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DRAFT
SITE INVESTIGATION REPORT
SITE 29
NAVAL WEAPONS STATION SEAL BEACH
DETACHMENT CONCORD
CONCORD, CALIFORNIA

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ACRONYMS AND ABBREVIATIONS

bgs	Below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CLEAN	Comprehensive Long-Term Environmental Action Navy
COPC	Chemical of potential concern
CSF	Cancer slope factor
CTO	Contract Task Order
DTSC	Department of Toxic Substances Control
EFA West	Naval Facilities Engineering Command, Engineering Field Activity West
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
FFA	Federal Facilities Agreement
FS	Feasibility study
HI	Hazard index
HQ	Hazard quotient
IT	IT Corporation
LFR	LFR Levine·Fricke
mg/kg	Milligrams per kilogram
mg/kg-day	Milligrams per kilogram per day
msl	Mean sea level
Navy	U.S. Department of the Navy
O&G	Oil and grease
PAH	Polynuclear aromatic hydrocarbons
PARCC	Precision, accuracy, representativeness, completeness, and comparability
PCB	Polychlorinated biphenyl
PRC	PRC Environmental Management, Inc.
PRG	Preliminary remedial goal
QA/QC	Quality assurance/quality control
QAPP	Quality assurance project plan
RCRA	Resource Conservation and Recovery Act
RFA	RCRA facility assessment
RFACS	RFA confirmation study
RfC	Reference concentration
RfD	Reference dose
RME	Reasonable maximum exposure
SI	Site investigation
SRA	Screening-level risk assessment
SVOC	Semivolatile organic compound
SWMU	Solid waste management unit

ACRONYMS AND ABBREVIATIONS (continued)

TPH	Total petroleum hydrocarbon
TtEMI	Tetra Tech EM Inc.
μg/kg	Micrograms per kilogram
UST	Underground storage tank
VOC	Volatile organic compound
WP	Work Plan
95 UCL	95 percent upper confidence limit of the arithmetic mean

1.0 INTRODUCTION

This site investigation (SI) report summarizes the results of soil investigation activities conducted for Site 29 located within the Naval Weapons Station Seal Beach Detachment Concord (Naval Weapons Station SBD Concord) under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) process. The SI report has been developed for the U.S. Department of the Navy (Navy), Naval Facilities Engineering Command, Engineering Field Activity West (EFA West) by Tetra Tech EM Inc. (TtEMI), and LFR Levine·Fricke (LFR) as Contract Task Order (CTO) No. 265 under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract No. N62474-94-D-7609 (CLEAN II).

Under this CTO, TtEMI and LFR were tasked to undertake follow-up soil sampling investigations at Site 29 according to the approved SI Work Plan (WP) (TtEMI 1998a). The Navy had previously conducted soil sampling events at Site 29 in 1988, 1989, and again in 1996, as a part of the Resource Conservation and Recovery Act (RCRA) Facility Assessment Confirmation Study (RFACS). Additional soil sampling investigations were recently conducted over the months of January and February, 1999, at Site 29 to evaluate the vertical and lateral extent of contaminants previously reported in shallow soils beneath Building IA-25 and to evaluate soil conditions adjacent to the inactive sanitary sewer line associated with Building IA-25.

This report summarizes the installation and site background, historic and current land use, previous and recently conducted soil sampling activities, and soil analytical results, and includes a screening level type human health risk assessment conducted in accordance with Department of Toxic Substances Control (DTSC) guidance (DTSC 1994). The report contains five sections in addition to this introduction. Section 2.0 presents the installation background; Section 3.0 presents the Site 29 background; Section 4.0 presents investigation methods; Section 5.0 presents the site characterization results including the screening-level risk assessment (SRA), and Section 6.0 summarizes the results and presents a recommendation for the need for additional CERCLA activities at Site 29. Appendices A, B, and C are included to present lithologic logs, complete analytical results, and data validation and data quality assessment, respectively.

2.0 INSTALLATION BACKGROUND

This section presents installation background information, including the location, history, geology, topography, hydrology, and climate at Naval Weapons Station SBD Concord.

2.1 LOCATION

Naval Weapons Station SBD Concord is the major naval munitions trans-shipment facility on the West Coast and is located in the north-central portion of Contra Costa County, California, approximately 30 miles northeast of San Francisco (Figure 2-1). The facility encompasses approximately 13,000 acres and is bounded by Suisun Bay to the north, the Los Medanos Hills to the east, and by the city of Concord to the south and west. Currently, the facility contains two separate primary land holdings divided by State Route 4, including the Tidal Area and the Inland Area (Figure 2-1). Site 29 is located within the south-central portion of the Inland Area.

2.2 HISTORY

Facilities located in the greater Tidal Area of Naval Weapons Station SBD Concord are dedicated to ordnance operations and are located on the original property of the Naval Magazine, Port Chicago, acquired by the Navy in 1942. The majority of Naval Weapons Station SBD Concord operations take place in the Inland Area. Ammunition storage, which constitutes the largest single land use at Naval Weapons Station SBD Concord, is maintained in five magazine groups and two groups of barricaded railroad sidings. Various production facilities for the inspection and maintenance of ordnance are located throughout the Inland Area.

2.3 GEOLOGY

Regional geologic features include several northwest-trending fault systems that divide Contra Costa County into large tectonic blocks. An uplifted block feature topographically separates the Inland and Tidal Areas.

Two major faults are known to exist in Naval Weapons Station SBD Concord: the Concord and Clayton faults. The Concord Fault passes approximately 2 miles south of Naval Weapons Station SBD Concord and is classified as an active, right-lateral strike-slip fault. The Clayton Fault lies at the base of Los Medanos Hills as it passes through Naval Weapons Station SBD Concord. The Clayton Fault is

classified as active or potentially active (PRC Environmental Management, Inc. [PRC] 1996). Broad lowlands are underlain by thick, unconsolidated Pleistocene-age alluvial sediments eroded from up-thrown blocks.

Soils in the north-central portions (Tidal Area) of Naval Weapons Station SBD Concord are clay-rich alluvium derived from nearby hills. They are well-sorted, pebbly alluvium from upstream areas of Mt. Diablo Creek. Soils in the central area (Inland Area) tend to be coarser at shallow depths, but grade comparatively finer than do soils in the north-central area.

The surface geology of the Inland Area is divided into two alluvial areas. The surface geology of the Tidal Area is composed of alluvial formations derived from erosion products associated with the geologic units of Los Medanos Hills intermixed with deltaic sediments from Suisun Bay. The second area consists of Quaternary age sedimentary formation and alluvial byproducts in the low and gently sloped hills to the southwest. Alluvium in this area consists of beds of sandy, silty, and clayey soils, which are detrital deposits made by streams on riverbeds. Silty soils appear to predominate. A 3foot-thick layer of dark brown or gray, clayey soil is consistently present on the alluvium throughout the region (PRC 1996). Bedrock at the Inland Area is a Pliocene nonmarine sedimentary rock formation.

These two geologic areas are separated by the approximate alignment of Seal Creek (PRC 1996). Site 29 is located on the west side of Seal Creek on the side of a gently sloped hill of the Quaternary age sedimentary formation.

2.4 TOPOGRAPHY

The topography of the Inland Area of the Naval Weapons Station SBD Concord varies sharply. Most of the western half of the Inland Area is characterized by gently sloping hills and includes the Site 29 area. Steeply sloping hills, beginning at 100 feet mean sea level (msl) and rising to over 800 feet msl, form the northeast boundary of the Inland Area. These steeply sloping hills have slopes ranging between 15 and 30 percent in places (IT Corporation [IT] 1990).

2.5 HYDROLOGY

Naval Weapons Station SBD Concord lies within the Mt. Diablo/Seal Creek Watershed, which drains an area of approximately 36 square miles. This watershed is bounded on the south by the north peak of Mt. Diablo and on the north by Suisun Bay. Streams that drain the watershed have their headwaters on

the slopes of Mt. Diablo and flow via Mt. Diablo creek through Clayton Valley and Naval Weapons Station SBD Concord to the outlet at Suisun Bay. Mt. Diablo Creek is known as Seal Creek where it enters Naval Weapons Station SBD Concord (PRC 1996).

Groundwater levels have never been recorded at Site 29. However, depth to first-encountered groundwater at Site 29 is estimated to be 20 to 30 feet below ground surface (bgs). Groundwater was not encountered in borings drilled at Site 29 to a depth of 15 feet bgs (PRC 1996). Based on local topography, the estimated groundwater direction is generally to the northeast.

Several groundwater wells in the vicinity of the nearby Mallard Reservoir, approximately 0.75 miles west of the Naval Weapons Station SBD Concord Inland Area, are used for firefighting at a nearby petroleum refinery facility. Groundwater is available beneath the Inland Area in the unconsolidated formations and the bedrock. North of State Route 4, the water table ranges from 30 to 40 feet bgs in low surface elevation areas and deeper as ground surface rises. Local variations in groundwater flow direction occur due to man-made structures and natural variations in local surface and subsurface features.

2.6 CLIMATE

Naval Weapons Station SBD Concord and the surrounding vicinity normally experience dry, warm summers and moderately rainy winters. The mean annual precipitation for Naval Weapons Station SBD Concord is 14 inches. Approximately 84 percent of the rainfall occurs from November through March. Regionally, rainfall may vary from 13 inches in the eastern portion of Contra Costa County to over 30 inches on the upper slopes of Mt. Diablo (IT 1990).

The average local temperature varies from 45°F in January to 75°F in August. In 1960, a high of 106°F in August and a low of 17°F in January was recorded. During a hard freeze in December 1972, the record low was 16°F. The average frost-free season is approximately 265 days (IT 1990).

3.0 SITE BACKGROUND

This section presents background information for Site 29. Specific subsections include the site location, operational history and waste characteristics, and a summary of previous investigations conducted at the site.

3.1 SITE LOCATION

Site 29 is approximately 1,800 feet southwest of the intersection of L Street and Kinne Boulevard, which is near the south boundary of the Inland Area of Naval Weapons Station SBD Concord (Figure 2-1). Site 29 is approximately 600 feet west of Seal Creek and 110 feet higher in elevation. It is located on the side of a hill that slopes eastward toward Seal Creek. Building IA-25 within Site 29 is surrounded on three sides by man-made earthen berms approximately 18 feet high (Figure 3-1).

3.2 OPERATIONAL HISTORY AND WASTE CHARACTERISTICS

Site 29 is comprised of Building IA-25 and solid waste management unit (SWMU) 13. SWMU 13 consists of the associated septic tank, sanitary sewer line, and leach field northeast of the Building IA-25.

Building IA-25 was reportedly used for manufacturing and testing of military explosives including a spray paint booth for repainting components. The spray booth was located in the southwest corner of the building. The building was renovated significantly for rework of explosives in the late 1970s.

The septic tank associated with SWMU 13 was cleaned out in 1997 (Pieper 1998). The sewer system remains operational, although the building is not currently in use.

3.3 PREVIOUS INVESTIGATIONS

Site investigations were conducted from 1988 through 1989 to evaluate potential soil contamination beneath Building IA-25. In 1988, seven surface soil samples were collected in the crawl spaces beneath Building IA-25, and one surface soil sample was collected immediately to the west of Building IA-25. In 1989, eight shallow soil borings were completed beneath Building IA-25, and two soil borings were completed immediately to the west of Building IA-25. At each of the ten soil boring locations completed in 1989, soil samples were collected between the surface and 18 inches below grade. The two sampling events are collectively referred to as the "Building Crawlspace Surface Soils" sampling event throughout this report.

During the Building Crawlspace Surface Soils sampling event, a total of 27 soil samples were collected from soil boring locations shown on Figure 3-1. Sample analyses included metals, explosives, volatile organic chemicals (VOC), semivolatile organic compounds (SVOC), pesticides and polychlorinated

biphenyls (PCB), polynuclear aromatic hydrocarbons (PAH), and chlorinated herbicides. Not all analyses were conducted on each sample. Several analytes including several PAHs and metals were detected at concentrations exceeding U.S. Environmental Protection Agency (EPA) Region IX residential preliminary remediation goals (PRG) (EPA 1998) and estimated ambient limits as shown on Table 3-1. Based on sampling results, the Navy concluded that shallow soils beneath the building contain trace amounts of organic compounds and pesticides, as well as metals. Results of a focused human health risk assessment concluded that no long-term health effects to construction and maintenance workers were anticipated and no further studies are warranted at Building IA-25. The report prepared by IT (IT 1990) presents and discusses these results in more detail. Table 3-1 also presents screening levels that were used to evaluate the data. Section 5.4.1 of this report discusses Table 3-1 in more detail and the screening of maximum concentrations detected in the Building Crawlspace Surface Soils sampling event against estimated ambient concentrations, EPA Region IX Residential PRGs, and EPA Region IX Industrial PRGs.

The DTSC performed a RCRA facility assessment (RFA) at Naval Weapons Station SBD Concord in June 1992. The RFA was performed to evaluate the potential for release of hazardous substances from 24 SWMUs at Naval Weapons Station SBD Concord. In 1996 the Navy performed an RFACS to further evaluate the state's RFA findings.

The septic tank, sanitary sewer outfall, and leach field were investigated as SWMU 13 during the RFACS (PRC 1996). Two soil borings were advanced to depths of up to 16.5 feet bgs in the vicinity of the septic leach field, approximately 100 feet northeast of Building IA-25 as SWMU 13 during the RFACS (Figure 3-1). Soil samples collected from the leach field area contained oil and grease (O&G), SVOCs (phenol at one sample location), and metals. One shallow boring (13-03, near the storm drain outfall) contained the most significant contaminants. This soil sample contained 920 milligrams per kilogram (mg/kg) of O&G, 0.004 mg/kg of endosulfan II, and 0.1 mg/kg of 4-nitrotoluene, metals and O&G in the near-surface sample. Based on the analytical results of adjacent soil samples in the same boring and adjacent borings, it appears the lateral extent of these constituents is limited in both vertical and horizontal extent. Because of the immobility of these constituents in the environment at Site 29 and the low concentrations detected, the RFACS concluded that there is no evidence of a significant release of contaminants to soil (PRC 1996). However, as a follow-up to this sampling event, an interim RCRA corrective action was conducted to remove the septic tank contents and clean the tank.

Based on the RFACS, SWMU 13 was recommended for no further action under RCRA. Further investigation of subsurface soils in the vicinity of Building IA-25 was recommended under CERCLA to evaluate the extent of detected contaminants in the vicinity of Building IA-25 and to evaluate sewage system pipeline for potential line breaks (PRC 1996). The recommended SI sampling which is the subject of this report was conducted in January and February of 1999. The 1999 sampling event is hereafter referred to as the "Subsurface Soils" sampling event throughout this report.

Section 4.0 below presents the investigation methods associated with the SI sampling conducted at Site 29.

4.0 INVESTIGATION METHODS

The recent Subsurface Soils sampling event at Site 29 consisted of collecting three soil samples from each of three soil borings. The fieldwork was conducted in January and February of 1999. This section discusses the soil sampling procedures, field quality assurance/quality control (QA/QC) procedures, and data validation procedures. Additional information on soil sampling procedures, field QA/QC, the analytical program, and data validation are contained in the Final Site Investigation Work Plan SWMU's 2, 5, 7, and 18 and Site 29, Weapons Support Facility Seal Beach, Detachment Concord (TtEMI 1998a) and the Basewide Naval Weapons Station SBD Concord Quality Assurance Project Plan (QAPP) (TtEMI 1998).

4.1 SUBSURFACE SOILS SAMPLING PROCEDURES

The Subsurface Soils sampling event at Site 29 was conducted according to the final SI WP (TtEMI 1998) and in accordance with the data quality objectives for the site. Three soil borings were drilled at Site 29 to a maximum depth of 15 feet bgs using standard hollow-stem auger drilling techniques. Soil samples were collected for lithologic description using a continuous core barrel sampler lined with brass tubes. Soil type and characteristics were examined and described by a geologist, and a record of these descriptions was maintained on a lithologic log. Soil samples were collected at 5-foot intervals for chemical analysis in accordance with the procedures described below. Three soil samples were collected from each boring. All drilling and sampling equipment and field monitoring equipment that came into contact with environmental media was decontaminated before each use.

in the QAPP for Naval Weapons Station SBD Concord (TtEMI 1998). The total study error in the validated data appears small enough to allow decision-makers to use the data to support making site decisions including the need for additional contingency sampling. The results of the data validation and a summary data quality assessment are presented in Appendix C.

5.0 CHEMICAL CHARACTERIZATION OF SITE 29

The following sections present the chemical characterization of Site 29 based on the analytical results of samples collected during the subsurface sampling event. The focus of the SI work conducted at Site 29 was to collect and analyze subsurface soil samples for use in the evaluation of the lateral and vertical extent of existing soil contamination found beneath Building IA-25. In addition, samples were collected to identify contaminants that may have been released into adjacent soils from the existing sanitary sewer system piping. Screening criteria were used with the analytical results to assess the need for additional investigation and abatement activities under the CERCLA process.

Nine soil samples were collected during the subsurface sampling event conducted at Site 29. The sampling locations are shown on Figure 3-1. The analyses performed and the depth of each soil sample collected at Site 29 are listed in Table 5-1. Complete analytical results of the investigation are presented in Appendix B. The analytical results table (Table 5-1) also includes detection limits and data qualifiers for each sample result.

5.1 SCREENING CRITERIA

The screening criteria used to characterize the nature and extent of contaminants at Site 29 are the EPA Region IX PRGs for residential and industrial soil and/or estimated ambient limit concentrations for the Naval Weapons Station SBD Concord Inland Area (Appendix C of RFACS). The screening criteria were also used to identify chemicals of potential concern (COPC) in the SRA, as discussed in Section 5.4.

5.2 OVERVIEW OF LABORATORY ANALYSIS

Nine subsurface soil samples were collected from three borings and submitted for analysis during the Subsurface Soils sampling event. The soil samples were collected in January and February of 1999 and were analyzed for VOCs, SVOCs, pesticides/PCBs, total petroleum hydrocarbons (TPH) as extractables, TPH as purgeables, and inorganics. The three samples collected from boring SB-1 were

also analyzed for explosive compounds. The Naval Weapons Station SBD Concord SI WP provides details regarding the specific procedures that were used to analyze samples.

5.3 RESULTS OF SUBSURFACE SOIL SAMPLE ANALYSIS

The results of organic and inorganic analysis of subsurface soil collected at Site 29 during the Subsurface Soils sampling event are discussed below. The analytical results of soil samples and each detected compounds' respective PRG for residential soil, PRG for industrial soil, and estimated ambient limit concentrations are presented in Table 5-1. Figure 3-1 shows the soil boring locations and concentrations of organic and inorganic compounds detected in soil samples.

5.3.1 Organic Compounds in Soil

Organic compounds, including VOCs, SVOCs (including PAHs), and TPH as purgeables were detected in soil samples collected at Site 29. The frequencies of detection and distribution of these compounds is discussed below. Pesticides/PCBs, TPH as extractables, and explosive compounds were not detected in soil samples collected during the SI program.

VOCs

Trichloroethene was detected in one sample collected from boring SB-1 at an estimated concentration of 2 micrograms per kilogram (μg/kg). This concentration is well below the residential PRG.

TPH as Purgeables

TPH as gasoline was detected in one sample collected at approximately 15 feet bgs in boring SB-3 at a concentration of 0.7 mg/kg. There are no known former underground storage tanks (UST) at the Site, although at an adjacent site (Building IA-19), a former UST and soils affected by petroleum hydrocarbons (diesel) were appropriately removed and the site was closed by the County in 1993. Overlying soil samples at Site 29 did not contain any TPH purgeable and no other borings detected TPH. There are no established PRGs for TPH in soil, and concentrations of gasoline detected at this low level do not appear to be of concern for further evaluation under the Navy's UST program.

5.3.2 Inorganic Compounds in Soil

Metals were detected in all nine soil samples collected at Site 29. The metals antimony, barium, beryllium, chromium, copper, iron, manganese, mercury, selenium, thallium, and vanadium were

detected in soil samples collected at Site 29 at concentrations exceeding Inland Area estimated ambient metals concentrations for soil but less than their respective residential PRGs as shown on Table 5-1. Samples collected from all three of the borings contained at least one metal at concentrations greater than the estimated ambient concentrations.

Arsenic, iron, manganese, and thallium were the only metals detected at concentrations exceeding residential PRGs. None of these were detected at concentrations exceeding industrial PRGs except arsenic, which was detected at a concentration exceeding the industrial PRG in one sample. Although arsenic exceeded both residential and industrial PRGs, it did not exceed the estimated ambient concentration in any sample. The detection frequencies and distribution of these inorganics are discussed below.

Arsenic was detected in eight of the nine soil samples collected at Site 29 at concentrations up to 9.5 mg/kg. Although all eight of the samples contained arsenic at concentrations exceeding the residential PRG of 0.38 mg/kg, none of the samples exceeded the estimated ambient concentration for arsenic of 15 mg/kg. A single sample containing arsenic at 9.5 mg/kg exceeded the industrial PRG of 3 mg/kg, but did not exceed the ambient concentration.

Iron was detected in all nine soil samples collected at Site 29 at concentrations ranging from 16,300 mg/kg to up to 41,300 mg/kg. Ambient concentrations for iron have not been established at Naval Weapons Station SBD Concord. Four of the nine samples contained concentrations of iron exceeded the residential PRG of 22,000 mg/kg. The four samples were collected from boring SB-1 at 4.5 to 5.0 feet bgs, from boring SB-1 at 14.4 to 15.0 feet bgs, from boring SB-2 at 5.0 to 5.5 feet bgs, and from boring SB-3 at 14.5 to 15.0 feet bgs.

Manganese was detected in all nine soil samples collected at Site 29 at concentrations ranging from 153 mg/kg to 6,560 mg/kg. The samples collected from soil boring SB-1 at 4.5 to 5.0 feet bgs and soil boring SB-2 at 5.0 to 5.5 feet bgs contained concentrations of manganese exceeding the estimated ambient concentration of 1,300 mg/kg. The concentration of manganese in boring SB-2 at 5.0 to 5.5 feet bgs also exceeded the residential PRG of 3,100 mg/kg.

Thallium was detected in one of nine soil samples collected at Site 29 at a concentration of 7.0 mg/kg. The concentration of thallium in the sample collected from soil boring SB-2 at 5.0 to 5.5 feet bgs was above the residential PRG of 5.2 mg/kg and above the estimated ambient concentration of 1.4 mg/kg.

5.4 SCREENING LEVEL RISK ASSESSMENT

An SRA was conducted to evaluate potential human health risks associated with the chemicals detected in soil at Site 29. The methods applied in the SRA are consistent with DTSC guidance in "Recommended Outline for Using U.S. EPA Environmental Protection Agency Region IX Preliminary Remediation Goals in Screening Risk Assessments at Military Facilities" memorandum (DTSC 1994).

Following the risk assessment paradigm consistent with EPA guidance (1989), the SRA is composed of the five following components:

- Data evaluation and identification of COPCs
- Exposure assessment
- Toxicity assessment
- Risk characterization
- Uncertainty analysis

These components are detailed in the following subsections. The results and conclusions of the SRA are summarized in Section 5.4.6.

5.4.1 Data Evaluation and Identification of COPCs

The data evaluated in this SRA include chemical data collected to assess soil conditions during the Building Crawlspace Surface Soils sampling event and the Subsurface Soils sampling event. The quality of the data collected during the Building Crawlspace Surface Soils sampling event cannot be verified because a complete data set is not available (only detection results are available). The Building Crawlspace Surface Soils sampling event data represent surface soil conditions beneath Building IA-25 and the Surface Soils sampling event data represent subsurface soil conditions outside Building IA-25. Therefore, the data sets for the two sampling events are evaluated separately in this SRA. The chemical data collected during the 1996 RFACS site investigation for the septic tank system (SWMU 13) are not evaluated in this SRA because potential human health risk concerns have been addressed in the RFACS (PRC 1996).

COPCs were identified through a three-step process. First, using the Building Crawlspace Surface Soils sampling event and the Subsurface Soils sampling event chemical data sets, preliminary lists of COPCs were developed that included all analytes detected in one or more soil samples. Petroleum indicator

results (i.e., gasoline) were not used in the SRA. However, the results of the principal toxic constituents in petroleum products (i.e., certain metals, benzene, toluene, ethylbenzene, xylenes, and PAHs), if detected, were used in the SRA.

Second, metals considered to be essential human nutrients were reviewed for possible elimination. Elements considered to be essential nutrients for humans include calcium, iron, magnesium, potassium, and sodium. EPA and DTSC guidance state that these elements can be deleted because of their low toxicities when detected at environmental concentrations (EPA 1989) (DTSC 1992). Although detected concentrations of iron exceeded the residential PRG, the industrial PRG concentrations of iron and the other four elements were well within their typical background range in California (Bradford and others 1996) and in the U.S. (Shacklette and Boerngen 1984; Lindsay 1979); therefore, these elements were eliminated as COPCs.

Third, an analysis was conducted to remove from the list of metals those only present at ambient levels. Many substances, including metals, occur naturally in soil. For the Naval Weapons Station SBD Concord inland area, "ambient limits" were estimated for 19 metals (Appendix C of RFACS). These limits represent an estimate of the upper limit of metal concentrations (80% lower confidence limit of the 95th percentile) in soil that can be assumed to represent site conditions before industrial operations at the facility began. EPA and DTSC guidance (EPA 1989; DTSC 1992) indicated that metals present at ambient concentrations may be eliminated as COPCs. Metals whose maximum detected concentrations were less than their "ambient limits" were eliminated as COPCs.

The COPCs identified using the above three-step process are listed in Tables 3-1 and 5-2 for the Building Crawlspace Surface Soils sampling event and the Subsurface Soils sampling event chemical data sets, respectively.

5.4.2 Exposure Assessment

Potential human health risks associated with chemicals detected in soil at Site 29 were conservatively evaluated under an unrestricted land-use scenario (residential). However, the land use at the site is currently industrial. Future land use at the site is likely to remain industrial because Naval Weapons Station SBD Concord is not expected to close. Therefore, potential human health risks associated with chemicals detected in soil at Site 29 were also evaluated for industrial workers under the industrial land use scenario.

The exposure pathways evaluated for potential receptors under both the residential and industrial land-use scenarios include the following:

- incidental ingestion of soils
- inhalation of particulates and volatiles emitted from soils
- dermal contact with soils

The maximum detected concentrations for COPCs in soil were conservatively used as exposure point concentrations (EPC) for estimating potential health risks and are presented in Tables 5-3 and Table 5-4 for the Building Crawlspace Surface Soils sampling event data set for the residential and industrial exposure scenarios, respectively. Tables 5-5 and Table 5-6 presents the EPCs for the Subsurface Soils sampling event for the residential and industrial exposure scenarios, respectively. In addition, Tables 5-7 and 5-8 present a summary of statistical analysis for the Building Crawlspace Surface Soils sampling event under the residential exposure scenario and industrial exposure scenario, respectively. Tables 5-9 and 5-10 present a summary of statistical analysis for the Subsurface Soils sampling event under the residential exposure scenario and industrial exposure scenario, respectively.

Exposure is based on "intake," which is defined as the mass of a substance taken into the body per unit body weight per unit time. Intake from a contaminated medium is determined by the amount of the chemical in the medium, the frequency and duration of exposure, body weight, the contact rate, and the averaging time. The following is a generic algorithm that is used to calculate chemical intake:

$$I = \frac{C \times CR \times EF \times ED}{BW \times AT}$$

where

I	=	Intake (milligrams per kilogram body weight per day [mg/kg-day])
C	=	Chemical concentration in contaminated medium (mg/kg) or (mg/L)
CR	=	Contact or ingestion rate (for example milligrams soil per day or liters per day)
EF	=	Exposure frequency; how often exposure occurs (days per year)
ED	=	Exposure duration; how long exposure occurs (years)
BW	=	Body weight [kilogram (kg)]
AT	=	Averaging time; period over which exposure is averaged (days)

In accordance with EPA guidance (EPA 1989), exposure parameters used to determine contaminant intakes for a given pathway represents a reasonable maximum exposure (RME). EPA default values for exposure parameters were used (EPA 1998).

5.4.3 Toxicity Assessment

5.4.3.2 Carcinogenic and Non-carcinogenic Chemicals

Standard toxicological methodologies for assessing the toxicity of chemicals involve quantifying the dose-response relationships for adverse human health effects associated with exposure to specific chemicals. For carcinogenic health effects, cancer slope factors (CSF) are used to estimate the incremental lifetime cancer risk of developing cancer as a result of chemical intake. CSFs correspond to specific routes of exposure. The potential for noncarcinogenic adverse health effects for oral exposures is typically evaluated by comparing estimated daily intakes with reference doses (RfD), which represent daily intakes at which no adverse health effects are expected to occur. Reference concentrations (RfC) present the same information for inhalation exposures; RfCs are typically converted to units of mg/kg-day and called inhalation RfDs for the purposes of hazard index (HI) calculations.

Sources of toxicity values include EPA's Integrated Risk Information System Chemical Files, Health Effects Assessment Summary Tables, National Center for Environmental Assessment (formerly Office of Environmental Health Hazard Assessment) (as cited in EPA 1998).

5.4.3.3 Lead Assessment

Risks and HIs are not evaluated for lead in the same manner as other human health COPCs because EPA and Cal/EPA have developed physiologically based modeling approaches to evaluate the intake and subsequent blood lead levels of receptors, based on exposure to soil and groundwater. Cal/EPA's LEADSPREAD Model estimates the percentage of children and adults whose blood lead levels would exceed acceptable limits if exposed to a specific concentration of lead.

The Cal/EPA value of 130 mg/kg for lead in residential soil and the EPA value of 1,000 mg/kg for lead in industrial soil were used as screening values for assessing lead exposures. If the maximum detected concentration of lead exceeded the industrial screening value, lead was screened further using

the 95 percent upper confidence limit of the arithmetic mean (95 UCL) instead of the maximum detected concentration. The 95 UCL was calculated in accordance with EPA guidance (EPA 1992).

5.4.4 Risk Characterization

This section presents a quantitative analysis of potential risk to human health from COPCs detected in soils.

5.4.4.1 Consideration of Carcinogenic Endpoints

Potential cancer risks were estimated using the ratios of the chemical concentrations and EPA Region IX PRGs in accordance with DTSC guidance (1994). COPCs whose PRGs are based on carcinogenic effects are designated with "ca" on Tables 5-3 and 5-4 for the Building Crawlspace Surface Soils sampling event for residential and industrial exposure scenarios, respectively. Tables 5-5 and 5-6 present COPCs whose PRGs are based on carcinogenic effects designated with "ca" for the Subsurface Soils sampling event data set for residential and industrial exposure scenarios, respectively. PRGs for carcinogenic chemicals are risk-based chemical concentrations that correspond to a one-in-one-million (1×10^{-6}) cancer risk using current EPA CSFs (discussed in Section 5.4.3) and regulatory default "standard" exposure factors in the intake equation (discussed in Section 5.4.2). The EPA's acceptable target cancer risk range is 1×10^{-6} to 1×10^{-4}. The PRGs for carcinogenic chemicals correspond to the lower bound limit of the EPA acceptable target risk range. The cancer risk for a carcinogenic COPC was calculated using the maximum detected concentration (C_{max}) and "ca" PRG (PRG_{ca}) in the following equation:

$$\text{Chemical-Specific Risk} = (C_{max} / PRG_{ca}) \times 10^{-6}$$

The total cancer risk for the site was estimated by summing together the cancer risk for each carcinogenic chemical. The cancer risk for individual carcinogenic chemicals and the total cancer risk for the site are presented in Tables 5-3 and 5-4 for the Building Crawlspace Surface Soils sampling event for the residential and industrial exposure scenarios, respectively. Tables 5-5 and 5-6 present the cancer risk for individual carcinogenic chemicals and the total cancer risk for the site for the Subsurface Soils sampling event for the residential and industrial exposure scenarios, respectively.

5.4.4.2 Consideration of Noncarcinogenic Endpoints

Potential non-cancer hazards were estimated using the ratios of the chemical concentrations and EPA Region IX PRGs in accordance with DTSC guidance (1994). COPCs whose PRGs are based on noncarcinogenic effects are designated with "nc" on Tables 5-3 and 5-4 for the Building Crawlspace Surface Soils sampling event for residential and industrial exposure scenarios, respectively. Tables 5-5 and 5-6 present COPCs whose PRGs are based on noncarcinogenic effects designated with "nc" for the Subsurface Soils sampling event for residential and industrial exposure scenarios, respectively. PRGs for noncarcinogenic chemicals are risk-based chemical concentrations that correspond to a non-cancer hazard quotient (HQ) of 1.0 using current EPA RfDs (discussed in Section 5.4.3) and regulatory default "standard" exposure factors in the intake equation (discussed in Section 5.4.2). The non-cancer HQ for a noncarcinogenic COPC was calculated using the maximum detected concentration (C_{max}) and "nc" PRG (PRG_{nc}) in the following equation:

$$HQ = C_{max} / PRG_{nc}$$

The non-cancer HI for the site was estimated by summing together the HQ for each noncarcinogenic chemical. If the HI is greater than 1.0, then the HI is recalculated for chemicals which have the same toxic manifestation, or which affect the same target organ.

The HQs for individual noncarcinogenic chemicals and the total non-cancer HI for the site are presented in Tables 5-3 and 5-4 for the Building Crawlspace Surface Soils sampling event for the residential and industrial exposure scenarios, respectively. Tables 5-5 and 5-6 present the HQs for individual noncarcinogenic chemicals and the total non-cancer HI for the site for the Subsurface Soils sampling event for the residential and industrial exposure scenarios, respectively.

The PRGs for total chromium assume a one-to-six ratio in soils of hexavalent chromium to trivalent chromium. The PRGs for thallium oxide were used as surrogates for thallium.

5.4.4.3 Results of Screening Level Risk Assessment

Building Crawlspace Surface Soils Sampling Event:

Volatiles, semivolatiles (including PAHs), organochlorine pesticides, PCBs, chlorinated herbicides, metals, and explosive byproducts were identified as COPCs in the Building Crawlspace Surface Soils sampling event.

Under the residential exposure scenario (see Table 5-3), the chemical-specific cancer risks for chrysene, benzo(a)pyrene, cadmium, chromium, and nickel exceeded 1×10^{-6}. The total cancer risk was estimated to be 2.4×10^{-5}, which is within the EPA's acceptable target risk range of 1×10^{-6} to 1×10^{-4}. All chemical-specific non-cancer HQs were below the target HQ of 1.0. The non-cancer HI for the site was estimated to be 3.9, which exceeded the threshold HI of 1.0. However, the HIs for individual toxic endpoints were all below the threshold HI of 1.0, indicating little potential for non-cancer health effects.

Under the industrial exposure scenario (see Table 5-4), the chemical-specific risk for chromium exceeded 1×10^{-6}. The total cancer risk for the site was estimated to be 6.9×10^{-6}, which is within the EPA's acceptable target risk range of 1×10^{-6} to 1×10^{-4}. All chemical-specific non-cancer HQs were below the target HQ of 1.0. The non-cancer HI for the site was estimated to be 0.11, which is below the threshold HI of 1.0.

The maximum detected concentration of lead of 3,400 mg/kg exceeded the residential screening value of 130 mg/kg and the industrial screening value of 1,000 mg/kg. The data set for lead was determined to be lognormally distributed using Shapiro-Wilk's W-test at a 0.05 probability level for normality (Gilbert 1987). The 95 UCL for lead was calculated to be 753 mg/kg, which is below the industrial screening level for lead.

Subsurface Soils Sampling Event:

Volatiles, semivolatiles, and metals were identified as COPCs in the Subsurface Soils sampling event data set (Table 5-2).

Under the residential exposure scenario (see Table 5-5), chemical-specific cancer risks for all COPCs were below 1×10^{-6}. The total cancer risk for the site was estimated to be 3.6×10^{-7}, which is a lower risk than the EPA's acceptable target risk range of 1×10^{-6} to 1×10^{-4}. Chemical-specific non-cancer

HQs for manganese and thallium exceeded the target HQ of 1.0. The non-cancer HI for the site was estimated to be 4.1, which exceeded the threshold HI of 1.0. The HIs for the central/peripheral nervous system and the skin toxic endpoints also exceeded the threshold HI of 1.0.

Under the industrial exposure scenario (see Table 5-6), chemical-specific cancer risks for all COPCs were below 1×10^{-6}. The total cancer risk for the site was estimated to be 1.7×10^{-7} which is below the EPA's acceptable target risk range of 1×10^{-6} to 1×10^{-4}. Chemical-specific non-cancer HQs for all COPCs were below the target HQ of 1.0. The non-cancer HI for the site was estimated to be 0.22, which is also below the threshold HI of 1.0.

5.4.5 Uncertainty Analysis

There are varying degrees of uncertainty at each stage of the SRA, arising from assumptions made in the risk assessment and limitations of the data used to calculate risk estimates. Uncertainty and variability are inherent in the identification of COPCs, exposure assessment, toxicity values, and risk characterization, and are discussed in the subsections below.

5.4.5.1 Identification of COPCs

For this site, the selection of COPCs for inclusion in the SRA was conservative. The only chemicals not quantitatively evaluated in the SRA were those that are essential nutrients, or were detected at concentrations below estimated ambient concentrations (inorganic chemicals only). Therefore, all chemicals that are not essential nutrients detected in soil at concentrations exceeding background were evaluated in the SRAs. It is unlikely that chemicals eliminated from the SRA were either site-related or would have posed a health risk of significance. The uncertainty related to this component of the risk assessment is likely to result in an overestimate of risk by including chemicals that are not site-related. Also, no decrease in organic chemical concentrations over time was assumed to occur. This also results in a more conservative risk estimate.

5.4.5.2 Exposure Assessment

The exposure assessment relies on current and predicted future uses of the land and the parameters that are available to estimate the magnitude and duration of exposures associated with those land uses. Because Naval Weapons Station SBD Concord is not proposed for closure, human receptors would most likely be present. For this site, this included workers. Therefore, EPA's occupational exposure

scenarios are most applicable to the Site. Although this site did not have a planned residential reuse, residential exposures are typically evaluated to represent an unrestricted exposure scenario.

Variability and uncertainty are also related to exposure parameters used in the SRA. Variability in exposure duration and frequency, as well as breathing rates, soil ingestion rates, and amount of dermal contact with soil, can be substantial. In this SRA, the RMEs were characterized for each receptor. The use of default RME parameters, however, leads to a compounding of conservative assumptions that likely overestimates risk. The default RME parameters are selected to be representative of the 95th percentile of exposure or higher for each exposure pathway. For the residential RME, for example, a person is assumed to be exposed to the site 24 hours per day, 350 days per year for 30 years.

In addition, the use of maximum detected concentrations rather than average concentrations (defined as the 95 UCL) as EPCs is likely to result in an overestimation of risk.

However, the standardized use of these exposure assumptions is recommended and accepted practice by state and federal regulate agencies for CERCLA risk assessments.

5.4.5.3 Toxicity Assessment

Uncertainties associated with the toxicity values used to calculate PRGs used in the SRA include:

- Unknown differences between humans and laboratory animals in absorption, distribution, metabolism, and excretion, which can greatly affect toxicity values
- Validity and quality of scientific studies that form the basis of EPA-derived and DTSC-derived toxicity values
- Statistical models used to extrapolate from high to low doses in animals in development of toxicity values
- Basic underlying assumptions in the dose-response model for carcinogens that there is no threshold involved in the pathogenesis of cancer

In general, toxicity values are developed to be protective of sensitive receptors, and are likely to be overestimate toxicity of the chemical. Toxicity values have not been developed for all chemicals, however; in these cases, risk or HIs may be underestimated. Toxicity values may not be available for a variety of reasons, including that a chemical may not have been studied; studies conducted were inconclusive; or the chemical has been studied only as part of a mixture and no chemical-specific information was generated. In each case, the lack of a toxicity value is likely to cause an underestimate of risk. The magnitude of the underestimation is unknown, because the lack of a toxicity value

indicates the lack of any reliable toxicity information. Also in this assessment, toxicity values were used to assess risks from dermal exposure without adjustment for gastrointestinal absorption efficiency. This may result in an underestimate of risk, the magnitude of which is inversely proportional to the gastrointestinal absorption of the chemical.

Furthermore, the PRG for total chromium conservatively assumes a 1/6 ratio of hexavalent chromium to trivalent chromium. Hexavalent chromium is classified as a human carcinogen. However, trivalent chromium is not classifiable as to human carcinogenicity. Previous and current site operations do not indicate the likelihood of hexavalent chromium being present in on-site soil. Therefore, inclusion of total chromium as a carcinogen in the risk calculations would overestimate potential risk.

5.4.5.4 Risk Characterization

To calculate total risks and HIs, the chemical-specific risks for each exposure pathway are summed. According to EPA guidance, "uncertainties associated with summing risks or HIs for several substances are of particular concern in the risk characterization step. The assumption of dose additivity ignores possible synergisms or antagonisms among chemicals, and assumes similarity in mechanisms of action and metabolism. Unfortunately, data to assess interactions quantitatively are lacking" (EPA 1989). EPA guidance recommends summing the risks and HIs in order to avoid underestimating cancer risk or potential noncarcinogenic health effects at a site, despite the concerns stated above (EPA 1989). Summing the risks and HIs may overestimate results, because similarity in mechanisms of action and metabolism are assumed to be similar, and because potential antagonistic effects are ignored. It is also possible that total risks and HIs may be underestimated because potential synergistic effects are ignored.

Overall, RME risks and HIs presented in this SRA for each site are conservative estimates and are more likely to have overestimated risks than to have underestimated them. The estimates presented here are single-value results that actually represent a range of actual exposures and risks. However, rarely do single point estimates accurately represent actual exposures, and much information on variability is lost by using point-estimates of exposure rather than distributions. As stated in DTSC guidance, "Uncertainty and variability in the movement of the chemical across the environment as well as the nature of the potential human exposures mean that the risk is more accurately characterized by a range or distribution" (DTSC 1995).

5.4.6 Summary and Conclusion of Screening Level Risk Assessment

This SRA was conducted to identify chemicals detected in soil at Site 29 that could be associated with potential human health risks. The data evaluated in this SRA include chemical data collected to assess soil conditions during the Building Crawlspace Surface Soils sampling event and the Subsurface Soils sampling event, and were evaluated separately. Potential human health risks were estimated under both a residential and industrial land-use scenario; however, land use at Site 29 will likely remain industrial.

For the Building Crawlspace Surface Soils sampling event, total cancer risks under both residential and industrial exposure scenarios exceeded 1×10^{-6}, but were within the EPA target risk range of 1×10^{-6} to 1×10^{-4}. Chemical-specific risk for chromium contributed the majority of the total cancer risk under both the residential and industrial scenarios. However, chromium was conservatively evaluated as a carcinogen assuming a 1/6 ratio of hexavalent to trivalent chromium. Previous and current site operations do not indicate the likelihood of hexavalent chromium being present in on-site soils. The non-cancer HI under the residential exposure scenario exceeds the threshold HI of 1.0. However, the segregated HIs were each below the threshold HI of 1.0. The non-cancer HI under the industrial exposure scenario was below the threshold HI of 1.0.

Lead was selected as a COPC for the Building Crawlspace Surface Soils sampling event. The maximum detected concentration of lead of 3,400 mg/kg exceeded the residential screening value of 130 mg/kg and the industrial screening value of 1,000 mg/kg. However, the 95 UCL for lead of 753 mg/kg is below the industrial screening concentration for lead.

For the Subsurface Soils sampling event, total cancer risks under both residential and industrial exposure scenarios were both less than the EPA target risk range of 1×10^{-6} to 1×10^{-4}. However, the non-cancer HI under the residential exposure scenario exceeds the threshold HI of 1.0. The HIs for the central/peripheral nervous system and the skin toxic endpoints also exceeded the threshold HI of 1.0 and were driven by concentrations of manganese and thallium, respectively. The potential source for these contaminants is not known because operations previously conducted at the Site (pilot scale testing of ammunitions) are not typically associated with manganese and thallium. The non-cancer HI under the industrial exposure scenario was below the threshold HI of 1.0.

The results of the SRA for the Building Crawlspace Surface Soils sampling event and the Subsurface Soils sampling event, indicate that under a residential land-use scenario, potential adverse health effects

may occur due to exposure to lead in surface soils and manganese, thallium, and lead in subsurface soils. However, the SRA incorporates conservative assumptions in the risk calculations and the overall effects of the use of conservative assumptions is likely to result in an over estimation of potential risk. Furthermore, land-use at Site 29 is likely to remain industrial. The results of the SRA indicate that under an industrial land-use scenario, chemicals detected at Site 29 do not pose an unacceptable risk to current or future industrial worker health.

6.0 SUMMARY

This SI report summarizes the results of soil investigation activities and screening level risk assessments conducted for Site 29. The results of recent soil sampling adjacent to Building IA-25 indicates that no apparent vertical or lateral migration of contaminants from beneath the building to other areas of the Site. Soil sampling directly adjacent to the sanitary sewer line associated with the septic tank system (SWMU 13) also indicates no contaminants of concern which pose an unacceptable risk to industrial worker health.

There is no expectation of significant impact to potential environmental receptors due to past contaminant releases from Site 29. No significant habitat or ecological receptors were identified at the site and there is no indication that future site plans would reestablish habitats and thereby create a potential for exposure of environmental receptors.

Site 29 does not pose an unacceptable risk to current or future industrial worker health and the environment, and the data quality objectives identified within the SI WP (TtEMI 1998a) have been satisfied. As a result, additional sampling or further CERCLA response activities (including Remedial Investigation/Feasibility Study) are not required. If the land use is proposed to change in the future, the site may require re-evaluation at that time. To assure that future land use decisions will appropriately consider the sampling results summarized in this report, the recommendations of this report will be presented in a decision document for inclusion in the Administrative Record. A draft copy of the document will be provided for regulatory agency review and comment.

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TABLES

TABLE 3-1
MAXIMUM CONCENTRATIONS OF DETECTED CONSTITUENTS AND SELECTION OF COPCS
(BUILDING CRAWLSPACE SURFACE SOILS SAMPLING EVENT)
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Chemical	Maximum Detected Concentration	Inland Area Ambient Level [1]	Exceeded Ambient Level	COPC Flag	Rationale for COPC Flag
Volatiles (µg/kg)					
2-BUTANONE (MEK)	480	--	NA	Yes	DT
1,1,1-TRICHLOROETHANE	13	--	NA	Yes	DT
METHYLENE CHLORIDE	11	--	NA	Yes	DT
XYLENES (total)	15	--	NA	Yes	DT
Semivolatiles (µg/kg)					
BIS(2-ETHYLHEXYL)PHTHALATE	3,900	--	NA	Yes	DT
Organochlorine Pesticides and PCB (µg/kg)					
4,4'-DDD	120	--	NA	Yes	DT
4,4'-DDT	230	--	NA	Yes	DT
beta-BHC	32	--	NA	Yes	DT
Polynuclear Aromatic Hydrocarbons (µg/kg)					
ACENAPHTHENE	52	--	NA	Yes	DT
ANTHRACENE	7,000	--	NA	Yes	DT
CHRYSENE	1,900	--	NA	Yes	DT
BENZO(b/k)FLUORANTHENE	480	--	NA	Yes	DT
BENZO(a)PYRENE	150	--	NA	Yes	DT
FLUORANTHENE	6,400	--	NA	Yes	DT
NAPHTHALENE	40	--	NA	Yes	DT
PHENANTHRENE	3,500	--	NA	Yes	DT
PYRENE	4,500	--	NA	Yes	DT
Chlorinated Herbicides (µg/kg)					
2,3,5-TP (Silvex)	13	--	NA	Yes	DT
2,4-DB	66	--	NA	Yes	DT
DINOSEB	23	--	NA	Yes	DT
CLP Metals (mg/kg)					
ALUMINUM	27,500	21,000	Yes	Yes	AAL
ARSENIC	10	15	No	No	BAL
BARIUM	1,660	560	Yes	Yes	AAL
BERYLLIUM	16	0.12	Yes	Yes	AAL
CADMIUM	32	0.28	Yes	Yes	AAL
CALCIUM	8,870	2541 to 45,577 [2] 100 to 320,000 [3]	No	No	NUT
CHROMIUM	2,600	62	Yes	Yes	AAL
COBALT	32	25	Yes	Yes	AAL
COPPER	1,190	65	Yes	Yes	AAL
IRON	42,400	10,000 to 87,000 [2] 7,000 to 550,000 [4]	No	No	NUT
LEAD	3,400	32	Yes	Yes	AAL
MAGNESIUM	12,800	1,456 to 32,378 [2] 50 to >100,000 [3]	No	No	NUT

TABLE 3-1
MAXIMUM CONCENTRATIONS OF DETECTED CONSTITUENTS AND SELECTION OF COPCS
(BUILDING CRAWLSPACE SURFACE SOILS SAMPLING EVENT)
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Chemical	Maximum Detected Concentration	Inland Area Ambient Level [1]	Exceeded Ambient Level	COPC Flag	Rationale for COPC Flag
MANGANESE	1,440	1,300	Yes	Yes	AAL
MERCURY	1.4	0.17	Yes	Yes	AAL
NICKEL	160	110	Yes	Yes	AAL
POTASSIUM	2270	2,100 to 30,000 [2] 50 to 63,000 [4]	No	No	NUT
SELENIUM	4.4	DL	Yes	Yes	AAL
SILVER	0.3	DL	Yes	Yes	AAL
SODIUM	3410	5,580 to 73,400 [2] < 500 to 100,000 [3]	No	No	NUT
VANADIUM	110	95	Yes	Yes	AAL
ZINC	20,000	99	Yes	Yes	AAL
Explosives and Explosive Byproducts (mg/kg)					
DIPHENYLAMINE	1.2	--	NA	Yes	DT

Notes:

COPC = Chemical of Potential Concern
-- = None Established
NA = Not applicable
DL = Detection limit.
DT = Detected in soil; no ambient screening level.
AAL = Above ambient level.
BAL = Below ambient level.
NUT = Essential nutrient.
[1] Naval Weapons Station Seal Beach Detachment Concord, Inland Area ambient limits (Appendic C of RF
[2] Values from Bradford and others (1996).
[3] Values from Shacklette and Boerngen (1984).
[4] Values from Lindsay (1979).

TABLE 5-1
SUMMARY OF SITE 29 ANALYTICAL RESULTS (SUBSURFACE SOILS SAMPLING EVENT)
NAVAL WEAPONS STATION FACILITY SEAL BEACH DETACHMENT CONCORD

Point ID	S29SB01	S29SB01	S29SB01	S29SB02	S29SB02	S29SB02	S29SB03	S29SB03	S29SB03	EPA Residential PRG	EPA Industrial PRG	Inland Area Ambient Levels
Sample ID	265S29SB001	265S29SB002	265S29SB003	265S29SB032	265S29SB033	265S29SB034	265S29SB004	265S29SB005	265S29SB006			
Matrix	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Date	1/25/99	1/25/99	1/25/99	2/3/99	2/3/99	2/3/99	1/25/99	1/25/99	1/25/99			
Sample Depth (in feet)	4.50 - 5.00	9.50 - 10.00	14.50 - 15.00	5.00 - 5.50	10.50 - 10.50	15.00 - 15.50	4.50 - 5.00	9.50 - 10.00	14.50 - 15.00			
Volatiles (µg/kg)												
TRICHLOROETHENE	2 J	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U	2,700	6,100	N/A
Petroleum Indicators (mg/kg)												
GASOLINE	0.6 U	0.5 U	0.5 U	0.5 U	0.6 U	0.6 U	0.6 U	0.6 U	0.7	N/A	N/A	N/A
CLP Metals (mg/kg)												
ALUMINUM	14,600	13,100	13,900	14,000	13,300	12,600	8,770	11,700	20,600	75,000	100,000	21,000
ANTIMONY	0.62 UR	0.74	1.3[A]	1.6[A]	0.77 UR	0.83 UR	0.67 UR	0.68 UR	1.9[A]	30	750	0.9
ARSENIC	3[R]	2.3[R]	1.6[R]	2.6[R]	1.6[R]	0.62 U	3[R]	1.7[R]	9.5[R,I]	0.38	3	15
BARIUM	438	274	379	1240[A]	223	250	256	354	439	5,200	100,000	560
BERYLLIUM	0.020 U	0.010 U	0.020 U	0.13[A]	0.35[A]	0.31[A]	0.09	0.020 U	0.08	150	3,400	0.12
CALCIUM	5,160	7,340	7,120	6,240	3,080	2,690	3,090	5,530	8,950	N/A	N/A	N/A
CHROMIUM	36.1	45.2	35.8	55.8	29.1	22.2	19.1	29.6	75[A]	210	450	62
COBALT	12.7	13.5	16.5	22.3	10.9	14.9	11.4	15.1	19.9	3,300	29,000	25
COPPER	61.9	29.5	37	35.8	26.2	25	66.8[A]	31.2	79.1[A]	2,800	70,000	65
IRON	31,800[R]	20,500	22,800[R]	31,800[R]	20,400	17,200	16,300	22,000	41,300[R]	22,000	100,000	N/A
LEAD	3.2	2.1	1.5	1.6	3.9	5.9	3.1	1.5	2.2	130	1,000	32
MAGNESIUM	10,700	8,800	9,950	10,700	7,760	7,900	5,050	9,060	12,200	N/A	N/A	N/A
MANGANESE	1840[A]	768	733	6560[A,R]	153	426	367	1,080	686	3,100	45,000	1,300
MERCURY	0.13	0.11	0.05	0.22[A]	0.21[A]	0.25[A]	0.12	0.1	0.09	22	560	0.17
MOLYBDENUM	0.28 U	0.21 U	0.27 U	0.19 U	0.22 U	0.23 U	0.30 U	0.31 U	0.48[A]	370	9,400	DL
NICKEL	101	64.9	55.6	91.2	51.7	55.1	39.3	71.4	58.1	150	37,000	110
POTASSIUM	458	552	500	682	1450	1560	801	390	832	N/A	N/A	N/A
SELENIUM	0.72 U	0.53 U	0.69 U	1.5[A]	0.71 U	0.77 U	0.78 U	0.79 U	0.83 U	370	9,400	DL
THALLIUM	3.4 U	1.8 U	2.8 U	7[A,R]	1.3 U	1.6 U	0.89 U	2.8 U	3.9 U	5.2[1]	130[1]	1.4
VANADIUM	63.1	51.8	58.5	99.7[A]	44.1	34.4	37.9	50.6	164[A]	520	13,000	95
ZINC	90.8	50.6	63.4	58.1	47.7	49.3	88	41.6	91.9	22,000	100,000	99

Notes: Samples where no volatiles, semivolatiles, petroleum indicators, metals, pesticides, or PCBs were detected are not listed in this table. U = Not detected with detection limit indicated, J = Estimated value, R = Value rejected due to data quality issues
Inorganic results less than 10 are reported to two significant figures and results greater than 10 are reported to three significant figures.
Organic results less than 10 are reported to one significant figure and results greater than 10 are reported to two significant figures.

DL = Detection Limit
N/A = Not Available
PRG = Preliminary Remediation Goal
R = Exceeds EPA Residential PRG
I = Exceeds EPA Industrial PRG
A = Exceeds Ambient Level
1 = PRG for thallium oxide used as surrogate for thallium

TABLE 5-2
MAXIMUM CONCENTRATIONS OF DETECTED CONSTITUENTS AND SELECTION OF COPCS
(SUBSURFACE SOILS SAMPLING EVENT)
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Chemicals	Maximum Detected Concentration	Inland Area Ambient Level [1]	Exceeded Ambient Level	COPC Flag	Rationale for COPC Flag
Volatiles (µg/kg)					
TRICHLOROETHENE	2	--	NA	Yes	DT
CLP Metals (mg/kg)					
ALUMINUM	20,600	21,000	No	No	BAL
ANTIMONY	1.9	0.9	Yes	Yes	AAL
ARSENIC	9.5	15	No	No	BAL
BARIUM	1,240	560	Yes	Yes	AAL
BERYLLIUM	0.35	0.12	Yes	Yes	AAL
CALCIUM	8,950	2541 to 45,577 [2] 100 to 320,000 [3]	No	No	NUT
CHROMIUM	75	62	Yes	Yes	AAL
COBALT	22.3	25	No	No	BAL
COPPER	79.1	65	Yes	Yes	AAL
IRON	41,300	10,000 to 87,000 [2] 7,000 to 550,000 [4]	No	No	NUT
LEAD	5.9	32	No	No	BAL
MAGNESIUM	12,200	1,456 to 32,378 [2] 50 to >100,000 [3]	No	No	NUT
MANGANESE	6,560	1,300	Yes	Yes	AAL
MERCURY	0.25	0.17	Yes	Yes	AAL
MOLYBDENUM	0.48	DL	Yes	Yes	AAL
NICKEL	101	110	No	No	BAL
POTASSIUM	1,560	2,100 to 30,000 [2] 50 to 63,000 [4]	No	No	NUT
SELENIUM	1.5	DL	Yes	Yes	AAL
THALLIUM	7	1.4	Yes	Yes	AAL
VANADIUM	164	95	Yes	Yes	AAL
ZINC	91.9	99	No	No	BAL

Notes:

COPC = Chemical of Potential Concern
-- = None Established
NA = Not applicable
DL = Detection limit.
DT = Detected in soil; no ambient screening level.
AAL = Above ambient level.
BAL = Below ambient level.
NUT = Essential nutrient.
[1] Naval Weapons Station Seal Beach Detachment Concord Inland Area ambient limits (Appendic C of RFACS).
[2] Values from Bradford and others (1996).
[3] Values from Shacklette and Boerngen (1984).
[4] Values from Lindsay (1979).

TABLE 5-3
SUMMARY OF RESIDENTIAL RISK AND HAZARD RESULTS
(BUILDING CRAWLSPACE SURFACE SOILS SAMPLING EVENT)
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Chemical	Maximum Detected Concentration	EPA Residential Cancer PRG		EPA Residential Non-Cancer PRG		Exceeded Residential PRG	Non-Cancer Toxic Endpoint	Residential Cancer Risk	Residential Non-cancer HQ [1]
Volatiles (µg/kg)									
2-BUTANONE (MEK)	480	NA		6,900,000	nc	No	R		0.000070
1,1,1-TRICHLOROETHANE	13	NA		680,000	nc	No	L		0.000019
METHYLENE CHLORIDE	11	8,500	ca	1,600,000	nc	No	L	1.3E-09	0.0000069
XYLENES (total)	15	NA		210,000	sat	No			NA
Semivolatiles (µg/kg)									
BIS(2-ETHYLHEXYL)PHTHALATE	3,900	32,000	ca	1,100,000	nc	No	L	1.2E-07	0.0035
Organochlorine Pesticides and PCB (µg/kg)									
4,4'-DDD	120	2,400	ca	35,000	nc [2]	No	--	5.0E-08	0.0034
4,4'-DDT	230	1,700	ca	35,000	nc	No	L	1.4E-07	0.0066
beta-BHC	32	300	ca	20,000	nc [3]	No	--	1.1E-07	0.0016
Polynuclear Aromatic Hydrocarbons (µg/kg)									
ACENAPHTHENE	52	NA		2,600,000	nc	No	L		0.000020
ANTHRACENE	7,000	NA		14,000,000	nc	No	N		0.00050
CHRYSENE	1,900	560	ca	--		Yes		3.4E-06	
BENZO(b/k)FLUORANTHENE	480	560	ca	--		No		8.6E-07	
BENZO(a)PYRENE	150	56	ca	--		Yes		2.7E-06	
FLUORANTHENE	6,400	NA		2,000,000	nc	No	B, K, L		0.0032
NAPHTHALENE	40	NA		55,000	nc	No	W, RP		0.00073
PHENANTHRENE	3,500	NA		1,800,000	nc [4]	No	--		0.0019
PYRENE	4,500	NA		1,500,000	nc	No	K		0.0030
Chlorinated Herbicides (µg/kg)									
2,3,5-TP (Silverx)	13	NA		440,000	nc	No	L		0.000030
2,4-DB	66	NA		440,000	nc	No	N		0.00015
DINOSEB	23	NA		55,000	nc	No	R		0.00042
CLP Metals (mg/kg)									
ALUMINUM	27,500	NA		75,000	nc	No	C		0.37
BARIUM	1,660	NA		5,200	nc	No	CV		0.32
BERYLLIUM	16	NA		150	nc	No	N		0.11
CADMIUM	32	9	ca	37	nc	Yes	K	3.6E-06	0.8649
CHROMIUM	2,600	210	ca	--		Yes		1.2E-05	
COBALT	32	NA		3,300	nc	No	B, RP		0.0097
COPPER	1,190	NA		2,800	nc	No	G		0.43
LEAD	3,400	NA		130	nc	Yes	C		NA [5]
MANGANESE	1,440	NA		3,100	nc	No	C		0.46
MERCURY	1.4	NA		22	nc	No	C		0.064
NICKEL	160	150	ca	1500	nc	Yes	W	1.1E-06	0.11
SELENIUM	4.4	NA		370	nc	No	C, L, S		0.012
SILVER	0.3	NA		370	nc	No	S		0.00081
VANADIUM	110	NA		520	nc	No	N		0.21
ZINC	20,000	NA		22,000	nc	No	B		0.91
Explosives and Exp. Byproducts (mg/kg)									
DIPHENYLAMINE	1.2	NA		1,400	nc	No	L, K, W		0.00086
Total Risk/Hazard									
TOTAL CANCER RISK								2.4E-05	
NON-CANCER HAZARD INDEX									3.9
Target Organ-Specific Hazard Index									
Central/peripheral nervous system (C)									0.91
Liver (L)									0.014
Kidney (K)									0.87
Cardiovascular system (CV)									0.32

TABLE 5-3
SUMMARY OF RESIDENTIAL RISK AND HAZARD RESULTS
(BUILDING CRAWLSPACE SURFACE SOILS SAMPLING EVENT)
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Chemical	Maximum Detected Concentration	EPA Residential Cancer PRG	EPA Residential Non-Cancer PRG	Exceeded Residential PRG	Non-Cancer Toxic Endpoint	Residential Cancer Risk	Residential Non-cancer HQ [1]
Blood (B)							0.92
Respiratory system (RP)							0.010
Skin including irritation or other effects (S)							0.013
Body weight alterations (W)							0.11
Reproductive system including teratogenic and developmental effects (R)							0.00049
Gastrointestinal system (G)							0.43
Other toxicological endpoints (O)							0.0
No observable toxicological endpoints (N)							0.32

Notes:
PRG = Preliminary Remediation Goal (EPA 1998)
HQ = Hazard Quotient
NA = Not Applicable
-- = None Established
ca = cancer PRG
nc = non-cancer PRG
sat = soil saturation limit concentration
(1) Cancer risk is presented for chemicals with cancer PRGs and non-cancer HQ is presented for chemicals with non-cancer PRGs.
(2) Non-cancer PRG for DDT used as a surrogate for DDD.
(3) Non-cancer PRG for gamma-BHC used as a surrogate for beta-BHC.
(4) PRG for fluorene used as a surrogate for phenanthrene.
(5) Lead is evaluated based on an estimated of blood lead levels in 99 percent of children and adults whose blood lead levels would exceed acceptable limits using the DTSC LeadSpread Model (DTSC 1992)

TABLE 5-4
SUMMARY OF INDUSTRIAL RISK AND HAZARD RESULTS
(BUILDING CRAWLSPACE SURFACE SOILS SAMPLING EVENT)
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Chemical	Maximum Detected Concentration	EPA Industrial Cancer PRG		EPA Industrial Non-Cancer PRG		Exceeded Industrial PRG	Industrial Cancer Risk	Industrial Non-cancer HQ [1]
Volatiles (µg/kg)								
2-BUTANONE (MEK)	480	NA		27,000,000	nc	No		0.000018
1,1,1-TRICHLOROETHANE	13	NA		1,400,000	nc	No		0.000009
METHYLENE CHLORIDE	11	20,000	ca	9,100,000	nc	No	5.5E-10	0.0000012
XYLENES (total)	15	NA		210,000	sat	No		NA
Semivolatiles (µg/kg)								
BIS(2-ETHYLHEXYL)PHTHALATE	3,900	210,000	ca	21,000,000	nc	No	1.9E-08	0.00019
Organochlorine Pesticides and PCB (µg/kg)								
4,4'-DDD	120	19,000	ca	800,000	c [2]	No	6.3E-09	0.00015
4,4'-DDT	230	13,000	ca	800,000	nc	No	1.8E-08	0.00029
beta-BHC	32	2,300	ca	450,000	c [3]	No	1.4E-08	0.000071
Polynuclear Aromatic Hydrocarbons (µg/kg)								
ACENAPHTHENE	52	NA		28,000,000	nc	No		0.0000019
ANTHRACENE	7,000	NA		220,000,000	nc	No		0.000032
CHRYSENE	1,900	3,600	ca	--		No	5.3E-07	
BENZO(b/k)FLUORANTHENE	480	3,600	ca	--		No	1.3E-07	
BENZO(a)PYRENE	150	360	ca	--		No	4.2E-07	
FLUORANTHENE	6,400	NA		37,000,000	nc	No		0.00017
NAPHTHALENE	40	NA		190,000	nc	No		0.00021
PHENANTHRENE	3,500	NA		22,000,000	c [4]			0.00016
PYRENE	4,500	NA		26,000,000	nc	No		0.00017
Chlorinated Herbicides (µg/kg)								
2,3,5-TP (Silvex)	13	NA		8,600,000	nc	No		0.0000015
2,4-DB	66	NA		8,600,000	nc	No		0.0000077
DINOSEB	23	NA		1,100,000	nc	No		0.000021
CLP Metals (mg/kg)								
ALUMINUM	27,500	NA		100,000	ma	No		NA
BARIUM	1,660	NA		100,000	ma	No		NA
BERYLLIUM	16	NA		3,400	nc	No		0.0047
CADMIUM	32	NA		930	nc	No		0.034
CHROMIUM	2,600	450	ca	--		Yes	5.8E-06	
COBALT	32	NA		29,000	nc	No		0.0011
COPPER	1,190	NA		70,000	nc	No		0.017
LEAD	3,400	NA		1,000	nc	Yes		NA [5]
MANGANESE	1,440	NA		45,000	nc	No		0.032
MERCURY	1.4	NA		560	nc	No		0.0025
NICKEL	160	NA		37,000	nc	No		0.0043
SELENIUM	4.4	NA		9,400	nc	No		0.00047
SILVER	0.3	NA		9,400	nc	No		0.000032
VANADIUM	110	NA		13,000	nc	No		0.0085
ZINC	20,000	NA		100,000	ma	No		NA
Explosives and Exp. Byproducts (mg/kg)								
DIPHENYLAMINE	1.2	NA		27,000	nc	No		0.000044

TABLE 5-4
SUMMARY OF INDUSTRIAL RISK AND HAZARD RESULTS
(BUILDING CRAWLSPACE SURFACE SOILS SAMPLING EVENT)
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Chemical	Maximum Detected Concentration	EPA Industrial Cancer PRG	EPA Industrial Non-Cancer PRG	Exceeded Industrial PRG	Industrial Cancer Risk	Industrial Non-cancer HQ [1]
Total Risk/Hazard						
TOTAL CANCER RISK					6.9E-06	
NON-CANCER HAZARD INDEX						0.11

Notes:
PRG = Preliminary Remediation Goal (EPA 1998)
HQ = Hazard Quotient
NA = Not Applicable
-- = None Established
ca = cancer PRG
nc = non-cancer PRG
max = nonrisk-based "ceiling limit" concentration
sat = soil saturation limit concentration
(1) Cancer risk is presented for chemicals with cancer PRGs and non-cancer HQ is presented for chemicals with non-cancer PRGs.
(2) Non-cancer PRG for DDT used as a surrogate for DDD.
(3) Non-cancer PRG for gamma-BHC used as a surrogate for beta-BHC.
(4) PRG for fluorene used as a surrogate for phenanthrene.
(5) Lead is evaluated based on an estimated of blood lead levels in 99 percent of children and adults whose blood lead levels would exceed acceptable limits using the DTSC LeadSpread Model (DTSC 1992).

TABLE 5-5
SUMMARY OF RESIDENTIAL RISK AND HAZARD RESULTS
(SUBSURFACE SOILS SAMPLING EVENT)
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Chemical	Maximum Detected Concentrations	EPA Residential Cancer PRG	EPA Residential Non-Cancer PRG	Non-Cancer Toxic Endpoint	Exceeded Residential PRG	Residential Cancer Risk	Residential Non-cancer HQ [1]
Volatiles (µg/kg)							
TRICHLOROETHENE	2	2,700 ca	23,000 nc	L	No	7.4E-10	0.000087
CLP Metals (mg/kg)							
ANTIMONY	1.9	NA	30 nc	B, O	No		0.063
BARIUM	1,240	NA	5,200 nc	CV	No		0.24
BERYLLIUM	0.35	NA	150 nc	N	No		0.0023
CHROMIUM	75	210 ca	--		No	3.6E-07	
COPPER	79.1	NA	2,800 nc	G	No		0.028
MANGANESE	6,560	NA	3,100 nc	C	Yes		2.1
MERCURY	0.25	NA	22 nc	C	No		0.011
MOLYBDENUM	0.48	NA	370 nc	K	No		0.0013
SELENIUM	1.5	NA	370 nc	C, L, S	No		0.0041
THALLIUM	7	NA	5.2 nc	S	Yes		1.3
VANADIUM	164	NA	520 nc	N	No		0.32
Total Risk/Hazard							
TOTAL CANCER RISK						3.6E-07	
NON-CANCER HAZARD INDEX							4.1
Target Organ-Specific Hazard Index							
Central/peripheral nervous system (C)							2.1
Liver (L)							0.0041
Kidney (K)							0.0013
Cardiovascular system (CV)							0.24
Blood (B)							0.063
Respiratory system (RP)							0.0
Skin including irritation or other effects (S)							1.3
Gastrointestinal system (G)							0.028
Other toxicological endpoints (O)							0.063
No observable toxicological endpoints (N)							0.32

Notes:
PRG = Preliminary Remediation Goal (EPA 1998)
HQ = Hazard Quotient
NA = Not Applicable
-- = None Established
ca = cancer PRG
nc = non-cancer PRG
[1] Cancer risk is presented for chemicals with cancer PRGs and non-cancer HQ is presented for chemicals with non-cancer PRGs.

TABLE 5-6
SUMMARY OF INDUSTRIAL RISK AND HAZARD RESULTS
(SUBSURFACE SOILS SAMPLING EVENT)
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Chemical	Maximum Detected Concentrations	EPA Industrial Cancer PRG		EPA Industrial Non-Cancer PRG		Exceeded Industrial PRG	Industrial Cancer Risk	Industrial Non-cancer HQ [1]
Volatiles (µg/kg)								
TRICHLOROETHENE	2	6,100	ca	79,000	nc	No	3.3E-10	0.000025
CLP Metals (mg/kg)								
ANTIMONY	1.9	NA		750	nc	No		0.0025
BARIUM	1,240	NA		100,000	max	No		NA
BERYLLIUM	0.35	NA		3,400	nc	No		0.00010
CHROMIUM	75	450	ca	--		No	1.7E-07	
COPPER	79.1	NA		70,000	nc	No		0.0011
MANGANESE	6,560	NA		45,000	nc	No		0.15
MERCURY	0.25	NA		560	nc	No		0.00045
MOLYBDENUM	0.48	NA		9,400	nc	No		0.000051
SELENIUM	1.5	NA		9,400	nc	No		0.00016
THALLIUM	7	NA		130	nc	No		0.054
VANADIUM	164	NA		13,000	nc	No		0.013
Total Risk/Hazard								
TOTAL CANCER RISK							1.7E-07	
NON-CANCER HAZARD INDEX								0.22

Notes:
PRG = Preliminary Remediation Goal (EPA 1998)
HQ = Hazard Quotient
NA = Not Applicable
-- = None Established
ca = cancer PRG
nc = non-cancer PRG
max = nonrisk-based "ceiling limit" concentration
[1] Cancer risk is presented for chemicals with cancer PRGs and non-cancer HQ is presented for chemicals with non-cancer PRGs.

TABLE 5-7
STATISTICAL SUMMARY OF RESIDENTIAL RISK AND HAZARD RESULTS
(BUILDING CRAWLSPACE SURFACE SOILS SAMPLING EVENT)
NAVAL WEAPONS STATION SEAL BEACH
DETACHMENT CONCORD

Analyte	Number of Detections	Maximum Detected Concentration	Average of Detected Concentration[1]	Number of Samples With Conc. Greater Than Residential PRG	Number of Discrete Locations With Sample Conc. Greater Than Residential PRG and Ambient	EPA Residential PRG Value	Ambient Value
Volatiles (µg/kg)							
2-BUTANONE (MEK)	1	480	480	0	0	6,900,000	---
1,1,1-TRICHLOROETHANE	1	13	13	0	0	680,000	---
METHYLENE CHLORIDE	4	11	9.4	0	0	8,500	---
XYLENES (total)	2	15	13	0	0	210,000	---
Semivolatiles (µg/kg)							
BIS(2-ETHYLHEXYL)PHTHALATE	2	3,900	2,966	0	0	32,000	--
Organochlorine Pesticides and PCB (µg/kg)							
4,4'-DDD	1	120	120	0	0	2,400	--
4,4'-DDT	7	230	82	0	0	1,700	--
beta-BHC	1	32	32	0	0	300	--
Polynuclear Aromatic Hydrocarbons (µg/kg)							
ACENAPHTHENE	1	52	52	0	0	2,600,000	--
ANTHRACENE	1	7,000	7,000	0	0	14,000,000	--
CHRYSENE	3	1,900	1,082	1	0	560	--
BENZO(b/k)FLUORANTHENE	3	480	352	0	0	560	--
BENZO(a)PYRENE	1	150	150	1	0	56	--
FLUORANTHENE	6	6,400	2,811	0	0	2,000,000	--
PHENANTHRENE	1	670	670	0	0	1,800,000[2]	--
NAPHTHALENE	1	40	40	0	0	55,000	--
PYRENE	6	4,500	1,944	0	0	1,500,000	--
Chlorinated Herbicides (µg/kg)							
2,3,5-TP (Silvex)	1	13	13	0	0	440,000	--
2,4-DB	2	66	61	0	0	440,000	--
DINOSEB	5	23	16	0	0	55,000	--

TABLE 5-7
STATISTICAL SUMMARY OF RESIDENTIAL RISK AND HAZARD RESULTS
(BUILDING CRAWLSPACE SURFACE SOILS SAMPLING EVENT)
NAVAL WEAPONS STATION SEAL BEACH
DETACHMENT CONCORD

Analyte	Number of Detections	Maximum Detected Concentration	Average of Detected Concentration[1]	Number of Samples With Conc. Greater Than Residential PRG	Number of Discrete Locations With Sample Conc. Greater Than Residential PRG and Ambient	EPA Residential PRG Value	Ambient Value
CLP Metals (mg/kg)							
ALUMINUM	22	27,500	20,595	0	0	75,000	21,000
BARIUM	28	1,660	607	0	0	5,200	560
BERYLLIUM	13	16	4.5	0	0	150	0.12
CADMIUM	12	32	8.7	3	3	9	0.28
CHROMIUM	29	2,600	237	1	1	210	62
COBALT	29	32	21.4	0	0	3,300	25
COPPER	29	1,190	138	0	0	2,800	65
LEAD	29	3,400	410	1	1	130	32
MANGANESE	22	1,440	1,123	0	0	3,100	1,300
MERCURY	18	1.4	0.43	0	0	22	0.17
NICKEL	29	160	83.9	1	1	150	110
SELENIUM	7	4.4	2.83	0	0	370	DL
SILVER	3	0.3	0.24	0	0	370	DL
VANADIUM	29	110	68	0	0	520	95
ZINC	29	20,000	1,710	0	0	22,000	99

Notes:

-- = None Established

PRG = Preliminary Remediation Goal (EPA 1998)

[1] Average based on a normal distribution

[2] PRG for fluorene used as a surrogate for phenanthrene

TABLE 5-8
SUMMARY OF STATISTICAL ANALYSIS FOR INDUSTRIAL RISK
(BUILDING CRAWLSPACE SURFACE SOILS SAMPLING EVENT)
NAVAL WEAPONS STATION SEAL BEACH
DETACHMENT CONCORD

Analyte	Number of Detections	Maximum Detected Concentrations	Average of Detected Concentrations[1]	Number of Samples With Conc. Greater Than Industrial PRG	Number of Discrete Locations With Sample Conc. Greater Than Industrial PRG and Ambient	EPA Industrial PRG Value	Ambient Value
Volatiles (µg/kg)							
2-BUTANONE (MEK)	1	480	480	0	0	27,000,000	--
1,1,1-TRICHLOROETHANE	1	13	13	0	0	1,400,000	--
METHYLENE CHLORIDE	4	11	9.4	0	0	20,000	--
XYLENES (total)	2	15	13	0	0	210,000	--
Semivolatiles (µg/kg)							
BIS(2-ETHYLHEXYL)PHTHALATE	2	3,900	2,966	0	0	210,000	--
Organochlorine Pesticides and PCB (µg/kg)							
4,4'-DDD	1	120	120	0	0	19,000	--
4,4'-DDT	7	230	82	0	0	13,000	--
beta-BHC	1	32	32	0	0	2,300	--
Polynuclear Aromatic Hydrocarbons (µg/kg)							
ACENAPHTHENE	1	52	52	0	0	28,000,000	--
ANTHRACENE	1	7,000	7,000	0	0	220,000,000	--
CHRYSENE	3	1,900	1,082	0	0	3,600	--
BENZO(b/k)FLUORANTHENE	3	480	352	0	0	3,600	--
BENZO(a)PYRENE	1	150	150	0	0	360	--
FLUORANTHENE	6	6,400	2,811	0	0	37,000,000	--
PHENANTHRENE	1	670	670	0	0	1,800,000[2]	--
NAPHTHALENE	1	40	40	0	0	190,000	--
PYRENE	6	4,500	1,994	0	0	26,000,000	--
Chlorinated Herbicides (µg/kg)							
2,3,5-TP (Silvex)	1	13	13	0	0	8,600,000	--
2,4-DB	2	66	62	0	0	8,600,000	--
DINOSEB	5	23	17	0	0	1,100,000	--

TABLE 5-8
SUMMARY OF STATISTICAL ANALYSIS FOR INDUSTRIAL RISK
(BUILDING CRAWLSPACE SURFACE SOILS SAMPLING EVENT)
NAVAL WEAPONS STATION SEAL BEACH
DETACHMENT CONCORD

Analyte	Number of Detections	Maximum Detected Concentrations	Average of Detected Concentrations[1]	Number of Samples With Conc. Greater Than Industrial PRG	Number of Discrete Locations With Sample Conc. Greater Than Industrial PRG and Ambient	EPA Industrial PRG Value	Ambient Value
CLP Metals (mg/kg)							
ALUMINUM	22	27,500	20,595	0	0	100,000	21,000
BARIUM	28	1,660	607	0	0	100,000	560
BERYLLIUM	13	16	5	0	0	3,400	0.12
CADMIUM	12	32	9	0	0	930	0.28
CHROMIUM	29	2,600	237	0	0	450	62
COBALT	29	32	21	0	0	29,000	25
COPPER	29	1,190	139	0	0	70,000	65
LEAD	29	3,400	411	2	2	1,000	32
MANGANESE	22	1,440	1,123	0	0	45,000	1,300
MERCURY	18	1.4	0.43	0	0	560	0.17
NICKEL	29	160	83.9	0	0	37,000	110
SELENIUM	7	4.4	2.83	0	0	9,400	DL
SILVER	3	0.3	0.24	0	0	9,400	DL
VANADIUM	29	110	68	0	0	13,000	95
ZINC	29	20,000	1,710	0	0	100,000	99

Notes:

-- None Established

PRG = Preliminary Remediation Goal (EPA 1998)

[1] Average based on a normal distribution

[2] PRG for fluorene used as a surrogate for phenanthrene

TABLE 5-9
SUMMARY OF STATISTICAL ANALYSIS FOR RESIDENTIAL RISK AND HAZARD RESULTS
(SUBSURFACE SOILS SAMPLING EVENT)
NAVAL WEAPONS STATION SEAL BEACH
DETACHMENT CONCORD

Analyte	Number of Detections/ Analysis	Maximum Detected Concentrations	Average of Detected Conc.[1]	Number of Samples With Conc. Greater Than Residential PRG	Number of Samples With Conc. Greater Than Residential PRG and Ambient	EPA Residential PRG	Ambient Value
Volatiles (µg/kg)							
TRICHLOROETHENE	1	2	2	0	0	2,700	--
CLP Metals (mg/kg)							
ALUMINUM	9	20,600	13,618	0	0	75,000	21,000
ANTIMONY	3	1.9	1.38	0	0	30	0.9
BARIUM	9	1,240	428	0	0	5,200	560
BERYLLIUM	3	0.35	0.192	0	0	150	0.12
CALCIUM	9	8,950	5,467	0	0	N/A	N/A
CHROMIUM	9	75	38.6	0	0	210	62
COPPER	9	79.1	43.6	0	0	2,800	65
MANGANESE	9	6,560	1,401	1	1	3,100	1,300
MERCURY	6	0.13	0.1	0	0	22	0.17
MOLYBDENUM	1	0.48	0.48	0	0	370	DL
SELENIUM	1	1.5	1.5	0	0	370	DL
THALLIUM	1	7	7	1	1	5.2	1.4
VANADIUM	9	164	67.1	0	0	520	95

Notes:

-- = None Established

PRG = Preliminary Remediation Goal (EPA 1998)

[1] Average based on a log normal distribution.

TABLE 5-10
SUMMARY OF STATISTICAL ANALYSIS FOR INDUSTRIAL RISK AND HAZARD RESULTS
(SUBSURFACE SOILS SAMPLING EVENT)
NAVAL WEAPONS STATION SEAL BEACH
DETACHMENT CONCORD

Analyte	Number of Detections/ Analysis	Maximum Detected Concentrations	Average of Detected Concentrations	Number of Samples With Conc. Greater Than Industrial PRG	Number of Samples With Conc. Greater Than Industrial PRG and Ambient	EPA Industrial PRG	Ambient Value
Volatiles (µg/kg)							
TRICHLOROETHENE	1	2	2	0	0	6,100	N/A
CLP Metals (mg/kg)							
ALUMINUM	9	20,600	13,618	0	0	100,000	21,100
ANTIMONY	3	1.9	1.38	0	0	750	0.9
BARIUM	9	1,240	428	0	0	100,000	560
BERYLLIUM	3	0.35	0.192	0	0	3,400	0.12
CALCIUM	9	8,950	5,467	0	0	N/A	N/A
CHROMIUM	9	75	38.6	0	0	450	62
COPPER	9	79.1	43.6	0	0	70,000	65
MANGANESE	9	6,560	1,401	1	1	45,000	1,300
MERCURY	6	0.13	0.1	0	0	560	0.17
MOLYBDENUM	1	0.48	0.48	0	0	9,400	DL
SELENIUM	1	1.5	1.5	0	0	9,400	DL
THALLIUM	1	7	7	1	1	130	1.4
VANADIUM	9	164	67.1	0	0	13,000	95

Notes:

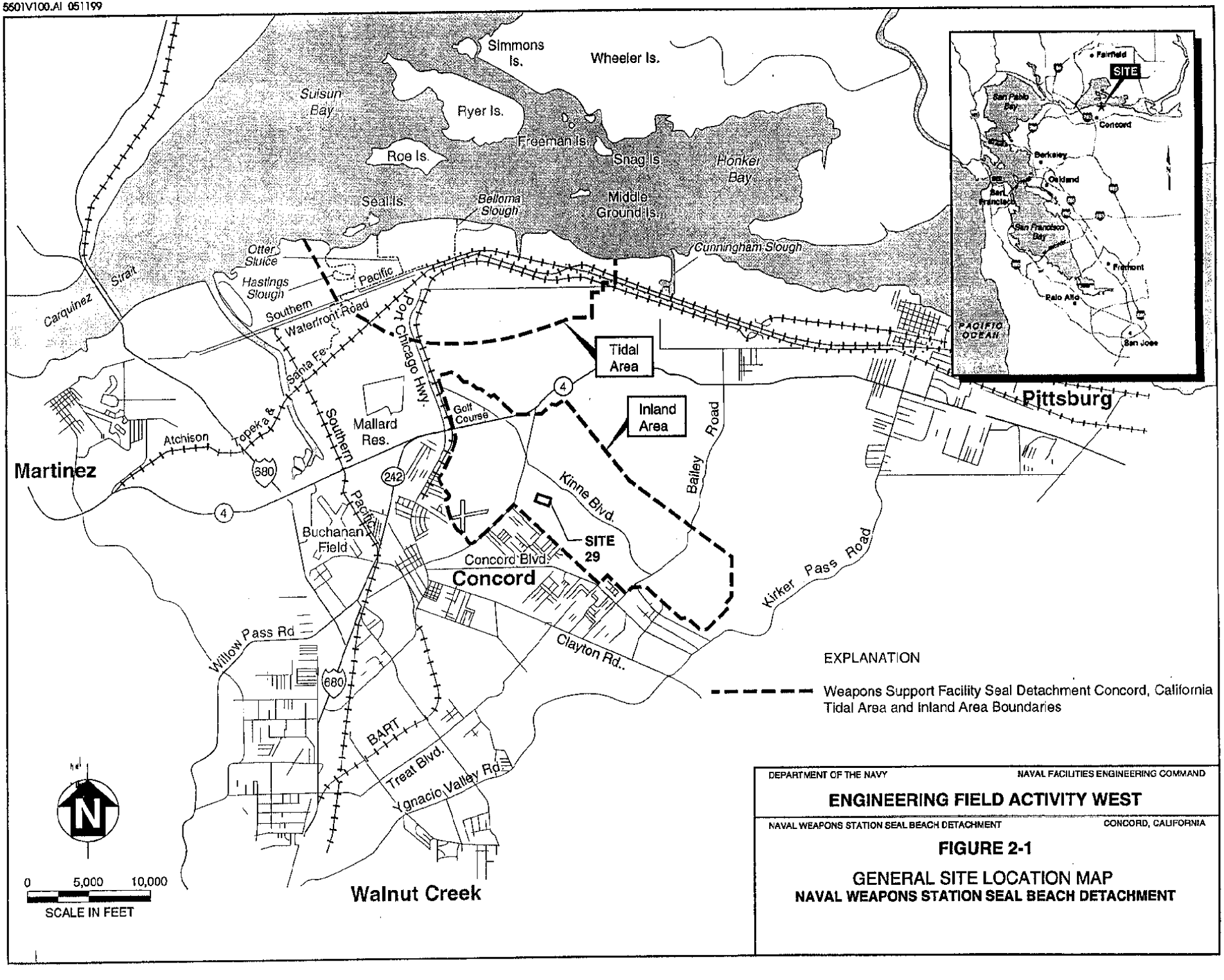
-- = None Established

PRG = Preliminary Remediation Goal (EPA 1998)

(1) Average based on a log normal distribution.

FIGURES

5501V100.AI 051199



EXPLANATION

Weapons Support Facility Seal Detachment Concord, California Tidal Area and Inland Area Boundaries

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND

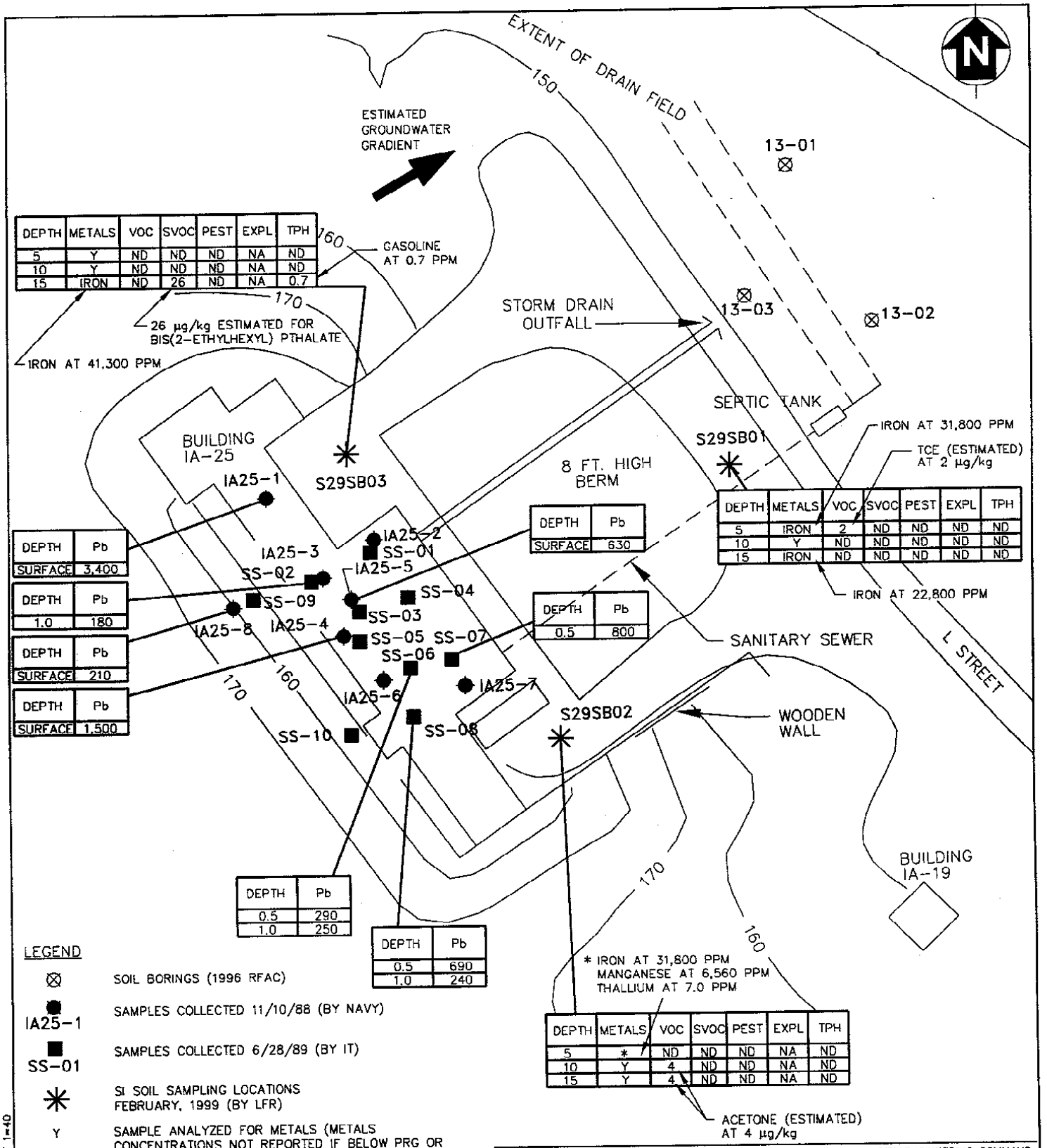
ENGINEERING FIELD ACTIVITY WEST

NAVAL WEAPONS STATION SEAL BEACH DETACHMENT — CONCORD, CALIFORNIA

FIGURE 2-1

GENERAL SITE LOCATION MAP

NAVAL WEAPONS STATION SEAL BEACH DETACHMENT



DEPTH	METALS	VOC	SVOC	PEST	EXPL	TPH
5	Y	ND	ND	ND	NA	ND
10	Y	ND	ND	ND	NA	ND
15	IRON	ND	26	ND	NA	0.7

DEPTH	Pb
SURFACE	3,400

DEPTH	Pb
1.0	180

DEPTH	Pb
SURFACE	210

DEPTH	Pb
SURFACE	1,500

DEPTH	Pb
SURFACE	630

DEPTH	Pb
0.5	800

DEPTH	Pb
0.5	290
1.0	250

DEPTH	Pb
0.5	690
1.0	240

DEPTH	METALS	VOC	SVOC	PEST	EXPL	TPH
5	IRON	2	ND	ND	ND	ND
10	Y	ND	ND	ND	ND	ND
15	IRON	ND	ND	ND	ND	ND

DEPTH	METALS	VOC	SVOC	PEST	EXPL	TPH
5	*	ND	ND	ND	NA	ND
10	Y	4	ND	ND	NA	ND
15	Y	4	ND	ND	NA	ND

LEGEND

⊗ SOIL BORINGS (1996 RFAC)

IA25-1 SAMPLES COLLECTED 11/10/88 (BY NAVY)

SS-01 SAMPLES COLLECTED 6/28/89 (BY IT)

✳ SI SOIL SAMPLING LOCATIONS FEBRUARY, 1999 (BY LFR)

Y SAMPLE ANALYZED FOR METALS (METALS CONCENTRATIONS NOT REPORTED IF BELOW PRG OR BACKGROUND SOIL LEVELS)

NA NOT ANALYZED

ND NOT DETECTED

NOTES:

1. RESULTS REPORTED IN mg/kg IF NOT SHOWN OTHERWISE.
2. ONLY THE ANALYTICAL DATA FOR LEAD THAT WAS DETECTED ABOVE THE RESIDENTIAL PRG OF 130 mg/kg ARE SHOWN. ALL SAMPLES WERE ANALYZED FOR LEAD.

20' 0 20' 40'

SCALE: 1" = 40'

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND

ENGINEERING FIELD ACTIVITY WEST

NAVAL WEAPONS STATION SEAL BEACH DETACHMENT — CONCORD, CALIFORNIA

FIGURE 3-1

SITE PLAN SHOWING SOIL ANALYTICAL RESULTS AT SITE 29

5505\WA-51B.DWG - 05/26/99 - PLOT 1=40

APPENDIX A

LITHOLOGIC LOGS

SITE 29

NAVAL WEAPONS STATION CONCORD

Log of boring **Boring : S29SB01**

Depth (feet bgs)	6" Sample Collected for Analysis	Sample ID	Sample Interval	Recovery	Blows/ft	Description
1–2						***Silty Clay (CL)*** **light yellowish brown (25YR 4/4), slightly moist; 30% clay, 60% silt, 10% very fine sand; slightly plastic**
3–4						***Silty Clay (CL)*** **brown (10 YR 4/3); slightly moist; 30% silt, 60% clay, slightly firm, medium plasticity; subangular gravel up to 1"**
4–5	—	265S29SB001				
5–6					48	***Clayey Sand (SC)*** **yellowish brown (10YR 5/4) slightly moist; 30% fine grained sand; 40% clay; 10% silt; 20% Angular gravel up to 1". Iron staining present; 10% quartz**
7–8					38	
8–9						***Silty Sand (SM)*** **dark, yellowish brown (10 YR 4/4); very moist; 25% silt; 60% coarse grained sand (subangular); loose; 15% angular gravel up to 1" 5% quartz; iron staining present**
9–10	—	265S29SB002				
11–12						***Silty Clay (CL)*** **brown (10 YR 4/3); slightly moist; 40% medium plastic clay; 30% silt very fine; 10% very fine sand; 20% rounded gravel; 5% quartz. Iron staining present.**
13–14						
14–15						***Silty Clay with Gravel (CL)*** **yellowish brown (10YR 5/6); moist, medium plasticity, medium stiffness, 20% sub angular gravel (<1cm) trace sand**
16						**Bottom of Boring**

Borings backfilled with portland cement topped off with concrete

DRILLING DATE: 1-25-99
DRILLING METHOD: 18" Split Spoon
DRILLING CO.: Gregg Drilling Co.
TOTAL BOREHOLE DEPTH: 15 ft bgs
LOGGED BY: Jennifer Sanders/Jim Burke
CLIENT: EFA West
PROJECT NO.: G0069-265A0301

Tetra Tech EM Inc.
135 Main Street, Suite 1800
San Francisco, CA 94105
415/543-4880

SITE 29

NAVAL WEAPONS STATION CONCORD

Log of boring **Boring : S29SB02**

Depth (feet bgs)	6" Sample Collected for Analysis	Sample ID	Sample Interval	Recovery	Blows/ft	Description
						4" asphalt
1						
2						
3						*Silty Clay (CL)* dark grayish brown (10 YR 4/2); 30% silt, 70% clay, slightly moist; slightly firm, medium plasticity; subangular gravel up to 1"; iron staining
4						
5		265S29SB032				
6						
7						iron staining from 8.0'-8.5'
8						sand content increases to 30%; very fine ; hard, dense; iron staining; color change, light yellowish brown (2.5 Y 6/3)
9						
10		265S29SB033				
11						
12						
13						
14						
15		265S29SB034				*Clayey Sand (SC)* olive (5 Y 5/3); 40% very fine sand, 20% silt, 40% clay, soft, iron staining
16						
17						Bottom of Boring
18						
19						
20						
21						
22						

DRILLING DATE: 2-3-99
DRILLING METHOD: 18" Split Spoon
DRILLING CO.: Gregg Drilling Co.
TOTAL BOREHOLE DEPTH: 17 ft bgs
LOGGED BY: Jennifer Sanders/Jim Burke
CLIENT: EFA West
PROJECT NO.: G0069-265A0301

Tetra Tech EM Inc.
135 Main Street, Suite 1800
San Francisco, CA 94105
415/543-4880

SITE 29

NAVAL WEAPONS STATION CONCORD

Log of boring **Boring : S29SB03**

Depth (feet bgs)	6" Sample Collected for Analysis	Sample ID	Sample Interval	Recovery	Blows/ft	Description
1						4" asphalt
2						***Gravelly Silt (ML)*** yellowish brown (10 YR 5/6); moist, low plasticity, soft, 25% gravel sub-rounded to angular
3						***Gravelly Sand (SW)*** dark yellowish brown (10 YR 3/4), moist, approx. 60% poorly sorted sub-rounded sand, appprox 40% sub-rounded gravel, fill material
4		265S29SB004				
5						***Gravelly Clayey Silt (ML)*** dark yellow (10 YR 4/4) moist, low to medium plasticity, soft, gravel is sub-rounded
6					100	
7					80	color change brown (10 YR 5/3)
8						
9						***Silty Sand Gravel (GM)*** yellowish brown (10 YR 4/4) moist, approx. 60% sub-rounded to angular gravel up to 6 cm. minor changes in proportions with depth
10		265S29SB005				
11					50	dark wet substance on soil/ cobbles at 7.5', no odor sheen
12					120	
13						Strong Fe oxidation at 10'
14					400	
15		265S29SB006				
16						Bottom of Boring
17						
18						Borings backfilled with portland cement and topped of with concrete
19						
20						
21						
22						

DRILLING DATE: 1-25-99
DRILLING METHOD: 18" Split Spoon
DRILLING CO.: Gregg Drilling Co.
TOTAL BOREHOLE DEPTH: 15 ft bgs
LOGGED BY: Jennifer Sanders/Jim Burke
CLIENT: EFA West
PROJECT NO.: G0069-265A0301

Tetra Tech EM Inc.
135 Main Street, Suite 1800
San Francisco, CA 94105
415/543-4880

APPENDIX B

COMPLETE ANALYTICAL RESULTS

BUILDING CRAWLSPACE SURFACE SOILS SAMPLING EVENT
ANALYTICAL RESULTS

ANALYTICAL SUMMARY

BUILDING IA-25

Concentrations in ug/kg

COMPOUND	A (1) SS-01-1	A SS-01-2	B (2) IA25-2	A SS-02-1	A SS-02-2	no corresp. B sample
Volatile Organics (GCMS) samples SS-02 and SS-07 only						
METHYLENE CHLORIDE				8	7	
2-BUTANONE (MEK)						
1,1,1-TRICHLOROETHANE						
XYLENES (total)				9	15	
Semivol. Organics (GCMS) samples SS-02 and SS-07 only						
BENZO(b)FLUORANTHENE				400		
BIS(2-ETHYLHEXYL)PHTHALATE				1100		
FLUORANTHENE					370	
PHENANTHRENE						
PYRENE						
Organochlorine Pesticides and PCB's (GC)						
4,4'-DDD						
4,4'-DDT	24					
beta-BHC						
Polynuc. Arom. HC (GC) samples SS-02 and SS-07 only						
ACENAPHTHENE				52		
ANTHRACENE /			7000			
PHENANTHRENE-CE				310	75	
BENZ(a)ANTHRACENE /						
CHRYSENE-CE			1900			
BENZO(b/k)FLUORANTHENE-CE				260	190	
BENZO(a)PYRENE				150		
FLUORANTHENE			6400	360	150	
NAPHTHALENE						
PYRENE			4500	240	110	
Chlorinated Herbicides (GC)						
2,4,5-TP (Silvex)						
2,4-DB						
DINOSEB						

(1) - "A" samples were sampled on 28 Jun 89.

(2) - "B" samples were sampled on 10 Nov 88.

ANALYTICAL SUMMARY

BUILDING IA-25

Concentrations in mg/kg

COMPOUND	A SS-01-1	A SS-01-2	B IA25-2	A SS-02-1	A SS-02-2	no corresp. B sample
CLP Metals						
ALUMINUM	17200	19300	-	9190	21900	
ARSENIC	3	3	3.6	7	10	
BARIUM	650	630	420	220	630	
BERYLLIUM			0.34		16	
CADMIUM			2		5	
CALCIUM	6000	6990	-	2990	5570	
CHROMIUM	64	67	46	21	87	
COBALT	22	30	16	14	27	
COPPER	55	57	62	46	1190	
IRON	32500	41600	-	16200	3880	
LEAD	32	11	63	99	180	
MAGNESIUM	8900	11200	-	4540	12800	
MANGANESE	1010	1300	-	730	1420	
MERCURY	0.3	0.5	0.14		0.4	
NICKEL	98	140	70	37	80	
POTASSIUM	1100		610			
SELENIUM			2			
SILVER			0.14			
SODIUM			-			
THALLIUM						
VANADIUM	70	93	43	28	92	
ZINC	140	95	200	100	630	
General Chemistries						
CYANIDE	2				2	
NITRATE (as N)	31	15	250	18	7.4	
pH	7.8	7.4	8	5.4	7.3	
SULFATE	130	94		41	17	
Explosives and Exp. Byproducts						
TETRYL					0.69	
DIPHENYLAMINE						

ANALYTICAL SUMMARY

BUILDING IA-25

Concentrations in ug/kg

COMPOUND	A SS-03-1	A SS-03-2	B IA25-5	A SS-04-1	A SS-04-2	no corresp. B sample
Volatile Organics (GCMS) samples SS-02 and SS-07 only						
METHYLENE CHLORIDE						
2-BUTANONE (MEK)						
1,1,1-TRICHLOROETHANE						
XYLENES (total)						
Semivol. Organics (GCMS) samples SS-02 and SS-07 only						
BENZO(b)FLUORANTHENE						
BIS(2-ETHYLHEXYL)PHTHALATE						
FLUORANTHENE						
PHENANTHRENE						
PYRENE						
Organochlorine Pesticides and PCB's (GC)						
4,4'-DDD						
4,4'-DDT	54 (D)			20	48	
beta-BHC						
Polynuc. Arom. HC (GC) samples SS-02 and SS-07 only						
ACENAPHTHENE						
ANTHRACENE / PHENANTHRENE-CE						
BENZ(a)ANTHRACENE / CHRYSENE-CE						
BENZO(b/k)FLUORANTHENE-CE						
BENZO(a)PYRENE						
FLUORANTHENE						
NAPHTHALENE						
PYRENE						
Chlorinated Herbicides (GC)						
2,4,5-TP (Silvex)					13	
2,4-DB						
DINOSEB				17	23	

(D) - Duplicate

ANALYTICAL SUMMARY

BUILDING IA-25

Concentrations in mg/kg

COMPOUND	A SS-03-1	A SS-03-2	B IA25-5	A SS-04-1	A SS-04-2	no corresp. B sample
CLP Metals						
ALUMINUM	21900	23900	-	16800	27400	
ARSENIC	5	4	2.7	4	3	
BARIUM	400	860	510	700	750	
BERYLLIUM			0.78			
CADMIUM			3.9			
CALCIUM	4440	6330	-	8120	6480	
CHROMIUM	46	67	160	63	75	
COBALT	16	22	22	29	20	
COPPER	29	44	160	36	37	
IRON	28300	35600	-	39400	37300	
LEAD	45	32	630	32	15	
MAGNESIUM	6890	9890	-	11800	10300	
MANGANESE	870	1260	-	1340	1180	
MERCURY			1.1		0.2	
NICKEL	56	84	95	160	100	
POTASSIUM	1350	1340	510	1100	1400	
SELENIUM			3.4			
SILVER						
SODIUM			-			
THALLIUM						
VANADIUM	68	85	47	85	89	
ZINC	98	240	1300	94	110	
General Chemistries						
CYANIDE		5				
NITRATE (as N)	3	120	330	12	11	
pH	6.8	8	8.7	7.3	7.3	
SULFATE	49	21	-	320	220	
Explosives and Exp. Byproducts						
TETRYL						
DIPHENYLAMINE						

ANALYTICAL SUMMARY

BUILDING IA-25

Concentrations in ug/kg

COMPOUND	A SS-05-1	A SS-05-2	B IA25-4	A SS-06-1	A SS-06-2	no corresp. B sample
Volatile Organics (GCMS) samples SS-02 and SS-07 only						
METHYLENE CHLORIDE						
2-BUTANONE (MEK)						
1,1,1-TRICHLOROETHANE						
XYLENES (total)						
Semivol. Organics (GCMS) samples SS-02 and SS-07 only						
BENZO(b)FLUORANTHENE						
BIS(2-ETHYLHEXYL)PHTHALATE						
FLUORANTHENE						
PHENANTHRENE						
PYRENE						
Organochlorine Pesticides and PCB's (GC)						
4,4'-DDD			120			
4,4'-DDT			230	34		
beta-BHC						
Polynuc. Arom. HC (GC) samples SS-02 and SS-07 only						
ACENAPHTHENE						
ANTHRACENE / PHENANTHRENE-CE						
BENZ(a)ANTHRACENE / CHRYSENE-CE						
BENZO(b/k)FLUORANTHENE-CE						
BENZO(a)PYRENE						
FLUORANTHENE						
NAPHTHALENE						
PYRENE						
Chlorinated Herbicides (GC)						
2,4,5-TP (Silvex)						
2,4-DB					53	
DINOSEB						

ANALYTICAL SUMMARY

BUILDING IA-25

Concentrations in mg/kg

COMPOUND	A SS-05-1	A SS-05-2	B IA25-4	A SS-06-1	A SS-06-2	no corresp. B sample
CLP Metals						
ALUMINUM	12900	23000	-	11500	10600	
ARSENIC	3	2	1.2	3		
BARIUM	330	430	590	310	300	
BERYLLIUM			0.7			
CADMIUM			10	2	2	
CALCIUM	7780	5750	-	2580	3440	
CHROMIUM	42	47	150	71	38	
COBALT	15	22	20	18	15	
COPPER	28	31	99	86	30	
IRON	17700	35500	-	18000	26200	
LEAD	72	23	1500	290	250	
MAGNESIUM	10500	10900	-	12500	10600	
MANGANESE	1420	1000	-	870	800	
MERCURY			1.4	0.4	0.4	
NICKEL	94	69	57	46	64	
POTASSIUM		1100	420			
SELENIUM			1.1			
SILVER						
SODIUM			-	3410	1780	
THALLIUM						
VANADIUM	39	88	6.6	32	75	
ZINC	56	120	4300	350	340	
General Chemistries						
CYANIDE			1	22	11	
NITRATE (as N)	0.8	3.5	120	180	97	
pH	6.4	6.7	8.9	8.2	9.5	
SULFATE	22	22	-	160	72	
Explosives and Exp. Byproducts						
TETRYL						
DIPHENYLAMINE						

ANALYTICAL SUMMARY

BUILDING IA-25

Concentrations in ug/kg

COMPOUND	A SS-07-1	A SS-07-2	B IA25-7	A SS-08-1	A SS-08-2	no corresp. B sample
Volatile Organics (GCMS) samples SS-02 and SS-07 only						
METHYLENE CHLORIDE	10	11				
2-BUTANONE (MEK)						
1,1,1-TRICHLOROETHANE			13			
XYLENES (total)						
Semivol. Organics (GCMS) samples SS-02 and SS-07 only						
BENZO(b)FLUORANTHENE						
BIS(2-ETHYLHEXYL)PHTHALATE	3900					
FLUORANTHENE	890					
PHENANTHRENE	670					
PYRENE	630					
Organochlorine Pesticides and PCB's (GC)						
4,4'-DDD						
4,4'-DDT	17					
beta-BHC		32				
Polynuc. Arom. HC (GC) samples SS-02 and SS-07 only						
ACENAPHTHENE						
ANTHRACENE / PHENANTHRENE-CE	590	120	3500			
BENZ(a)ANTHRACENE / CHRYSENE-CE	450	78				
BENZO(b/k)FLUORANTHENE-CE	480					
BENZO(a)PYRENE						
FLUORANTHENE	980	190	5200			
NAPHTHALENE	40					
PYRENE	770	140	3700			
Chlorinated Herbicides (GC)						
2,4,5-TP (Silvex)						
2,4-DB					66	
DINOSEB	12			14	12	

ANALYTICAL SUMMARY

BUILDING IA-25

Concentrations in mg/kg

COMPOUND	A SS-07-1	A SS-07-2	B IA25-7	A SS-08-1	A SS-08-2	no corresp. B sample
CLP Metals						
ALUMINUM	21400	14900	-	21500	25400	
ARSENIC	6	3	3.6	6	5	
BARIUM	1660	600	480	1310	1150	
BERYLLIUM			0.3	6	6	
CADMIUM			2	8	4	
CALCIUM	7380	5520	-	7210	8870	
CHROMIUM	85	58	84	160	100	
COBALT	32	22	19	27	28	
COPPER	110	31	87	110	76	
IRON	41400	32300	-	42300	42400	
LEAD	800	11	89	690	240	
MAGNESIUM	10800	9420	-	9400	11000	
MANGANESE	1340	790	-	1340	1440	
MERCURY	0.2	0.2	0.16	0.3	0.2	
NICKEL	130	79	89	98	100	
POTASSIUM	1310		570	1200	1410	
SELENIUM			2.5			
SILVER			0.22			
SODIUM	1770		-			
THALLIUM						
VANADIUM	84	70	52	87	110	
ZINC	190	85	310	1250	520	
General Chemistries						
CYANIDE				3	3	
NITRATE (as N)	43	180	220	20	15	
pH	7.8	8.2	10.2	7.8	7.5	
SULFATE	160	160	-	46	22	
Explosives and Exp. Byproducts						
TETRYL						
DIPHENYLAMINE						

ANALYTICAL SUMMARY

BUILDING IA-25

Concentrations in ug/kg

COMPOUND	A SS-09-1	A SS-09-2	B IA25-8	A SS-10-1	A SS-10-2	no corresp. B sample
Volatile Organics (GCMS)	samples SS-02 and SS-07 only					
METHYLENE CHLORIDE						
2-BUTANONE (MEK)						
1,1,1-TRICHLOROETHANE						
XYLENES (total)						
Semivol. Organics (GCMS)	samples SS-02 and SS-07 only					
BENZO(b)FLUORANTHENE						
BIS(2-ETHYLHEXYL)PHTHALATE						
FLUORANTHENE						
PHENANTHRENE						
PYRENE						
Organochlorine Pesticides and PCB's (GC)						
4,4'-DDD						
4,4'-DDT						
beta-BHC						
Polynuc. Arom. HC (GC)	samples SS-02 and SS-07 only					
ACENAPHTHENE						
ANTHRACENE / PHENANTHRENE-CE						
BENZ(a)ANTHRACENE / CHRYSENE-CE						
BENZO(b/k)FLUORANTHENE-CE						
BENZO(a)PYRENE						
FLUORANTHENE						
NAPHTHALENE						
PYRENE						
Chlorinated Herbicides (GC)						
2,4,5-TP (Silvex)						
2,4-DB						
DINOSEB						

ANALYTICAL SUMMARY

BUILDING IA-25

Concentrations in mg/kg

COMPOUND	A SS-09-1	A SS-09-2	B IA25-8	A SS-10-1	A SS-10-2	no corresp. B sample
CLP Metals						
ALUMINUM	27500	27300	-	20700	27300	
ARSENIC	4	4	2.6	2	3	
BARIUM	440	370	280	440	460	
BERYLLIUM	5	5	0.45			
CADMIUM			10			
CALCIUM	6090	5760	-	6160	4790	
CHROMIUM	54	54	32	50	57	
COBALT	22	19	13	19	18	
COPPER	39	33	28	31	31	
IRON	34300	31700	-	31500	33500	
LEAD	20	18	210	12	10	
MAGNESIUM	9280	8640	-	8480	7970	
MANGANESE	1370	1010	-	970	1040	
MERCURY	0.4		0.08			
NICKEL	75	75	53	63	68	
POTASSIUM	1830	1640	950	1240	2270	
SELENIUM			2.3			
SILVER						
SODIUM			-			
THALLIUM						
VANADIUM	85	78	38	74	76	
ZINC	85	74	63	94	67	
General Chemistries						
CYANIDE						
NITRATE (as N)		1.7	49		1.1	
pH	7.1	8.1	7.5	5.9	7.6	
SULFATE	11	6.2	-	10	2.3	
Explosives and Exp. Byproducts						
TETRYL						
DIPHENYLAMINE	1.2					

ANALYTICAL SUMMARY

BUILDING IA-25

Concentrations in ug/kg

COMPOUND	A	A	B	A	A	B
	no corresp. A samples		IA25-1	no corresp. A samples		IA25-6
Volatile Organics (GCMS) samples SS-02 and SS-07 only						
METHYLENE CHLORIDE						
2-BUTANONE (MEK)			480			
1,1,1-TRICHLOROETHANE						
XYLENES (total)						
Semivol. Organics (GCMS) samples SS-02 and SS-07 only						
BENZO(b)FLUORANTHENE						
BIS(2-ETHYLHEXYL)PHTHALATE						
FLUORANTHENE						
PHENANTHRENE						
PYRENE						
Organochlorine Pesticides and PCB's (GC)						
4,4'-DDD						
4,4'-DDT						
beta-BHC						
Polynuc. Arom. HC (GC) samples SS-02 and SS-07 only						
ACENAPHTHENE						
ANTHRACENE / PHENANTHRENE-CE						
BENZ(a)ANTHRACENE / CHRYSENE-CE						
BENZO(b/k)FLUORANTHENE-CE						
BENZO(a)PYRENE						
FLUORANTHENE						
NAPHTHALENE						
PYRENE						
Chlorinated Herbicides (GC)						
2,4,5-TP (Silvex)						
2,4-DB						
DINOSEB						

ANALYTICAL SUMMARY

BUILDING IA-25

Concentrations in mg/kg

COMPOUND	A	A	B	A	A	B
	no corresp. A samples		IA25-1	no corresp. A samples		IA25-6
CLP Metals						
ALUMINUM			-			-
ARSENIC			2.8			2.4
BARIUM			370			340
BERYLLIUM			1.3			0.22
CADMIUM			32			0.81
CALCIUM			-			-
CHROMIUM			2600			49
COBALT			30			18
COPPER			320			31
IRON			-			-
LEAD			3400			53
MAGNESIUM			-			-
MANGANESE			-			-
MERCURY			0.21			0.21
NICKEL			65			82
POTASSIUM			2100			300
SELENIUM			4.4			2.6
SILVER			0.3			
SODIUM			-			-
THALLIUM						
VANADIUM			47			43
ZINC			20000			230
General Chemistries						
CYANIDE			2.2			
NITRATE (as N)			530			28
pH			6.7			6.9
SULFATE			-			-
Explosives and Exp. Byproducts						
TETRYL						
DIPHENYLAMINE						

ANALYTICAL SUMMARY

BUILDING IA-25

Concentrations in ug/kg

COMPOUND	A FD-03-1	A FD-03-2	A	A
Volatile Organics (GCMS) samples SS-02 and SS-07 only				
METHYLENE CHLORIDE				
2-BUTANONE (MEK)				
1,1,1-TRICHLOROETHANE				
XYLENES (total)				
Semivol. Organics (GCMS) samples SS-02 and SS-07 only				
BENZO(b)FLUORANTHENE				
BIS(2-ETHYLHEXYL)PHTHALATE				
FLUORANTHENE				
PHENANTHRENE				
PYRENE				
Organochlorine Pesticides and PCB's (GC)				
4,4'-DDD				
4,4'-DDT				
beta-BHC				
Polynuc. Arom. HC (GC) samples SS-02 and SS-07 only				
ACENAPHTHENE				
ANTHRACENE / PHENANTHRENE-CE				
BENZ(a)ANTHRACENE / CHRYSENE-CE				
BENZO(b/k)FLUORANTHENE-CE				
BENZO(a)PYRENE				
FLUORANTHENE				
NAPHTHALENE				
PYRENE				
Chlorinated Herbicides (GC)				
2,4,5-TP (Silvex)				
2,4-DB				
DINOSEB				

ANALYTICAL SUMMARY

BUILDING IA-25

Concentrations in mg/kg

COMPOUND	A FD-03-1	A FD-03-2		A	A	
CLP Metals						
ALUMINUM	23600	21000				
ARSENIC	4	3				
BARIUM	360	580				
BERYLLIUM		5				
CADMIUM						
CALCIUM	4530	6060				
CHROMIUM	46	52				
COBALT	15	20				
COPPER	26	36				
IRON	29000	31600				
LEAD	63	32				
MAGNESIUM	7480	10200				
MANGANESE	830	1060				
MERCURY						
NICKEL	58	73				
POTASSIUM	1480	1140				
SELENIUM						
SILVER						
SODIUM						
THALLIUM						
VANADIUM	71	79				
ZINC	72	100				
General Chemistries						
CYANIDE	11	2				
NITRATE (as N)	4.2	120				
pH	6.5	6.6				
SULFATE	26	24				
Explosives and Exp. Byproducts						
TETRYL						
DIPHENYLAMINE						

SUBSURFACE SOILS SAMPLING EVENT
ANALYTICAL RESULTS

Naval Weapon Station Concord Laboratory Sampling Report

Point ID	S29SB01	S29SB01	S29SB01	S29SB02	S29SB02	S29SB02	S29SB03	S29SB03	S29SB03
Sample ID	265S29SB001	265S29SB002	265S29SB003	265S29SB032	265S29SB033	265S29SB034	265S29SB004	265S29SB005	265S29SB006
Matrix	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	01/25/99	01/25/99	01/25/99	02/03/99	02/03/99	02/03/99	01/25/99	01/25/99	01/25/99
Sample Depth (in feet)	4.50 - 5.00	9.50 - 10.00	14.50 - 15.00	5.00 - 5.50	10.00 - 10.50	15.00 - 15.50	4.50 - 5.00	9.50 - 10.00	14.50 - 15.00
Volatiles (in ug/Kg)									
TRICHLOROETHENE	2 J	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
Petroleum Indicators (in mg/Kg)									
GASOLINE	0.6 U	0.5 U	0.5 U	0.5 U	0.6 U	0.6 U	0.6 U	0.6 U	0.7
CLP Metals (in mg/Kg)									
ALUMINUM	14,600 J	13,100 J	13,900 J	14,000	13,300	12,600	8,770 J	11,700 J	20,600 J
ANTIMONY	R	0.74 J	1.3 J	1.6 UJ	R	R	R	R	1.9 J
ARSENIC	3.0 UJ	2.3 UJ	1.6 UJ	2.6 J	1.6 J	0.62 U	3.0 UJ	1.7 UJ	9.5
BARIUM	438 J	274 J	379 J	1,240	223	250	256 J	354 J	439 J
BERYLLIUM	0.020 U	0.010 U	0.020 U	0.13 J	0.35 J	0.31 J	0.090 UJ	0.020 U	0.080 UJ
CALCIUM	5,160 J	7,340 J	7,120 J	6,240	3,080	2,690	3,090 J	5,530 J	8,950 J
CHROMIUM	36.1 J	45.2 J	35.8 J	55.8	29.1	22.2	19.1 J	29.6 J	75.0 J
COBALT	12.7	13.5	16.5	22.3	10.9	14.9	11.4	15.1	19.9
COPPER	61.9 J	29.5 J	37.0 J	35.8	26.2	25.0	66.8 J	31.2 J	79.1 J
IRON	31,800 J	20,500 J	22,800 J	31,800	20,400	17,200	16,300 J	22,000 J	41,300 J
LEAD	3.2	2.1	1.5 J	1.6 J	3.9 J	5.9 J	3.1	1.5	2.2
MAGNESIUM	10,700 J	8,800 J	9,950 J	10,700	7,760	7,900	5,050 J	9,060 J	12,200 J
MANGANESE	1,840 J	768 J	733 J	6,560 J	153 J	426 J	367 J	1,080 J	686 J
MERCURY	0.13 J	0.11 J	0.050 J	0.22 UJ	0.21 UJ	0.25 UJ	0.12 J	0.10 J	0.090 J
MOLYBDENUM	0.28 UJ	0.21 UJ	0.27 UJ	0.19 UJ	0.22 U	0.23 U	0.30 UJ	0.31 UJ	0.48 J
NICKEL	101 J	64.9 J	55.6 J	91.2	51.7	55.1	39.3 J	71.4 J	58.1 J
POTASSIUM	458 J	552 J	500 J	682 J	1,450 J	1,560 J	801 J	390 J	832 J
SELENIUM	0.72 UJ	0.53 UJ	0.69 UJ	1.5 J	0.71 UJ	0.77 UJ	0.78 UJ	0.79 UJ	0.83 UJ
THALLIUM	3.4 UJ	1.8 UJ	2.8 UJ	7.0	1.3 UJ	1.6 UJ	0.89 UJ	2.8 UJ	3.9 UJ
VANADIUM	63.1 J	51.8 J	58.5 J	99.7	44.1	34.4	37.9 J	50.6 J	164 J
ZINC	90.8 J	50.6 J	63.4 J	58.1 J	47.7 J	49.3 J	88.0 J	41.6 J	91.9 J

Notes: Samples where no volatiles, semivolatiles, petroleum indicators, metals, pesticides, or PCBs were detected are not listed in this table. U = Not detected with detection limit indicated, J = Estimated value, -- = Not analyzed

Inorganic results less than 10 are reported to two significant figures and results greater than 10 are reported to three significant figures.

Organic results less than 10 are reported to one significant figure and results greater than 10 are reported to two significant figures.

R = Results rejected due to data quality issues.

X

05/06/99

Naval Weapon Station Concord Laboratory Sampling Report

Point ID	S29SB01	S29SB01	S29SB01	S29SB02	S29SB02	S29SB02	S29SB03	S29SB03	S29SB03
Sample ID	265S29SB001	265S29SB002	265S29SB003	265S29SB032	265S29SB033	265S29SB034	265S29SB004	265S29SB005	265S29SB006
Matrix	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	01/25/99	01/25/99	01/25/99	02/03/99	02/03/99	02/03/99	01/25/99	01/25/99	01/25/99
Sample Depth (in feet)	4.50 - 5.00	9.50 - 10.00	14.50 - 15.00	5.00 - 5.50	10.00 - 10.50	15.00 - 15.50	4.50 - 5.00	9.50 - 10.00	14.50 - 15.00
Volatiles (in µg/Kg)									
1,1,1-TRICHLOROETHANE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
1,1,2,2-TETRACHLOROETHANE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
1,1,2-TRICHLOROETHANE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
1,1-DICHLOROETHANE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
1,1-DICHLOROETHENE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
1,2-DICHLOROETHANE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
1,2-DICHLOROETHENE (TOTAL)	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
1,2-DICHLOROPROPANE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
2-BUTANONE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
2-HEXANONE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
4-METHYL-2-PENTANONE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
ACETONE	11 U	11 U	11 U	11 U	12 UJ	12 UJ	12 U	12 U	11 U
BENZENE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
BROMODICHLOROMETHANE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
BROMOFORM	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
BROMOMETHANE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
CARBON DISULFIDE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
CARBON TETRACHLORIDE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
CHLOROBENZENE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
CHLOROETHANE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
CHLOROFORM	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
CHLOROMETHANE	11 U	11 U	11 U	11 UJ	12 UJ	12 UJ	12 U	12 U	11 U
CIS-1,3-DICHLOROPROPENE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
DIBROMOCHLOROMETHANE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
ETHYLBENZENE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
METHYLENE CHLORIDE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
STYRENE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
TETRACHLOROETHENE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
TOLUENE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
TRANS-1,3-DICHLOROPROPENE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
TRICHLOROETHENE	2 J	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
VINYL CHLORIDE	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U
XYLENE (TOTAL)	11 U	11 U	11 U	11 U	12 U	12 U	12 U	12 U	11 U

Notes: U = Not detected with detection limit indicated, J = Estimated value, -- = Not analyzed

Inorganic results less than 10 are reported to two significant figures and results greater than 10 are reported to three significant figures.

Organic results less than 10 are reported to one significant figure and results greater than 10 are reported to two significant figures.

05/06/99

Point ID	S29SB01	S29SB01	S29SB01	S29SB02	S29SB02	S29SB02	S29SB03	S29SB03	S29SB03
Sample ID	265S29SB001	265S29SB002	265S29SB003	265S29SB032	265S29SB033	265S29SB034	265S29SB004	265S29SB005	265S29SB006
Matrix	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	01/25/99	01/25/99	01/25/99	02/03/99	02/03/99	02/03/99	01/25/99	01/25/99	01/25/99
Sample Depth (in feet)	4.50 - 5.00	9.50 - 10.00	14.50 - 15.00	5.00 - 5.50	10.00 - 10.50	15.00 - 15.50	4.50 - 5.00	9.50 - 10.00	14.50 - 15.00
Semivolatiles (in µg/Kg)									
1,2,4-TRICHLOROBENZENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
1,2-DICHLOROBENZENE	200 U	180 U	180 U	180 U	190 U	200 U	190 U	190 U	190 U
1,3-DICHLOROBENZENE	200 U	180 U	180 U	180 U	190 U	200 U	190 U	190 U	190 U
1,4-DICHLOROBENZENE	200 U	180 U	180 U	180 U	190 U	200 U	190 U	190 U	190 U
2,2'-OXYBIS(1-CHLOROPROPANE)	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
2,4,5-TRICHLOROPHENOL	990 U	900 U	880 U	900 U	950 U	1,000 U	960 U	950 U	960 U
2,4,6-TRICHLOROPHENOL	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
2,4-DICHLOROPHENOL	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
2,4-DIMETHYLPHENOL	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
2,4-DINITROPHENOL	990 UJ	900 UJ	880 UJ	900 U	950 U	1,000 U	960 UJ	950 UJ	960 U
2,4-DINITROTOLUENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
2,6-DINITROTOLUENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
2-CHLORONAPHTHALENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
2-CHLOROPHENOL	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
2-METHYLNAPHTHALENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
2-METHYLPHENOL	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
2-NITROANILINE	990 U	900 U	880 U	900 U	950 U	1,000 U	960 U	950 U	960 U
2-NITROPHENOL	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
3,3'-DICHLOROBENZIDINE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
3-NITROANILINE	990 U	900 U	880 U	900 U	950 U	1,000 U	960 U	950 U	960 U
4,6-DINITRO-2-METHYLPHENOL	990 U	900 U	880 U	900 U	950 U	1,000 U	960 U	950 U	960 U
4-BROMOPHENYL-PHENYLETHER	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
4-CHLORO-3-METHYLPHENOL	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
4-CHLOROANILINE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
4-CHLOROPHENYL-PHENYLETHER	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
4-METHYLPHENOL	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
4-NITROANILINE	990 U	900 U	880 U	900 U	950 U	1,000 U	960 U	950 U	960 U
4-NITROPHENOL	990 UJ	900 UJ	880 UJ	900 U	950 U	1,000 U	960 UJ	950 UJ	960 U
ACENAPHTHENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
ACENAPHTHYLENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
ANTHRACENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
BENZO(A)ANTHRACENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
BENZO(A)PYRENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
BENZO(B)FLUORANTHENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
BENZO(G,H,I)PERYLENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U

Notes: U = Not detected with detection limit indicated, J = Estimated value, -- = Not analyzed

Inorganic results less than 10 are reported to two significant figures and results greater than 10 are reported to three significant figures.

Organic results less than 10 are reported to one significant figure and results greater than 10 are reported to two significant figures.

Naval Weapon Station Concord Laboratory Sampling Report

Point ID	S29SB01	S29SB01	S29SB01	S29SB02	S29SB02	S29SB02	S29SB03	S29SB03	S29SB03
Sample ID	265S29SB001	265S29SB002	265S29SB003	265S29SB032	265S29SB033	265S29SB034	265S29SB004	265S29SB005	265S29SB006
Matrix	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	01/25/99	01/25/99	01/25/99	02/03/99	02/03/99	02/03/99	01/25/99	01/25/99	01/25/99
Sample Depth (in feet)	4.50 - 5.00	9.50 - 10.00	14.50 - 15.00	5.00 - 5.50	10.00 - 10.50	15.00 - 15.50	4.50 - 5.00	9.50 - 10.00	14.50 - 15.00
Semivolatiles (in µg/kg)									
BENZO(K)FLUORANTHENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
BIS(2-CHLOROETHOXY)METHANE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
BIS(2-CHLOROETHYL)ETHER	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
BIS(2-ETHYLHEXYL) PHTHALATE	150 U	140 U	140 U	140 U	150 U	160 U	150 U	150 U	150 UJ
BUTYLBENZYLPHTHALATE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
CARBAZOLE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
CHRYSENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
DI-N-BUTYLPHTHALATE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
DI-N-OCTYLPHTHALATE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
DIBENZ(A,H)ANTHRACENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
DIBENZOFURAN	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
DIETHYLPHTHALATE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
DIMETHYLPHTHALATE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
FLUORANTHENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
FLUORENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
HEXACHLOROBENZENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
HEXACHLOROBUTADIENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
HEXACHLOROCYCLOPENTADIENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
HEXACHLOROETHANE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
INDENO(1,2,3-CD)PYRENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
ISOPHORONE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
N-NITROSO-DI-N-PROPYLAMINE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
N-NITROSODIPHENYLAMINE (1)	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
NAPHTHALENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
NITROBENZENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
PENTACHLOROPHENOL	990 UJ	900 UJ	880 UJ	900 U	950 U	1,000 U	960 UJ	950 UJ	960 U
PHENANTHRENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
PHENOL	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
PYRENE	390 U	360 U	350 U	360 U	380 U	400 U	380 U	380 U	380 U
TOTAL HIGH MOLECULAR PAHS	U	U	U	U	U	U	U	U	U
TOTAL LOW MOLECULAR PAHS	U	U	U	U	U	U	U	U	U
TOTAL PAHS	U	U	U	U	U	U	U	U	U
Pesticides (in µg/Kg)									
4,4'-DDD	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U

Notes: U = Not detected with detection limit indicated, J = Estimated value, -- = Not analyzed

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Organic results less than 10 are reported to one significant figure and results greater than 10 are reported to two significant figures.

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Sample ID	265S29SB001	265S29SB002	265S29SB003	265S29SB032	265S29SB033	265S29SB034	265S29SB004	265S29SB005	265S29SB006
Matrix	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	01/25/99	01/25/99	01/25/99	02/03/99	02/03/99	02/03/99	01/25/99	01/25/99	01/25/99
Sample Depth (in feet)	4.50 - 5.00	9.50 - 10.00	14.50 - 15.00	5.00 - 5.50	10.00 - 10.50	15.00 - 15.50	4.50 - 5.00	9.50 - 10.00	14.50 - 15.00
Pesticides (in µg/Kg)									
4,4'-DDE	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
4,4'-DDT	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
ALDRIN	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
ALPHA-BHC	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
ALPHA-CHLORDANE	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
AROCLOR-1016	20 U	18 U	18 U	18 U	19 U	20 U	19 U	19 U	19 U
AROCLOR-1221	40 U	36 U	35 U	36 U	38 U	41 U	39 U	38 U	39 U
AROCLOR-1232	20 U	18 U	18 U	18 U	19 U	20 U	19 U	19 U	19 U
AROCLOR-1242	20 U	18 U	18 U	18 U	19 U	20 U	19 U	19 U	19 U
AROCLOR-1248	20 U	18 U	18 U	18 U	19 U	20 U	19 U	19 U	19 U
AROCLOR-1254	20 U	18 U	18 U	18 U	19 U	20 U	19 U	19 U	19 U
AROCLOR-1260	20 U	18 U	18 U	18 U	19 U	20 U	19 U	19 U	19 U
BETA-BHC	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
DELTA-BHC	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
DIELDRIN	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
ENDOSULFAN I	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
ENDOSULFAN II	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
ENDOSULFAN SULFATE	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
ENDRIN	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
ENDRIN ALDEHYDE	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
ENDRIN KETONE	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
GAMMA-BHC (LINDANE)	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
GAMMA-CHLORDANE	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
HEPTACHLOR	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ
HEPTACHLOR EPOXIDE	0.4 UJ	0.4 UJ	0.4 UJ	0.4 U	0.4 U	0.4 U	0.4 UJ	0.4 UJ	0.4 UJ
METHOXYCHLOR	20 U	18 U	18 U	18 U	19 U	20 U	19 U	19 U	19 U
TOXAPHENE	120 U	110 U	110 U	110 U	110 U	120 U	120 U	110 U	120 U
TOTAL CHLORDANES	U	U	U	U	U	U	U	U	U
TOTAL DDTS	U	U	U	U	U	U	U	U	U
Explosives (in µg/Kg)									
1,3,5-TRINITROBENZENE	120 U	120 U	120 U	--	--	--	--	--	--
1,3-DINITROBENZENE	120 U	120 U	120 U	--	--	--	--	--	--
2,4,6-TRINITROTOLUENE	120 U	120 U	120 U	--	--	--	--	--	--
2,4-DINITROTOLUENE	120 U	120 U	120 U	--	--	--	--	--	--

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Sample ID	265S29SB001	265S29SB002	265S29SB003	265S29SB032	265S29SB033	265S29SB034	265S29SB004	265S29SB005	265S29SB006
Matrix	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	01/25/99	01/25/99	01/25/99	02/03/99	02/03/99	02/03/99	01/25/99	01/25/99	01/25/99
Sample Depth (in feet)	4.50 - 5.00	9.50 - 10.00	14.50 - 15.00	5.00 - 5.50	10.00 - 10.50	15.00 - 15.50	4.50 - 5.00	9.50 - 10.00	14.50 - 15.00
Explosives (in ug/Kg)									
2,6-DINITROTOLUENE	120 U	120 U	120 U	--	--	--	--	--	--
2-AMINO-4,6-DINITROTOLUENE	120 U	120 U	120 U	--	--	--	--	--	--
2-NITROTOLUENE	120 U	120 U	120 U	--	--	--	--	--	--
3-NITROTOLUENE	120 U	120 U	120 U	--	--	--	--	--	--
4-AMINO-2,6-DINITROTOLUENE	120 U	120 U	120 U	--	--	--	--	--	--
4-NITROTOLUENE	120 U	120 U	120 U	--	--	--	--	--	--
HMX	120 U	120 U	120 U	--	--	--	--	--	--
NITROBENZENE	120 U	120 U	120 U	--	--	--	--	--	--
RDX	120 U	120 U	120 U	--	--	--	--	--	--
TETRYL	120 U	120 U	120 U	--	--	--	--	--	--
Petroleum Indicators (in mg/Kg)									
DIESEL FUEL	8 U	7 U	7 U	7 U	8 U	8 U	8 U	8 U	8 U
GASOLINE	0.6 U	0.5 U	0.5 U	0.5 U	0.6 U	0.6 U	0.6 U	0.6 U	0.7
MOTOR OIL	8 U	7 U	7 U	7 U	8 U	8 U	8 U	8 U	8 U
CLP Metals (in mg/kg)									
ALUMINUM	14,600 J	13,100 J	13,900 J	14,000	13,300	12,600	8,770 J	11,700 J	20,600 J
ANTIMONY	R	0.74 J	1.3 J	1.6 UJ	R	R	R	R	1.9 J
ARSENIC	3.0 UJ	2.3 UJ	1.6 UJ	2.6 J	1.6 J	0.62 U	3.0 UJ	1.7 UJ	9.5
BARIUM	438 J	274 J	379 J	1,240	223	250	256 J	354 J	439 J
BERYLLIUM	0.020 U	0.010 U	0.020 U	0.13 J	0.35 J	0.31 J	0.090 UJ	0.020 U	0.080 UJ
CADMIUM	0.040 UJ	0.030 UJ	0.040 UJ	0.080 UJ	0.10 U	0.11 U	0.040 UJ	0.040 UJ	0.050 UJ
CALCIUM	5,160 J	7,340 J	7,120 J	6,240	3,080	2,690	3,090 J	5,530 J	8,950 J
CHROMIUM	36.1 J	45.2 J	35.8 J	55.8	29.1	22.2	19.1 J	29.6 J	75.0 J
COBALT	12.7	13.5	16.5	22.3	10.9	14.9	11.4	15.1	19.9
COPPER	61.9 J	29.5 J	37.0 J	35.8	26.2	25.0	66.8 J	31.2 J	79.1 J
IRON	31,800 J	20,500 J	22,800 J	31,800	20,400	17,200	16,300 J	22,000 J	41,300 J
LEAD	3.2	2.1	1.5 J	1.6 J	3.9 J	5.9 J	3.1	1.5	2.2
MAGNESIUM	10,700 J	8,800 J	9,950 J	10,700	7,760	7,900	5,050 J	9,060 J	12,200 J
MANGANESE	1,840 J	768 J	733 J	6,560 J	153 J	426 J	367 J	1,080 J	686 J
MERCURY	0.13 J	0.11 J	0.050 J	0.22 UJ	0.21 UJ	0.25 UJ	0.12 J	0.10 J	0.090 J
MOLYBDENUM	0.28 UJ	0.21 UJ	0.27 UJ	0.19 UJ	0.22 U	0.23 U	0.30 UJ	0.31 UJ	0.48 J
NICKEL	101 J	64.9 J	55.6 J	91.2	51.7	55.1	39.3 J	71.4 J	58.1 J
POTASSIUM	458 J	552 J	500 J	682 J	1,450 J	1,560 J	801 J	390 J	832 J
SELENIUM	0.72 UJ	0.53 UJ	0.69 UJ	1.5 J	0.71 UJ	0.77 UJ	0.78 UJ	0.79 UJ	0.83 UJ
SILVER	0.20 U	0.15 U	0.19 U	0.17 U	0.20 U	0.21 U	0.22 U	0.22 U	0.23 U

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Organic results less than 10 are reported to one significant figure and results greater than 10 are reported to two significant figures.

Point ID	S29SB01	S29SB01	S29SB01	S29SB02	S29SB02	S29SB02	S29SB03	S29SB03	S29SB03
Sample ID	265S29SB001	265S29SB002	265S29SB003	265S29SB032	265S29SB033	265S29SB034	265S29SB004	265S29SB005	265S29SB006
Matrix	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	01/25/99	01/25/99	01/25/99	02/03/99	02/03/99	02/03/99	01/25/99	01/25/99	01/25/99
Sample Depth (in feet)	4.50 - 5.00	9.50 - 10.00	14.50 - 15.00	5.00 - 5.50	10.00 - 10.50	15.00 - 15.50	4.50 - 5.00	9.50 - 10.00	14.50 - 15.00
CLP Metals (in mg/Kg)									
SODIUM	52.3 UJ	38.6 UJ	50.6 UJ	44.4 U	51.6 U	55.7 U	56.9 UJ	57.4 UJ	60.6 UJ
THALLIUM	3.4 UJ	1.8 UJ	2.8 UJ	7.0	1.3 UJ	1.6 UJ	0.89 UJ	2.8 UJ	3.9 UJ
VANADIUM	63.1 J	51.8 J	58.5 J	99.7	44.1	34.4	37.9 J	50.6 J	164 J
ZINC	90.8 J	50.6 J	63.4 J	58.1 J	47.7 J	49.3 J	88.0 J	41.6 J	91.9 J

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05/06/99

APPENDIX C

DATA VALIDATION AND ASSESSMENT

DATA VALIDATION

Data validation is a systematic process for reviewing and qualifying data against a set of criteria to ensure that the chemical data are adequate for their intended use. Validation is accomplished by reviewing and evaluating all analytical data for their precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters. The laboratory analytical data generated during the Naval Weapons Station Concord Site 29 sampling event were validated according to procedures outlined in the Contract Laboratory Program (CLP) "National Functional Guidelines for Organic Data Review" (U.S. Environmental Protection Agency [EPA] 1994a), the CLP "National Functional Guidelines for Inorganic Data Review" (EPA 1994b), and associated analytical methods (EPA 1994c, 1994d, 1996, LUFT 1989).

Data validation occurred in two stages: (1) a cursory review of the analytical reports and the quality assurance and quality control (QA/QC) information for 100 percent of the chemical data and (2) a full review of the analytical reports, the QA/QC information, and the associated raw data for 10 percent of the chemical data. The cursory review evaluated the effect the most critical QA/QC information had on the data, such as holding times, calibration requirements, and spiking accuracy. The full review evaluated additional QA/QC criteria and used the raw data to check calculations and analyte identifications. At each stage of validation, qualifiers were assigned to the results according to EPA guidelines, procedures outlined in the Quality Assurance Project Plan (QAPP), and associated analytical methods (EPA 1994c, 1994d, 1996, LUFT 1989).

The overall objective of data validation was to ensure that the quality of the chemical data set was adequate for its intended purpose, as defined by the PARCC parameters. The PARCC parameters are defined in the EPA document "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, Draft Supplement" (EPA 1986). PARCC parameters were assessed by completing the following tasks:

- Review precision and accuracy of laboratory QC data
- Review precision and accuracy of field QC data
- Review overall analytical process, including holding times, calibrations, analytical or matrix performance, and analyte identification and quantitation

- Assign qualifiers to data affected by QA/QC exceedences
- Review and summarize implications of the frequency and severity of qualifiers in the validated data

Data usability issues that affect the detection of chemicals at Site 29 are discussed in the following subsections, by analytical methodology. The discussion focuses on data evaluation issues relevant to the usability of the data for site characterization, risk assessment, and feasibility studies.

CLP VOLATILE ORGANIC COMPOUNDS (VOC)

After reviewing the results of the most critical QA/QC information such as holding times, calibration requirements, and spiking accuracy and evaluating additional QA/QC criteria such as examining calculations and analyte identifications, all CLP VOC data were assessed to be valid and usable with no rejected data.

The common VOC laboratory contaminant acetone was detected in the laboratory blank, and sample results were qualified as nondetected (UJb) if the sample result was less than 10 times the blank value.

Quantitation limit goals defined in the QAPjP for VOCs were slightly exceeded due to the moisture content of the soil. This slight increase in quantitation limits does not impact the usability of the data.

CLP SEMIVOLATILE ORGANIC COMPOUNDS (SVOC)

After reviewing the results of the most critical QA/QC information such as holding times, calibration requirements, and spiking accuracy and evaluating additional QA/QC criteria such as examining calculations and analyte identifications, all CLP SVOC data were assessed to be valid and usable with no rejected data.

The common SVOC laboratory contaminant bis(2-ethylhexyl)phthalate was detected in the laboratory blank, and sample results were qualified as nondetected (UJb) if the sample result was less than 10 times the blank value. Quantitation limit goals defined in the QAPjP for SVOCs were slightly exceeded due to the moisture content of the soil. This slight increase in quantitation limits does not impact the usability of the data.

CLP PESTICIDES AND POLYCHLORINATED BIPHENYLS (PCBS)

After reviewing the results of the most critical QA/QC information such as holding times, calibration requirements, and spiking accuracy and evaluating additional QA/QC criteria such as examining calculations and analyte identifications, all CLP pesticides and PCB results were assessed to be valid and usable with no rejected data.

Quantitation limit goals defined in the QAPjP for CLP PCBs were met, however due to the moisture content of the soil, quantitation limit goals for the pesticides were slightly exceeded. This slight increase in quantitation limits does not impact the usability of the data.

EXPLOSIVES BY EPA METHOD 8330

After reviewing the results of the most critical QA/QC information such as holding times, calibration requirements, and spiking accuracy and evaluating additional QA/QC criteria such as examining calculations and analyte identifications, all explosive data were assessed to be valid and usable with no rejected data. In addition, quantitation limit goals specified in the QAPjP were met.

TOTAL PETROLEUM HYDROCARBONS - EXTRACTABLE (TPH-E)

After reviewing the results of the most critical QA/QC information such as holding times, calibration requirements, and spiking accuracy and evaluating additional QA/QC criteria such as examining calculations and analyte identifications, all TPH-e data were assessed to be valid and usable with no rejected data. In addition, quantitation limit goals specified in the QAPjP were met.

TOTAL PETROLEUM HYDROCARBONS - PURGEABLE (TPH-P)

After reviewing the results of the most critical QA/QC information such as holding times, calibration requirements, and spiking accuracy and evaluating additional QA/QC criteria such as examining calculations and analyte identifications, all TPH-p data were assessed to be valid and usable with no rejected data. In addition, quantitation limit goals specified in the QAPjP were met.

CLP METALS

After reviewing the results of the most critical QA/QC information such as holding times, calibration requirements, and spiking accuracy and evaluating additional QA/QC criteria such as examining calculations and analyte identifications, all CLP metals results were assessed to be valid and usable with the exception of antimony, which was rejected (Re) in 5 out of a total of 9 samples. The rejection was due to low matrix spike recoveries (less than 10%). Since antimony is not a likely contaminant at this site rejection of this data has little impact on the usability of the metals data. Laboratory blanks contained detectable amounts of several metals (antimony, arsenic, beryllium, mercury, and thallium) which affected 8.8 percent of the data. Sample results were qualified as nondetected (UJb) if the sample results were less than five times the associated blank value. In addition, quantitation limit goals defined in the QAPjP for metals were met.

DATA VALIDATION CONCLUSION

Although some qualifiers were added to the data, a final review of the data set with respect to EPA data quality parameters indicates that the data are of high overall quality. The data meet all of the requirements of Level IV data and all requirements of "definitive data," as described in the "Data Quality Objectives Process for Superfund" (EPA 1993). Because the data meet all applicable requirements, they can be used for site characterization, risk assessment, and feasibility studies. The overall assessment of the sampling program, QA/QC data, data review, and data validation results, is that the data are generally of acceptable precision, accuracy, representativeness, completeness, and comparability. All supporting documentation and data are available upon request, including cursory and full validation reports and the database that contains the sample results and summaries of qualified data.

EPA guidance was used to determine the usability of the validated data. This guidance is provided in "Risk Assessment Guidance for Superfund" (RAGS), Volume I (EPA 1989). Exhibit 5-5 in RAGS states that data qualified as estimated (J) based on data validation reports may be used in quantitative risk assessments. Only data qualified as rejected (R) are considered unusable for risk assessment purposes. Greater than 99 percent of the data collected are, therefore, usable for their intended purpose. If data are of acceptable quality for use in quantitative risk assessments, they should also be appropriate for determining the extent of contamination. Accordingly, all J-qualified data and no R-qualified data were used for Site 29.

DATA QUALITY ASSESSMENT

Data quality assessment (DQA) is the scientific and statistical evaluation of data to determine if data obtained from environmental data operations are the right type, quality, and quantity to support their intended use. DQA uses the validated data set to determine if the quality of the data is satisfactory to meet the data quality objectives (DQOs) developed for the project. DQOs for Site 29 are presented in the Site Investigation Work Plan (TtEMI 1998).

The DQA process involves five steps: (1) review the DQOs and sampling design, (2) conduct a preliminary data review, (3) select the statistical test, (4) verify the assumptions of the statistical test, and (5) draw conclusions from the data. The DQA process was used to identify the following information:

- Whether the data meet the requirements of the DQOs and the assumptions under which the DQOs were prepared
- Whether the total study error in the data is small enough to allow the decision-makers to use the data to support a decision.

The DQOs, sampling design, and analytical sampling data for the Site 29 site investigation were reviewed as part of the DQA process. Based on the number and locations of previous soil samples collected at Site 29, the sampling design for the site investigation included a nonprobabilistic (judgmental) type sampling approach, which attempts to further define the extent of contaminants and potential sources. Sampling error will be minimized with the nonprobabilistic approach because it does not address the environmental conditions of an entire site, but rather focuses the investigation on areas where contamination and its source are most likely to exist. This approach also minimizes the likelihood of a false negative decision error in which the hypothesis that a chemical exists at the site at concentrations in excess of the screening criteria and therefore is representative of a release of a contaminant of potential concern is rejected when the hypothesis, in fact, is true. The consequences of a false negative decision error are that the potential human health risks of a site will not be evaluated and that future users of the site may have adverse effects. For chemical concentrations that are at or slightly greater than screening criteria, the consequences of a false negative decision error are relatively minor.

Because the objectives and sampling design of the site investigation were not of a statistical nature, a statistical test was not selected for and performed on the analytical data set. The analytical data set is of adequate quality to meet the requirement and assumption of the DQO for screening purposes to determine where contamination and its source are mostly to exist, and also whether levels of contaminants detected within soils pose a potential concern to human health. Level of contaminants detected within soils were at or slightly above the screening criteria, therefore, the total study error in the data is likely small enough to allow for the decision-makers to use the data to support a decision.

REFERENCES

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