels of common industrial solvents and their transformation products. These compounds were also detected in wells previously installed in the Phases 2B and 3 investigation around the perimeter of Building 5 (PRC/JMM 1992). In addition, cyanide was detected in all groundwater samples collected from beneath the plating shop during the current investigation.

The metals aluminum, cadmium, chromium, lead, nickel, and zinc were identified at levels in excess of background concentrations in all groundwater samples collected beneath the plating shop. Arsenic, beryllium, cobalt, copper, mercury, silver, and vanadium were present in excess of background concentrations in one or more samples. The presence of metals and cyanide in groundwater beneath the plating shop is probably related to past plating activities.

5.6.2 Selective Plating Shop

Soil samples from the selective plating shop contained cadmium and chromium in excess of background levels, again indicating probable impacts from past operations.

5.6.3 Wastewater Treatment Area

Soil samples collected downgradient of the wastewater treatment area contained PAH and phthalates. No cyanide or metals in excess of background levels were identified in soils. Groundwater downgradient of the wastewater treatment system contained common industrial solvents, phthalates, PAH, phenols, and cyanide, and the metals aluminum, beryllium, chromium, cobalt, lead, nickel, vanadium, and zinc in excess of background levels. These compounds may be related to releases from the wastewater treatment area sumps or may be related to other sources. Solvents and phenols were also detected in well M05-03, installed upgradient of the wastewater treatment area as part of the Phases 2B and 3 investigation. However, these compounds were present at lower concentrations in the upgradient well (PRC/JMM 1992).

5.6.4 Former Hazardous Waste Storage Area

Soils in the former hazardous waste storage area contained low levels of solvents and one sample contained relatively high levels of PAH. No metals were detected in soils in excess of background concentrations. Groundwater in the former hazardous waste storage area contained common industrial solvents at relatively low levels. These compounds were not identified in soils at the site and thus do not appear to be related to past storage practices at the site.

5.6.5 Battery Storage Area

Lead was detected in excess of background levels in one sample from the battery storage area. Lead may be related to past disposal practices of lead-acid battery fluids. Groundwater in the vicinity of the battery storage area contained common industrial

solvents, phthalates, and ethers. Metals were not identified in excess of background levels in the groundwater sample from the battery storage area. The solvents and phthalates identified in groundwater have been detected in numerous wells at Site 5 and are probably not related to past practices in the battery storage area.

TABLE
NAS ALAMEDA - SITE 5 PLATING SHOP
SURFACE SCRAPE AND WIPE SAMPLE ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample I.D.	Scrape W05-01			Scrape W05-02			Scrape W05-03			Scrape W05-04			Wipe W05-05		
Date Sampled	06/9/92			06/9/92			06/9/92			06/9/92			06/9/92		
PARAMETER REPORTED	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl
Units	(mg/kg)			(mg/kg)			(mg/kg)			(mg/kg)			(µg/sq. ft.)		
Metals															
Aluminum	28800	J	e	678	J	e	8190	J	e	9320	J	e	5700		
Antimony	<39	UJ	e,h	<7.6	UJ	e,h	34	J	e,h	21	J	e,h	<7.50		
Arsenic	3			<0.390			2.58			2.79			0.88		
Barium	611	J	f	37.9	J	f	416	J	f	1190	J	f	8670		
Beryllium	<2.57			<0.508			1.38			3.9			<0.500		
Cadmium	1640	J	h	56.3	J	h	66900	J	h	14600	J	h	370		
Calcium	3360			3370			18800			18300			5420		
Chromium, Total	12100	J	h	1270	J	h	2490	J	h	1700	J	h	122		
Chromium, Hexavalent	2940000	J	f,i	186	J	f	649	J	f	799	J	f	<1000		
Cobalt	<17.7			<3.50			7.69			9.17			4.59		
Copper	646	J	h	47.7	J	h	161	J	h	605	J	h	68.9		
Iron	2600			502			25200			16700			697		
Lead	861	J	f,h	61.4	J	f,h	2070	J	f,h	1110	J	f,h	62.6		
Magnesium	468			240			3880			3270			616		
Manganese	46.9			12.7			271			218			9.52		
Mercury	0.339			<0.102			0.112			0.462			<0.020		
Nickel	15100	J	h	107	J	h	353	J	h	1160	J	h	42.1		
Potassium	<550			121			402			588			4540		
Selenium	<2.22			<0.411			<0.457	UJ	g	<0.595	UJ	g	<0.400		
Silver	<4.93	UJ	h	<0.976	UJ	h	<1.05	UJ	h	<1.48	UJ	h	<0.960		
Sodium	230000			2240			15300			26100			16100		
Thallium	<1.89			<0.349			2.65			<0.505			<21.8	J	h
Vanadium	<6.17			<1.22			1.66			5.18			<1.20	J	h
Zinc	481			92.9			571			1850			6310		
Cyanide	N/A			1.6			138			65.5			5570	J	d

Notes:

N/A = Not analyzed due to insufficient sample volume
< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution
i = exceeds total chromium value

TABLE 5-1
NAS ALAMEDA - SITE 5 PLATING SHOP
SURFACE SCRAPE AND WIPE SAMPLE ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample I.D.	Wipe W05-06			Wipe W05-07			Wipe W05-08			Duplicate W05-08			Wipe W05-09		
Date Sampled	06/9/92			06/9/92			06/9/92			06/9/92			06/9/92		
PARAMETER REPORTED	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl
Units	(µg/sq. ft.)			(µg/sq. ft.)			(µg/sq. ft.)			(µg/sq. ft.)			(µg/sq. ft.)		
Metals															
Aluminum	6430			7750			9660			8370			8470		
Antimony	11.6			<7.50			12.2			8.99			41.5		
Arsenic	1.16			0.52			3.08			2.06			0.6		
Barium	6180			10900			11800	J	c	7640			5040		
Beryllium	<0.500			0.804			0.898			<0.500			0.912		
Cadmium	28.4			23.2			45			46.1			472		
Calcium	4890			21400			33200	J	c	61500			6030		
Chromium, Total	4500			301			1690	J	c	1520			2950		
Chromium, Hexavalent	1160			1840	J	i	1600			1450			3490	J	i
Cobalt	8.32			17.8			36			70.5			7.06		
Copper	153			15.2			71.6			72.5			592		
Iron	1110			689			1620			1800			11200		
Lead	360			809			1430	J	c	2740			396		
Magnesium	701			1100			1840			3060			1830		
Manganese	24.6			18.4			41.8			56			255		
Mercury	<0.020			0.037			0.07			0.14			0.048		
Nickel	118			36.6			801	J	c	492			2340		
Potassium	3390			5720			6730			4950			3580		
Selenium	<0.400			<0.400			<0.400	UJ	g	<0.400			<0.400		
Silver	<0.960			<0.960			<0.960			<0.960			2.89		
Sodium	11300			19000			22300			16600			14200		
Thallium	<21.8			<21.8			<21.8			<21.8			<21.8		
Vanadium	<1.20			<1.20			2.24			3.22			12.8		
Zinc	4600			7480			11100	J	c	6080			4420		
Cyanide	<5000	UJ	d	<5000	UJ	d	<5000	UJ	d	<5000	UJ	d	9260	J	d

Notes:

N/A = Not analyzed due to insufficient sample volume
< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = LCS
f = replicate
g = post-digestion spike recovery
h = serial dilution

TAL. 5-1
NAS ALAMEDA - SITE 5 PLATING SHOP
SURFACE SCRAPE AND WIPE SAMPLE ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample I.D.	Wipe W05-10			Wipe W05-11			Wipe W05-12		
Date Sampled	06/9/92			06/9/92			06/9/92		
PARAMETER REPORTED	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl
Units	(µg/sq. ft.)			(µg/sq. ft.)			(µg/sq. ft.)		
Metals									
Aluminum	10400			83500			26000		
Antimony	43.6	J	h	221	J	h	269	J	h
Arsenic	2.42			35.3			7.88		
Barium	11300			575			4690		
Beryllium	<0.500			0.734			<0.500		
Cadmium	245			5210			638		
Calcium	8140			60000			20500		
Chromium, Total	10400			70700			8500		
Chromium, Hexavalent	288000	J	i	1340			1260		
Cobalt	9.1			92.8			31.3		
Copper	552			7850			919		
Iron	6800			143000			32500		
Lead	783			6900			912		
Magnesium	1650			18700			13600		
Manganese	154			2460			665		
Mercury	0.456			1.61			0.478		
Nickel	1180			23300			2350		
Potassium	6470			14300			4710		
Selenium	<0.400	UJ	g	2.00	UJ	g	<2.00		
Silver	2.65			38.2			3.59		
Sodium	23300			130000			18700		
Thallium	<21.8	UJ	h	135	J	h	24.2	J	h
Vanadium	9.06	J	h	146	J	h	32.1	J	h
Zinc	8390			22400			4280		
Cyanide	40900			541000			83900		

Notes:

N/A = Not analyzed due to insufficient sample volume
< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = LCS
f = replicate
g = post-digestion spike recovery
h = serial dilution

TABLE 5-2
NAS ALAMEDA - SITE 5 PLATING SHOP
SOIL SAMPLE ANALYTICAL RESULTS - ORGANIC COMPOUNDS

Sample Number Depth (feet) Date Sampled	B-05PS-01 0.0 6/4/92			B-05PS-01 5.0 6/4/92			B-05PS-01 18.0 6/4/92			Duplicate B-05PS-01 18 6/4/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Volatile Organic Compounds (μg/kg)												
Acetone	14	UJ	a	18	UJ	a	28	UJ	a	21	UJ	a
Chloroethane	<5.5			<5.9			<6.5			16		
1,1,1-Trichloroethane	<5.5			<5.9			<6.5			<6.1		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = laboratory indicated questionable data

TABLE 5-2
NAS ALAMEDA - SITE 5 PLATING SHOP
SOIL SAMPLE ANALYTICAL RESULTS - ORGANIC COMPOUNDS

Sample Number Depth (feet) Date Sampled	B-05PS-02 0.0 6/3/92			B-05PS-02 5.0 6/3/92			B-05PS-03 0.0 6/3/92			B-05PS-03 5.0 6/3/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Volatile Organic Compounds (μg/kg)												
Acetone	32	UJ	a	27	UJ	a	26	UJ	a	22	UJ	a
Chloroethane	<5.8			<5.8			<5.6			<5.9		
1,1,1-Trichloroethane	27			<5.8			<5.6			<5.9		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = laboratory indicated questionable data

TABLE 5-2
NAS ALAMEDA - SITE 5 PLATING SHOP
SOIL SAMPLE ANALYTICAL RESULTS - ORGANIC COMPOUNDS

Sample Number Depth (feet) Date Sampled	B-05PS-04 0.0 6/3/92			B-05PS-04 5.0 6/3/92			B-05PS-05 0.0 6/3/92			B-05PS-05 5.0 6/3/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Volatile Organic Compounds (μg/kg)												
Acetone	15	UJ	a	20	UJ	a	17	UJ	a	24	UJ	a
Chloroethane	<5.7			<6.1			<6.1			<5.9		
1,1,1-Trichloroethane	46			<6.1			9			<5.9		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

LE 5-3

NAS ALAMEDA - SITE 5 PLATING SHOP

SOIL SAMPLE ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample Number	B-05PS-01			B-05PS-01			B-05PS-01			Duplicate B-05PS-01			B-05PS-02		
Depth (feet)	0.0			5.0			18.0			18.0			0.0		
Date Sampled	06/4/92			06/4/92			06/4/92			06/4/92			06/3/92		
Parameter Reported	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Metals (mg/kg)															
Aluminum	3330	J	e	6980	J	e	3950	J	e	2840	J	c,e	3470	J	e
Antimony	<7.9	UJ	e,h	<8.5	UJ	e,h	<9.4	UJ	e,h	<9.0	UJ	e,h	<8.4	UJ	e,h
Arsenic	1.28			1.38			4.45			3.1			<0.427		
Barium	32.7	J	f	41.7	J	f	28.4	J	f	19.4	J	f	14.2	J	f
Beryllium	<0.526			<0.564			<0.623			<0.599	UJ	h	<0.558		
Cadmium	3.71	J	h	570	J	h	133	J	h	<0.934			<0.871	J	h
Calcium	2470			6980			1870			8440	J	c	5050		
Chromium, Total	106	J	h	139	J	h	850	J	h	16.7	J	f	15.8	J	h
Chromium, Hexavalent	3550	J	i	484	J	i	143			242	J	f,i	445	J	f,i
Cobalt	3.86	J	h	7.08	J	h	5.19	J	h	4.45	J	f	4.47	J	h
Copper	6.09			22			11.2			6.02			5.63		
Iron	7380			16300			8580			6110	J	c	5810		
Lead	62.8	J	f,h	3.78	J	f,h	2.15	J	f,h	3.20	J	f,h	9.72	J	f,h
Magnesium	1770			3930			2080			1890			1570		
Manganese	79.9			200			105			64.2			54.7		
Mercury	0.986			0.181			<0.123			<0.120			<0.116		
Nickel	17.8	J	h	55.9	J	h	42.8	J	h	14.3	J	f	12.2	J	h
Potassium	543			800			688			859			723		
Selenium	<0.426			<0.461			<0.489			<0.484			<0.449		
Silver	<1.01	UJ	f	3.34	J	f	4.90	J	f	<1.15	UJ	h	<0.107	UJ	f
Sodium	556			567			492			850	J	f	838		
Thallium	<0.362			<0.392			<0.415			<0.412			<0.382		
Vanadium	15.9			39			18.7			11.8			11.5		
Zinc	12.2			38.4			16.5			18.3			17.5		
Cyanide (mg/kg)	0.3			1.4			<0.2			0.1			1.5		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution
i = exceeds total chromium value

LE 5-3
NAS ALAMEDA - SITE 5 PLATING SHOP
SOIL SAMPLE ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample Number	B-05PS-02			B-05PS-03			B-05PS-03			B-05PS-04			B-05PS-04		
Depth (feet)	5.0			0.0			5.0			0.0			5.0		
Date Sampled	06/3/92			06/3/92			06/3/92			06/3/92			06/3/92		
Parameter Reported	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl
Metals (mg/kg)															
Aluminum	5350	J	e	11700	J	e	4200	J	c,e	10800	J	e	3710	J	e
Antimony	<8.6	UJ	e,h	<7.8	UJ	e,f	<8.8	UJ	e	<8.1	UJ	e,f	<8.6	UJ	e,f
Arsenic	1.53			<0.402			1.39	J	g	<0.403			1.16		
Barium	38.3	J	f	15.4	J	f	34			15.0	J	f	40.4	J	f
Beryllium	0.866			0.806	J	h	<0.587			1.18	J	h	<0.575	UJ	h
Cadmium	3.4	J	h	58.1	J	h	<0.915	UJ	h	13.7	J	h	9.78	J	h
Calcium	2500			4060			1730			5100			1680		
Chromium, Total	143	J	h	114	J	h	73.1			60.0	J	h	72.1	J	h
Chromium, Hexavalent	257	J	f,i	340	J	f,i	350	J	f,i	<114	UJ	f	405	J	f,i
Cobalt	6.31	J	h	14.3	J	h	<4.04			39.0	J	h	4.11	J	h
Copper	7.11			30.3			14.8	J	e	19.8			24.8		
Iron	12200			34600			8150	J	c	31500			7200		
Lead	2.22	J	f,h	9.18	J	f,h	2.71			4.82	J	f,h	1.75	J	f,h
Magnesium	2960			7680			2450			7180			1850		
Manganese	155			406			90.9			353			74.5		
Mercury	<0.110			<0.106			<0.115			<0.107			<0.114		
Nickel	19.5	J	h	16.8	J	h	27.4	J	h	20.7	J	h	22.1	J	h
Potassium	658			598			754	J	e,h	377			650		
Selenium	<0.444			<0.423			<0.023	UJ	f	<0.424			<0.448		
Silver	<1.10	UJ	f	1.65	J	h	<1.13			<0.104	UJ	h	<1.10	UJ	h
Sodium	766			1900	J	h	260			3470	J	f	418	J	f
Thallium	<0.378			<0.360			<0.387			<0.361			<0.381		
Vanadium	28.9			105			16.1	J	h	93.2			15.1		
Zinc	15.8			32.7			19.8			20			16.8		
Cyanide (mg/kg)	1			2.9			0.9			0.4			0.7		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution
i = exceeds total chromium value

TABLE 5-3
NAS ALAMEDA - SITE 5 PLATING SHOP
SOIL SAMPLE ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample Number	B-05PS-05			B-05PS-05		
Depth (feet)	0.0			5.0		
Date Sampled	06/3/92			06/3/92		
Parameter Reported	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Metals (mg/kg)						
Aluminum	8190	J	e	3100	J	e
Antimony	<9.0	UJ	e,f	<8.6	UJ	e,f
Arsenic	0.546			1.38		
Barium	28.5	J	f	47.2	J	f
Beryllium	0.986	J	h	<0.576	UJ	h
Cadmium	18.4	J	h	10.3	J	h
Calcium	3140			1900		
Chromium, Total	72	J	h	154	J	h
Chromium, Hexavalent	366	J	f,i	395	J	f,i
Cobalt	25.6	J	h	4.42	J	h
Copper	27.2			20.4		
Iron	23800			7210		
Lead	27.5	J	f,h	2.06	J	f,h
Magnesium	5860			1770		
Manganese	272			77.7		
Mercury	<0.116			<0.115		
Nickel	21.1	J	h	26.2	J	h
Potassium	1100			646		
Selenium	<0.455			<0.453		
Silver	<1.15	UJ	h	1.15	UJ	h
Sodium	1140	J	f	476	J	f
Thallium	<0.386			<0.385		
Vanadium	66.1			16.1		
Zinc	29.5			18		
Cyanide (mg/kg)	0.2			<0.1		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution
i = exceeds total chromium value

TABLE 5-4
NAS ALAMEDA - SITE 5 PLATING SHOP
GROUNDWATER ANALYTICAL RESULTS - ORGANIC COMPOUNDS

Sample Number Date Sampled	B-05PS-01 6/4/92			Duplicate B-05PS-01 6/4/92			B-05PS-02 6/3/92			B-05PS-03 6/3/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Volatile Organic Compounds (μg/L)												
Chloroethane	1300			1500			<100			<250		
1,1-Dichloroethane	480			400			170			140		
1,1-Dichloroethylene	<50			<50			91			110		
1,1,1-Trichloroethane	720			430			3900			5200		
Vinyl Chloride	<50			<50			<100			<250		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

TABLE 5-4
NAS ALAMEDA - SITE 5 PLATING SHOP
GROUNDWATER ANALYTICAL RESULTS - ORGANIC COMPOUNDS

Sample Number Date Sampled	B-05PS-04 6/3/92			B-05PS-05 6/3/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Volatile Organic Compounds (μg/L)						
Chloroethane	<25000			160		
1,1-Dichloroethane	13000			56		
1,1-Dichloroethylene	9200			6.6		
1,1,1-Trichloroethane	790000			59		
Vinyl Chloride	<25000			5.9		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

TABLE 5-5
NAS ALAMEDA - SITE 5 PLATING SHOP
GROUNDWATER ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample Number	B-05PS-01			Duplicate B-05PS-01			B-05PS-02			B-05PS-03			B-05PS-04			B-05PS-05		
Date Sampled	06/4/92			06/4/92			06/3/92			06/3/92			06/3/92			06/3/92		
PARAMETER REPORTED	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl
Metals (µg/L)																		
Aluminum	1470			1150			103000			6370			35200			328000		
Antimony	<37.5			<37.5			<37.5			<37.5			<37.5			<37.5		
Arsenic	3.4			2.9			25.7			6.2	J	g	39.2			22.2		
Barium	161			165			1200			234			282			2820		
Beryllium	<2.5			<2.5			5.8			<2.5			<2.5			10.9		
Cadmium	4.4			<3.9			443			24.5			248			983		
Calcium	11200			10200			25500			24300			17500			58700		
Chromium, Total	23			18.6			2470			111			227			10700		
Chromium, Hexavalent	1020	J	i	<1000			6470	J	i	7010	J	i	13100	J	i	<5000		
Cobalt	<17.2			<17.2			46.4			<17.2			43			145		
Copper	15.1			24.6			313			48.5			425			1310		
Iron	1380	J	f	1150	J	f	117000	J	f	6050	J	f	36700	J	f	330000	J	f
Lead	4.2			156			63.4			3.4			19.5			243		
Magnesium	22800			22400			30000			6430			11400			82000		
Manganese	212			204			1350			182			334			2990		
Mercury	<0.2			<0.2			1.1			0.3			0.3			2		
Nickel	46.5			45.2			325			57.7			116			1030		
Potassium	30400			29600			15500			9760			10500			50100		
Selenium	<2.0			<2.0			<10.0			<2.0			<2.0	UJ	g	<2.0		
Silver	<4.8			<4.8			18.7			<4.8			<4.8			26.8		
Sodium	747000			739000			99100			168000			77100			54800		
Thallium	<1.7			<1.7			<1.7			<1.7			<1.7			<1.7		
Vanadium	13.8			12.3			264			19.9			130			818		
Zinc	369			429			266			34.8			186			1730		
Cyanide (µg/L)	342			166	J	c	3610			1140			4550			4550		
Total Dissolved Solids (mg/L)	2380			2410			2060			3340			4730			824		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution
i = exceeds total chromium value

T.. .E 5-6

NAS ALAMEDA - SITE 5 SELECTIVE PLATING SHOP

SOIL SAMPLE ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample Number	B-05SP-01		
Depth (feet)	0.0		
Date Sampled	06/2/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**
Metals (mg/kg)			
Aluminum	4220	J	e
Antimony	<7.9	UJ	e,h
Arsenic	1.89		
Barium	40.8	J	f
Beryllium	0.771	J	h
Cadmium	113	J	h
Calcium	5150		
Chromium, Total	110	J	h
Chromium, Hexavalen	2170	J	c,f,i
Cobalt	5.54	J	h
Copper	9.08		
Iron	8120		
Lead	4.87	J	f,h
Magnesium	2530		
Manganese	103		
Mercury	<0.101		
Nickel	27.5	J	h
Potassium	567		
Selenium	<0.429		
Silver	<1.02	UJ	h
Sodium	244	J	f
Thallium	<0.365		
Vanadium	18.8		
Zinc	21.1		
Cyanide (mg/kg)	<0.1		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution
i = exceeds total chromium value

TABLE 5-7
NAS ALAMEDA - SITE 5 WASTEWATER TREATMENT AREA
SOIL SAMPLE ANALYTICAL RESULTS - ORGANIC COMPOUNDS

Sample Number Depth (feet) Date Sampled	B-05WT-01 10.0 6/4/92			B-05WT-02 10.0 6/4/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Volatile Organic Compounds (μg/kg)						
Acetone	21	UJ	a	17	UJ	a
Semivolatile Organic Compounds (μg/kg)						
Bis(2-ethylhexyl)phthalate	1100	UJ	a	130	UJ	a
Di-N-Butyl phthalate	160			<97		
Naphthalene	1500			<97		
Phenanthrene	110			<97		
2-Methylnaphthalene	710			<120		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

TABL.. ..-8
NAS ALAMEDA - SITE 5 WASTEWATER TREATMENT AREA
SOIL SAMPLE ANALYTICAL RESUTLS - INORGANIC CONSTITUENTS

Sample Number	B-05WT-01			B-05WT-02		
Depth (feet)	10.0			10.0		
Date Sampled	06/4/92			06/4/92		
PARAMETER REPORTED	Results	DQF	Rtnl	Results	DQF	Rtnl
Metals (mg/kg)						
Aluminum	3940	J	e	4310	J	e
Antimony	<8.1	UJ	e,h	<8.8	UJ	e,h
Arsenic	1.54			1.85		
Barium	54.5	J	f	43.4	J	f
Beryllium	0.833	J	h	0.948	J	h
Cadmium	<0.839	J	h	<0.915	J	h
Calcium	1710			1850		
Chromium, Total	27.9	J	h	27	J	h
Chromium, Hexavalent	446	J	f,i	521	J	f,i
Cobalt	4.69	J	h	4.56	J	h
Copper	6.74			8.08		
Iron	7890			8320		
Lead	20.6	J	f,h	8.65	J	f,h
Magnesium	2190			2510		
Manganese	85.1			93.4		
Mercury	<0.112			<0.116		
Nickel	24.8	J	h	28.9	J	h
Potassium	775			843		
Selenium	<0.415			<0.474		
Silver	<1.03	UJ	h	<1.13	UJ	h
Sodium	164	J	f	241	J	f
Thallium	<0.353			<0.403		
Vanadium	16.9			17.6		
Zinc	20.4			20.9		
Cyanide (mg/kg)	<0.1			<0.1		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined belo
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recover
h = serial dilution
i = exceeds total chromium valu

TABLE 5-9
NAS ALAMEDA - SITE 5 WASTEWATER TREATMENT AREA
GROUNDWATER ANALYTICAL RESULTS - ORGANIC COMPOUNDS

Sample Number Date Sampled	B-05WT-01 06/4/92			B-05WT-02 06/4/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Volatile Organic Compounds (μg/L)						
Acetone	17	UJ	a	<50		
Chlorobenzene	12			45		
Chloroethane	140			210		
1,1-Dichloroethane	180			24		
1,2-Dichloroethene, Total	120			62		
Ethylbenzene	100			36		
Methylene Chloride	<5.0			25		
Toluene	30			<25		
Vinyl Chloride	62			40		
Xylenes, Total	660			160		
Semivolatile Organic Compounds (μg/L)						
Bis (2-Ethylhexyl) phthalate	2.5	UJ	a	NA		
Di-N-butyl phthalate	1.7			NA		
1,2-Dichlorobenzene	17			NA		
2,4-Dimethylphenol	8.5			NA		
4-Methyl phenol	2.1			NA		
Naphthalene	4.4			NA		

Notes:

NA = Not Analyzed
< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recover
h = serial dilution

TABLE 5-10
NAS ALAMEDA - SITE 5 WASTEWATER TREATMENT AREA
GROUNDWATER ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample Number Date Sampled	B-05WT-01 06/4/92			B-05WT-02 06/4/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Metals (μg/L)						
Aluminum	<40.7			169		
Antimony	<37.5			<37.5		
Arsenic	30.3			4.8	UJ	g
Barium	472			628		
Beryllium	<2.5			3.2		
Cadmium	<3.9			<3.9		
Calcium	57200			71900		
Chromium, Total	17.1			9.9		
Chromium, Hexavalent	2830	J	i	9350	J	i
Cobalt	<17.2			19.4		
Copper	<3.8			15.1		
Iron	1580	J	f	2320	J	f
Lead	<2.0			4420		
Magnesium	32500			24800		
Manganese	1400			1150		
Mercury	<0.2			<0.2		
Nickel	312			483		
Potassium	47200			10800		
Selenium	<2.0			<2.0		
Silver	<4.8			<4.8		
Sodium	339000			158000		
Thallium	<1.7			<1.7		
Vanadium	<6.0			8		
Zinc	1900			136		
Cyanide (μg/L)	39.6			24.3		
Total Dissolved Solids (mg/L)	532			1570		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recover
h = serial dilution
i = exceeds total chromium value

TABLE 5-11
NAS ALAMEDA - SITE 5 FORMER HAZARDOUS WASTE STORAGE AREA
SOIL ANALYTICAL RESULTS - ORGANIC COMPOUNDS

Sample Number Depth (feet) Date Sampled	M-05HW-01 0.0 5/28/92			M-05HW-01 5.0 5/28/92			M-05HW-01 10.0 5/28/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Volatile Organic Compounds (μg/kg)									
Acetone	<11			31	UJ	a	38	UJ	a
Tetrachloroethene	5.4			<6.2			<6.2		
Vinyl Chloride	<5.3			<6.2			6.4		
Semivolatile Organic Compounds (μg/kg)									
Acenaphthylene	<85			<99			110		
Benzo(a)anthracene	<110			<120			1100		
Benzo(b)fluoranthene	<110			<120			2200		
Benzo(k)fluoranthene	<110			<120			720		
Benzo(a)pyrene	<150			<170			2400		
Bis(2-ethylhexyl)phthalate	440	UJ	a	<120			260	UJ	a
Chrysene	<110			<120			910		
Fluoranthene	<85			<99			1100		
Indeno(1,2,3-cd)pyrene	<170			<200			1600		
Naphthalene	<85			<99			130		
Phenanthrene	<85			<99			300		
Pyrene	<85			<99			6700		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

TABLE 5-11
NAS ALAMEDA - SITE 5 FORMER HAZARDOUS WASTE STORAGE AREA
SOIL ANALYTICAL RESULTS - ORGANIC COMPOUNDS

Sample Number Depth (feet) Date Sampled	M-05HW-01 15.0 5/28/92			B-05HW-02 0.0 5/28/92			B-05HW-02 5.0 5/28/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Volatile Organic Compounds (μg/kg)									
Acetone	34	UJ	a	28	UJ	a	31	UJ	a
Tetrachloroethene	<6.2			<5.4			<5.8		
Vinyl Chloride	<6.2			<11			<5.8		
Semivolatile Organic Compounds (μg/kg)									
Acenaphthylene	<99			<86			<93		
Benzo(a)anthracene	<120			<110			<120		
Benzo(b)fluoranthene	<120			<110			<120		
Benzo(k)fluoranthene	<120			<110			<120		
Benzo(a)pyrene	<170			<150			<160		
Bis(2-ethylhexyl)phthalate	450	UJ	a	190	UJ	a	<120		
Chrysene	<120			<110			<120		
Fluoranthene	<99			<86			<93		
Indeno(1,2,3-cd)pyrene	<200			<170			<190		
Naphthalene	<99			<86			<93		
Phenanthrene	<99			<86			<93		
Pyrene	<99			<86			<93		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

TABLE 5-11
NAS ALAMEDA - SITE 5 FORMER HAZARDOUS WASTE STORAGE AREA
SOIL ANALYTICAL RESULTS - ORGANIC COMPOUNDS

Sample Number Depth (feet) Date Sampled	B-05HW-02 10.0 5/28/92			Duplicate B- 05HW 10 5/28/92			B-05HW-02 15.0 5/28/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Volatile Organic Compounds (μg/kg)									
Acetone	23	UJ	a	29	UJ	a	34	UJ	a
Tetrachloroethene	<6.2			<6.1			<6.0		
Vinyl Chloride	<12			<12			<6.0		
Semivolatile Organic Compounds (μg/kg)									
Acenaphthylene	<98			<97			<96		
Benzo(a)anthracene	<120			<120			<120		
Benzo(b)fluoranthene	<120			<120			<120		
Benzo(k)fluoranthene	<120			<120			<120		
Benzo(a)pyrene	<170			<170			<170		
Bis(2-ethylhexyl)phthalate	<120			230	UJ	a	<120		
Chrysene	<120			<120			<120		
Fluoranthene	<98			<97			<96		
Indeno(1,2,3-cd)pyrene	<200			<190			<190		
Naphthalene	<98			<97			<96		
Phenanthrene	<98			<97			<96		
Pyrene	<98			<97			<96		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

TABLE 5-12
NAS ALAMEDA - SITE 5 FORMER HAZARDOUS WASTE STORAGE AREA
SOIL ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample Number	M-05HW-01			M-05HW-01			M-05HW-01			M-05HW-01		
Depth (feet)	0.0			5.0			10.0			15.0		
Date Sampled	5/28/92			5/28/92			5/28/92			5/28/92		
PARAMETER REPORTED	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl
Metals (mg/kg)												
Aluminum	5290			2810			3780			4190		
Antimony	<7.9			<9.1			<9.3			<9.1		
Arsenic	1.06			1.26			2.86			1.64		
Barium	42.6			24.8			33			72.2		
Beryllium	<0.524			<0.609			<0.618			<0.609		
Cadmium	<0.818			<0.949			<0.965			<0.950		
Calcium	2740			1090			2590			1710		
Chromium, Total	37			19.3			21.2			24.5		
Chromium, Hexavalent	291	J	f,i	334	J	f,i	<115	UJ	f	326	J	f,i
Cobalt	<3.61			<4.19			4.43			<4.19		
Copper	7.81			3.78			6.66			5.07		
Iron	9660			5950			7950			7760		
Lead	16.4			1.93			4.28			2.03		
Magnesium	2470			1730			2360			2290		
Manganese	118			64.8			85			86.1		
Mercury	<0.056			<0.065			<0.070			<0.086		
Nickel	23.6			20.7			23.1			26.3		
Potassium	897			601			925			806		
Selenium	<0.407			<0.483			<0.492			<0.476		
Silver	<1.01			<1.17			<1.19			<1.17		
Sodium	346			272			854			468		
Thallium	<0.346			<0.4.11			<0.419			<0.405		
Vanadium	21.9			11.1			14.2			15.2		
Zinc	35.2			15.7			23.4			19.7		
Cyanide (mg/kg)	<0.1			<0.1			<0.1			<0.1		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution
i = exceeds total chromium value

TABLE 5-12
NAS ALAMEDA - SITE 5 FORMER HAZARDOUS WASTE STORAGE AREA
SOIL ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample Number	B-05HW-02			B-05HW-02			B-05HW-02			Duplicate B-05HW-02			B-05HW-02		
Depth (feet)	0.0			5.0			10.0			10.0			15.0		
Date Sampled	05/28/92			05/28/92			05/28/92			5/28/92			05/28/92		
PARAMETER REPORTED	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl
Metals (mg/kg)															
Aluminum	6010			5720			5650			4590			3740		
Antimony	<8.0	UJ	e	<8.6			<9.1			<9.0			<9.0		
Arsenic	1.5			1.6			1.68			1.5			3.05		
Barium	45.4			48.2			53.2			41.8			21		
Beryllium	0.626			<0.574			<0.610			<0.603			<0.600		
Cadmium	<0.830			<0.896			<0.951			<0.941			<0.936		
Calcium	4160	J	f	2540			2230			1730			6080		
Chromium, Total	31.2			32.2			29.1			26.9			15.8		
Chromium, Hexavalent	502	J	f,i	280	J	f,i	291	J	f,i	962	J	f,i	<114	UJ	f
Cobalt	4.20	J	f	4.59			4.52			5.14			<4.13		
Copper	14.6	J	e,f,h	5.71			5.56			5.71			4.57		
Iron	11900			9800			9730			8870			5460		
Lead	17.9			3			2.48			2.02			1.61		
Magnesium	2930			2620			2750			2740			1550		
Manganese	149			104			104			99.1			49.9		
Mercury	0.169			<0.079			<0.067			<0.090			<0.087		
Nickel	27.1			28.8			31.1			32.2			12.6		
Potassium	919	J	e,h	956			1070			988			851		
Selenium	<0.423			<0.426			<0.468			<0.469			<0.448		
Silver	<0.102			<1.10			<1.17			<1.16			<1.15		
Sodium	396	J	e,h	398			730			667			1280		
Thallium	<0.360			<0.362			<0.397			<0.399			<0.381		
Vanadium	24.3			22.2			20			16.7			11.6		
Zinc	46.6			22.6			24.2			23.1			16		
Cyanide (mg/kg)	<0.1			<0.1			<0.1			<0.1			<0.1		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution
i = exceeds total chromium value

TABLE 5-13
NAS ALAMEDA - SITE 5 FORMER HAZARDOUS WASTE STORAGE AREA
GROUNDWATER ANALYTICAL RESULTS - ORGANIC COMPOUNDS

Sample Number Date Sampled	B-05HW-01 6/15/92			Duplicate B-05HW-01 6/15/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Volatile Organic Compounds (μg/L)						
Chlorobenzene	2.1			2.2		
1,1-Dichloroethane	97			<1.0		
1,1-Dichloroethylene	3.9			3.2		
1,2-Dichloroethene, Total	46			21		
Tetrachloroethene	2.9			2.9		
Trichloroethene	16			15		
Vinyl Chloride	33			27		
Semivolatile Organic Compounds (μg/L)						
Bis (2-Chloroisopropyl) ether	<1.0			1.2		
Bis (2-Ethylhexyl) phthalate	11	UJ	a	9.1	UJ	a
1,2-Dichlorobenzene	34			44		
1,3-Dichlorobenzene	2.3			3.3		
1,4-Dichlorobenzene	6.4			9.3		
Pyrene	1.4			1.3		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

TABLE

NAS ALAMEDA - SITE 5 FORMER HAZARDOUS WASTE STORAGE AREA
GROUNDWATER ANALYTICAL RESULTS - INORGANIC CONSTITUENTS

Sample Number Date Sampled	M-05HW-01 06/15/92			Duplicate M-05HW-01 06/15/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**
Metals (μg/L)						
Aluminum	<40.7			<40.7		
Antimony	<37.5			<37.5		
Arsenic	4.6	J	g	3.9	J	g
Barium	70.3			81.9		
Beryllium	<2.5			<2.5		
Cadmium	<3.9			<3.9		
Calcium	43800			48200		
Chromium, Total	<6.3			<6.3		
Chromium, Hexavalent	<100.0	UJ	c	NA		
Cobalt	<17.2			<17.2		
Copper	<3.8			12.9		
Iron	8.0	J	f	60.0	UJ	a,f
Lead	<2.0			<2.0		
Magnesium	31300			34400		
Manganese	256			278		
Mercury	<0.2			<0.2		
Nickel	39.1			37.3		
Potassium	22900			24900		
Selenium	<2.0			<2.0		
Silver	<4.8			<4.8		
Sodium	201000			181000		
Thallium	<1.7			<1.7		
Vanadium	6.2			<6.0		
Zinc	<4.6			21.4	J	f
Cyanide (μg/L)	<10.0			15.7		
Total Dissolved Solids (mg/L)	900			858		

Notes:

NA = Not Analyzed
< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

TABLE 5-15
NAS ALAMEDA - SITE 5 BATTERY STORAGE AREA
SOIL ANALYTICAL RESULTS - ORGANIC COMPOUNDS

Sample Number	M-05BS-01			M-05BS-01			M-05BS-01			M-05BS-01			B-05BS-02	
Depth (feet)	0.0			2.5			6.0			15.0			0.0	
Date Sampled	5/28/92			5/28/92			5/28/92			5/28/92			6/4/92	
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**	**Rtnl**	**Results**	**DQF**
Volatile Organic Compounds (μg/kg)														
Acetone	<11			15	UJ	a	<11			16	UJ	a	20	UJ
Semivolatile Organic Compounds (μg/kg)														
Bis(2-ethylhexyl)phthalate	<110			130	UJ	a	210	UJ	a	180	UJ	a	130	UJ
Pyrene	<86			<85			<89			260			<86	

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

TABL. .

NAS ALAMEDA - SITE 5 BATTERY STORAGE AREA

SOIL SAMPLE ANALYTICAL RESTULTS - INORGANIC CONSTITUENTS

Sample Number	M-05BS-01			M-05BS-01			M-05BS-01			M-05BS-01			B-05BS-02		
Depth	0.0			2.5			6.0			15.0			0.0		
Date Sampled	5/28/92			5/28/92			5/28/92			5/28/92			06/04/92		
PARAMETER REPORTED	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl	Results	DQF	Rtnl
Metals (mg/kg)															
Aluminum	5580			4950			3320			3870			4120		
Antimony	<8.0	UJ	e	<7.9	UJ	e	<8.2	UJ	e	<9.1	UJ	e	<7.9	UJ	e
Arsenic	1.59			1.33			1.47			1			1.19		
Barium	41.3			47.5			27.6			28.5			36.4		
Beryllium	<0.536			<0.529			<0.549			<0.603			0.691		
Cadmium	<0.837			<0.825			<0.857			<0.941			<0.817		
Calcium	2590			1710			1750			1810			1900	J	f
Chromium, Total	29.5			27.9			21.1			22.3			26.8		
Chromium, Hexavalent	48.2	J	f,i	376	J	f,i	564	J	f,i	411	J	f,i	706	J	f,i
Cobalt	4.32			<3.64			3.85			4.85			7.27	J	f
Copper	5.83	J	e,f,h	14.7	J	e,f,h	6.09	J	e,f,h	4.4	J	e,f,h	7.3	J	e,f,h
Iron	9640			8420			7110			7100			8530		
Lead	5.34			94.8			5.19			1.72			5.03		
Magnesium	2410			2200			1730			2080			2510		
Manganese	126			86			87.7			87			112		
Mercury	<0.074			<0.079			<0.078			<0.079			0.119		
Nickel	26.6			23.9			24.3			21.4			27.7		
Potassium	815	J	e,h	803	J	e,h	684	J	e,h	832	J	e,h	854	J	e,h
Selenium	<0.407			<0.396			<0.432			<0.466			<0.426		
Silver	<1.03			<1.02			<1.05			<1.16			<1.00		
Sodium	286	J	e,h	245	J	e,h	319	J	e,h	983	J	e,h	361	J	e,h
Thallium	<0.346			<0.337			<0.368			<0.396			<0.362		
Vanadium	20.7			18.8			14.8			15.1			17.3		
Zinc	26.1			30.7			18.4			16.4			20.3		
Cyanide (mg/kg)	<0.1			<0.1			<0.1			<0.1			<0.1		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution
i = exceeds total chromium value

TABLE 5-17
NAS ALAMEDA - SITE 5 BATTERY STORAGE AREA
GROUNDWATER ANALYTICAL RESULTS - ORGANIC COMPOUNDS

Sample Number Date Sampled	B-05BS-01 6/15/92		
PARAMETER REPORTED	**Results**	**DQF**	**Rtnl**
Volatile Organic Compounds (μg/L)			
Benzene	1.5		
1,1-Dichloroethane	15		
1,1-Dichloroethylene	1.5		
1,2-Dichloroethene, Total	70		
Trichloroethene	1.2		
Vinyl chloride	98		
Semivolatile Organic Compounds (μg/L)			
Bis (2-Chloroethyl) ether	4.7		
Bis (2-Ethylhexyl) phthalate	3.5	UJ	a
Dimethylphthalate	2.2		

Notes:

< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution

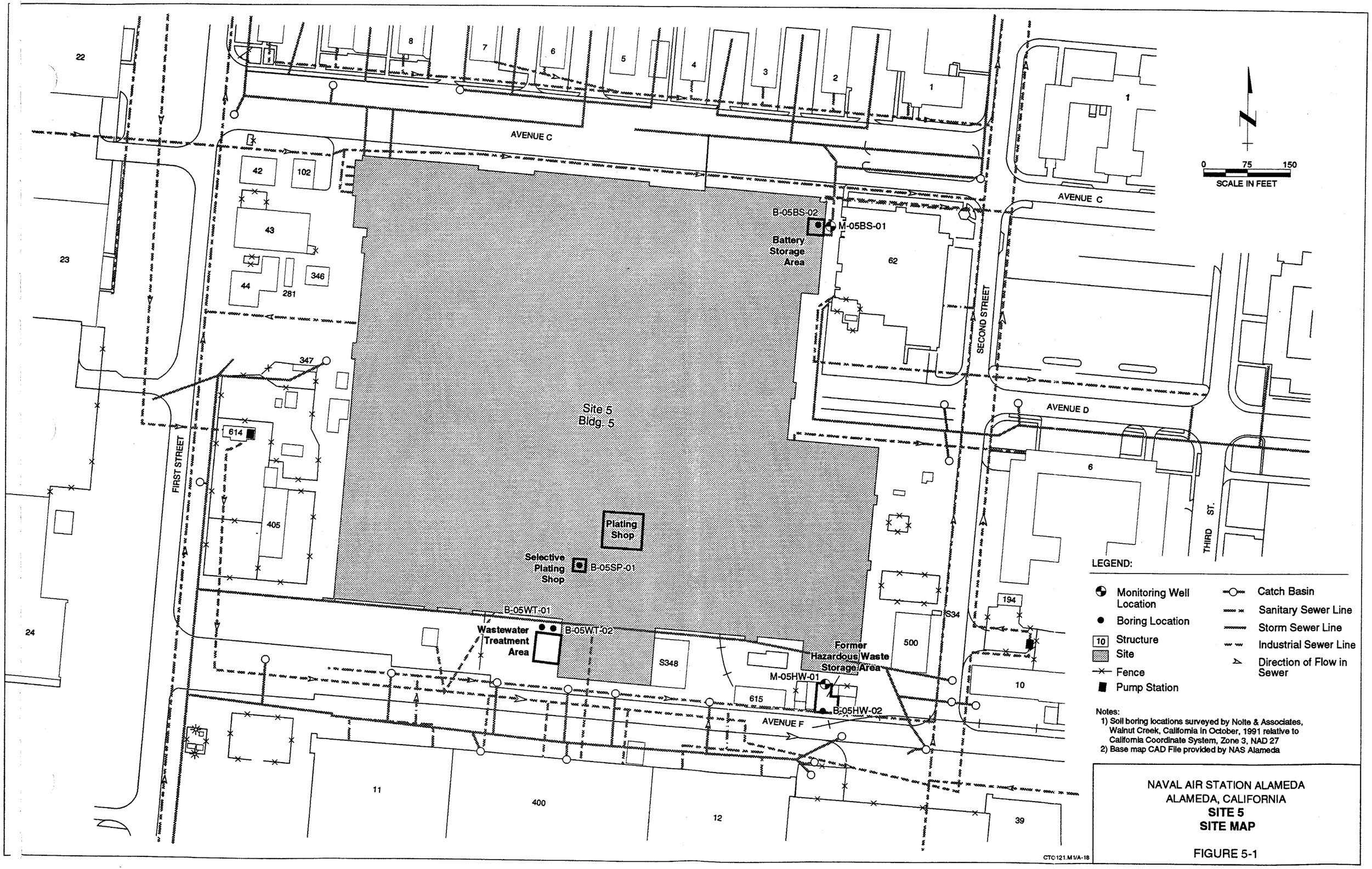
TABLE 5-18
NAS ALAMEDA - SITE 5 BATTERY STORAGE AREA
GROUNDWATER ANALYTICAL RESTULTS - INORGANIC CONSTITUENTS

Sample I.D.	M-BS1-GW		
Date Sample	06/15/92		
PARAMETER REPORTED	Results	DQF	Rtnl
Metals (µg/L)			
Aluminum	<40.7		
Antimony	<37.5		
Arsenic	9.8		
Barium	740		
Beryllium	<2.5		
Cadmium	<3.9		
Calcium	85800		
Chromium, Total	<6.3		
Chromium, Hexavalent	<200		
Cobalt	<17.2		
Copper	<3.8		
Iron	3650	J	f
Lead	<2.0		
Magnesium	188000		
Manganese	1430		
Mercury	<0.2		
Nickel	28.5		
Potassium	68400		
Selenium	<2.0		
Silver	<4.8		
Sodium	2210		
Thallium	<1.7		
Vanadium	18.9		
Zinc	9.3		
Cyanide (µg/L)	<10.0		
Total Dissolved Solids (mg/L)	7840		

Notes:

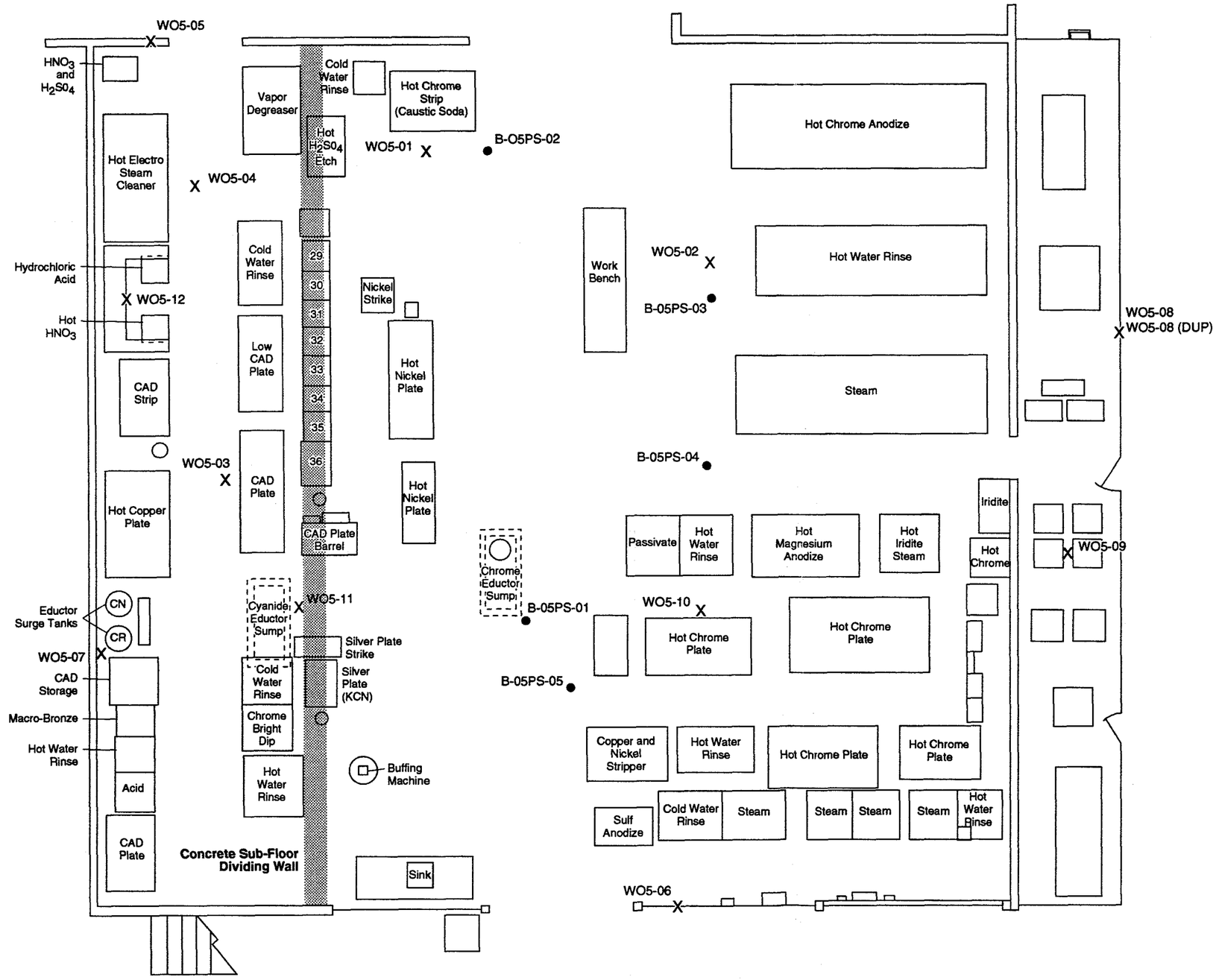
< = Analyte reported below detection limit
DQF = Data qualification flags, defined below
UJ = Qualified, estimated not detected
J = Qualified, estimated value
R = Qualified, not usable

Rtnl = Rationale for data qualification, defined below
a = method blank
b = surrogate spike
c = matrix spike
d = holding time
e = laboratory control sample
f = replicate
g = post-digestion spike recovery
h = serial dilution



NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 5
SITE MAP

FIGURE 5-1



LEGEND

B-05PS-01 ●	Soil Boring Location
W05-01 X	Wipe or Scrape Sample Location
DUP	Indicates Duplicate Sample Collected
	Educator Sump Location
29	Plating Tank
	Concrete Sub-Floor Dividing Wall
HNO_3	Nitric Acid
H_2SO_4	Sulfuric Acid
CAD	Cadmium
KCN	Potassium Cyanide

Notes: Numbered tanks contain the following:

29	Hot Copper Plate
30	Zincate
31	Cold Water
32	Acid
33	Nitric and Sulfuric Acie
34	Acid
35	Cold Water
36	Hot Caustic Etch

N

0 4 8
SCALE IN FEET

CTO121.M1/A-18

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 5 PLATING SHOP

FIGURE 5-2

6.0 REFERENCES

California DHS, 1988. Notice of Remedial Action Order, Health and Safety Code Section (s) 205, 206, 25220, 25355.5 (a) (1) (B), Docket No. HSA 88/89-051, Letter dated June 30, 1988.

California Department of Toxic Substances Control (DTSC), 1992a. Letter from Virginia L. Lasky of DTSC to Louise T. Lew of WESTDIV, Proposed Relocation of Boring/Well (February 25, 1992) for the RI/FS, Alameda Naval Air Station, dated March 16, 1992.

California Department of Toxic Substances Control (DTSC), 1992b. Letter from Virginia L. Lasky of DTSC to Wing Wong of WESTDIV, Response to Comments - Additional Field Work at Sites 4 and 5 for the RI/FS, NAS Alameda, dated May 7, 1992.

California State Water Resources Control Board (SWRCB), 1988. "Adoption of Policy Entitled Sources of Drinking Water," Resolution No. 88-63, adopted at State Water Resources Control Board Meeting, May 19, 1988.

Canonie, 1990a. Sampling Plan, Remedial Investigation/Feasibility Study (RI/FS), Naval Air Station (NAS) Alameda, California, Volume 1. Prepared for NAVY-WESTDIV, February 12, 1990.

Dragun, James, 1988. "The Soil Chemistry of Hazardous Materials," The Hazardous Materials Control Research Institute, Silver Spring, Maryland.

Fetherston, Bill, 1992. Personal communication from Bill Fetherston, Naval Aviation Depot, NAS Alameda, to Donna Courington of James M. Montgomery Consulting Engineers, Inc., May, 1992.

Finney, Debra, 1992. Personal communication from AG1 Debra Finney, Naval Oceanography Command Detachment, NAS Alameda to Donna Courington of James M. Montgomery Consulting Engineers, Inc., March 7, 1992.

Gilbert, R.O., 1987. "Statistical Methods for Environmental Pollution Monitoring," Van Nostrand Reinhold, New York, New York, p. 320.

Horning, R.W., and L.D. Reed, 1990. Estimation of Average Concentrations in the Presence of Nondetectable Values, Applied Environmental Hygiene 5(1):46-51.

6.0 REFERENCES (Continued)

Pacific Aerial Surveys. Aerial Photo, ALA-C19L-18, November 18, 1930; Aerial Photo, AAP-2-9, February 25, 1938; Aerial Photo, AAP-2-14, February 18, 1939; Aerial Photo, AV-11-08-06, March 24, 1947; Aerial Photo, AV-28-9-33, September 6, 1949; Aerial Photo, AV-119-7-28, August 14, 1953; Aerial Photo, AV-253-06-23, May 3, 1957; Aerial Photo, AV 902-03-07, May 19, 1969; Aerial Photo, AV 1100-03-05, April 30, 1973; Aerial Photo, AV 1750-03-3, September 14, 1979; Aerial Photo, AV 2300-03-03, June 21, 1983; Aerial Photo, AV 2640-03-04, May 15, 1985; Aerial Photo, AV 3268-03-06, March 30, 1988.

PRC/James M. Montgomery Engineers, Inc. (PRC/JMM), 1991a. NAS Alameda, Alameda, California, Work Plan, RI/FS Phases 2B and 3. Prepared for NAVY-WESTDIV, February 15, 1991.

PRC/JMM, 1991b. NAS Alameda, Alameda, California, Health and Safety Plan, RI/FS Phases 2B and 3 and IMF Site EE/CA. Prepared for NAVY-WESTDIV, May 1991.

PRC/JMM, 1992. NAS Alameda, Alameda, California, Data Summary Report RI/FS Phases 2B and 3 Draft Final. Prepared for NAVY-WESTDIV, April 1992.

Radbruch, Dorothy H., 1957. "Areal and Engineering Geology of the Oakland West Quadrangle, California," Miscellaneous Geologic Investigations MAP I-239. U.S. Geological Survey.

Sanborn-Ferris Map Co.(Sanborn), 1897. Map of Alameda, California.

Serfes, Michael, 1991. "Determining the Mean Hydraulic Gradient of Ground Water Affected by Tidal Fluctuations," Ground Water, Vol. 29, No. 4, July-August 1991, pp. 549-555.

Taylor, J.K., 1990. "Statistical Techniques for Data Analysis," Lewis Publishers, Chelsea, MI., pp.70-73.

Trask, P.D., and J.W. Rolston, 1951. "Engineering Geology of San Francisco Bay, California," Geological Society of America Bulletin, Vol. 62, No. 9, pp. 1079-1110.

N00236.001296
ALAMEDA POINT
SSIC NO. 5090.3

FINAL
DATA SUMMARY REPORT BACKGROUND AND TIDAL INFLUENCE STUDIES AND ADDITIONAL WORK AT SITES 4 AND 5

DATED 16 OCTOBER 1995

THIS RECORD CONTAINS MULTIPLE VOLUMES WHICH HAVE BEEN ENTERED SEPARATELY

VOLUME 2 OF 2 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.001297**