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Subject: FINAL INVESTIGATION REPORT FOR 21 AREA AND CAMP DE
LUZ, MCB CAMP PENDLETON, CA

Dear Ms. Prowell, Mr. Mahmoud, Mr. Hausladen:

The Navy transmits the final version of the subject document for your files. The field work at the 21 Area and Camp De Luz sites was conducted in response to a Freedom of Information Act request to the Environmental Protection Agency. As this is not a primary document under the FFA and these sites are not IR sites, the document is provided for information and not for review.

Contamination was detected at one of the sites (Location 1) above human health screening levels (vinyl chloride in soil gas at 21A-1-B5, Location 1, in the 21 Area). Therefore, this location will be added to the IR Program for further investigation and/or action.

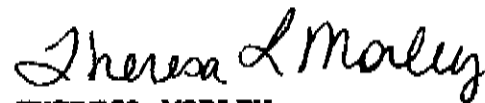
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December 4, 2008

Should you have questions, please call me at (619) 532-1502.

Sincerely,



THERESA MORLEY

Lead Remedial Project Manager

By direction of the Commander

Copy to: CG, MCB Camp Pendleton (Attn: ACOS, Environmental Security - Dr. Rick Bottoms)

EXECUTIVE SUMMARY

This report presents the results of a soil gas, soil, and groundwater investigation conducted at selected locations in the 21 Area and Camp de Luz at the Marine Corps Base Camp Pendleton, California (MCB Camp Pendleton or the Base). The report was generated following a Freedom of Information Act (FOIA) request to United States Marine Corps (USMC), Naval Facilities Engineering Command (NAVFAC), and United States Environmental Protection Agency (USEPA) regarding use of chemicals at Camp Pendleton to support a claim by a Vietnam Veteran. The goal of this investigation was to determine if chemicals of potential concern (COPCs) are present in significant concentrations at the subject locations. This report documents field activities and analytical laboratory results obtained in accordance with the Final Discovery Sites Work Plan dated December 4, 2007 (Parsons, 2007). Remediation decisions will be made in accordance with procedures established under the Installation Restoration Program at MCB Camp Pendleton, pursuant to Section 121(c) of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), 42 United States Code (USC) 9621(c), and the National Contingency Plan (NCP) 40 Code of Federal Regulations (CFR) Part 300.430(f)(4).

Sampling results indicate COPCs may be present at the sites, but below the health-based screening concentrations (i.e., California Human Health Screening Level [CHHSLs], Regional Screening Levels [RSLs], and Maximum Contaminant Levels [MCLs]), with the following exceptions:

- Arsenic was detected in soils above the residential soil RSLs in soil samples from the locations where samples were analyzed for metals, with the highest concentrations of arsenic detected in soils at 21 Area Location 1. However, these arsenic detections are considered to be within the range that occurs naturally at the Base. This conclusion is based on several lines of evidence, including a document published by California Environmental Protection Agency/Department of Toxic Substances Control (Cal/EPA DTSC) (DTSC 2008) that concludes that background concentrations of arsenic in southern California soils may be up to 12 mg/kg. Also, the highest arsenic results were obtained from a specific layer of clay soils at approximately 10 feet below ground surface (bgs), which further indicates that observed detections occur naturally in site soils.
- Based on calculated toxicity equivalent (TEQ), dioxins/furans concentrations exceed the residential soil RSLs at Location 4, in boring 21A-4-B2 in the surface soil sample (0.0 to 0.5 feet bgs). Historical operations included herbicides and pesticides storage and mixing. Herbicides are known to contain dioxins and furans (Harte et al., 1991; Hay, 1982) and are likely responsible for the reported dioxins/furans concentrations in shallow soil at this location.
- Vinyl chloride was detected above the residential soil gas CHHSL in soil gas at 21A-1-B5, Location 1 in the 21 Area. In addition, tetrachloroethene (PCE), trichloroethane (TCE), 1,1,1-(TCA), 1,1-dichloroethene (DCE), *cis*-1,2-DCE, and 1,1-dichloroethane (DCA) were detected in the same sample. The sampling point is located in proximity to a reported former disposal pit near the Boat Basin and, therefore, the vinyl chloride detection in soil gas is likely to be related to a historical release of PCE or TCE that has degraded over time.

- A groundwater sample collected from 21 Area Location 3 contained concentrations of iron and manganese that exceed secondary MCLs for drinking water, but are below tap water RSLs. In this same sample, the reported concentration of vanadium exceeded the California Notification Level, but was below the tap water RSL. The groundwater at this location is in close proximity to the ocean and is not used for drinking water purposes. Compared to the groundwater samples collected from 21 Area Location 2, which is several hundred feet further inland, the Location 3 sample had higher sodium (1,420 milligrams per liter [mg/L]) and magnesium (53 mg/L), likely due to the close proximity to the ocean.

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ABBREVIATION AND ACRONYMS

bgs	below ground surface
Cal/EPA/DTSC	California Environmental Protection Agency/Department of Toxic Substances Control
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CHHSL	California Human Health Screening Level
COPC	chemicals of potential concern
DEH	Department of Environmental Health
DCA	dichloroethane
DCE	dichloroethene
DON	Department of the Navy
FOIA	Freedom of Information Act
MCB	Marine Corps Base
MCL	Maximum Contaminant Levels
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mL	milliliters
MTBE	methyl tert-butyl ether
NAVFAC SW	Naval Facilities Engineering Command, Southwest
NCP	National Contingency Plan
ng/kg	nanograms per kilogram
PCE	tetrachloroethene
PQL	practical quantitation limit
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RSL	Regional Screening Levels
SVOCs	semi-volatile organic compounds
TCDD	tetrachlorodibenzo-p-dioxin
TCE	trichloroethane
TEQ	toxicity equivalent
TOC	total organic carbon
TPH	total petroleum hydrocarbons
USCS	Unified Soils Classification System
USEPA	United States Environmental Protection Agency
USMC	United States Marine Corps
VOC	volatile organic compound
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µg/m ³	micrograms per cubic meter

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1.0 INTRODUCTION

This report presents the results of a soil, soil gas and groundwater investigation conducted at selected locations in the 21 Area and Camp de Luz at the Marine Corps Base Camp Pendleton, California (MCB Camp Pendleton or the Base) (Figures 1 and 2). The report was generated following a Freedom of Information Act (FOIA) request to United States Marine Corps (USMC), Naval Facilities Engineering Command (NAVFAC), and United States Environmental Protection Agency (USEPA) regarding use of chemicals at Camp Pendleton to support a claim by a Vietnam Veteran. The goal of this investigation was to determine if chemical of potential concern (COPCs) are present in significant concentrations at the subject locations. This report documents field activities and analytical laboratory results obtained in accordance with the Final Discovery Sites Work Plan (Work Plan) dated December 4, 2007 (Parsons, 2007). Remediation decisions will be made in accordance with procedures established under the Installation Restoration Program at MCB Camp Pendleton, pursuant to Section 121(c) of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), 42 USC 9621(c), and the National Contingency Plan (NCP) 40 Code of Federal Regulations (CFR) Part 300.430(f)(4).

As discussed in the Work Plan, the planned sampling locations were selected based both on information from site reconnaissance and the personal accounts of historic operations and waste disposal practices provided by former military personnel stationed at MCB Camp Pendleton during the later 1960s. These locations are referred to as Discovery Sites, and they have not been previously identified as potentially impacted areas under the Navy's Installation Restoration program or under Resource Conservation and Recovery Act (RCRA) Facility Assessment program. As part of the documentation process, a site visit conducted on August 2, 2007 was attended by NAVFAC, Parsons, and a former Marine who was stationed at the Base in the late 1960s and 1970s. The former Marine, Mr. Tom Bowen, pointed out specific locations that should be targeted for sampling, based on his knowledge of past operations. Additional information on specific site locations was provided by another former Marine, Mr. John Peinart, by e-mail.

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2.0 FIELD INVESTIGATION ACTIVITIES

Field sampling for this project was conducted in December 2007 and January 2008. Table 1 summarizes the analytical program for 21 Area and Camp de Luz investigation, including boring identifications, sample identifications, and analysis performed for each sample. Appendices to this document contain supporting information including boring logs (Appendix A); the data quality assessment report (Appendix B); chain-of-custody forms (Appendix C); and validated analytical laboratory data (Appendix D).

Work was conducted at seven locations at 21 Area and Camp de Luz. These locations are listed below and are shown on Figures 1 and 2. Individual site maps are presented on Figures 3 through 9.

- 21 Area Location 1 - Former Assault Amphibian School Buildings

- 21 Area Location 2 - Trench between Two Buildings
- 21 Area Location 3 - Topographic Low near Beach
- 21 Area Location 4 - Paved and Fenced Area
- 21 Area Location 5 - Former Dry Cleaner Facility
- 21 Area Location 6 - Possible Disposal Area Northwest of Track
- Camp de Luz

The locations identified above represent the areas suspected of being chemical release sites or waste disposal areas, based on the personal accounts and site visit described above.

The following sections summarize field activities associated with soil, soil gas and groundwater investigation at 21 Area and Camp de Luz. All work was conducted in accordance with the Work Plan, with a few exceptions specified in this report.

2.1 Soil Gas Sampling

Semi-permanent soil gas probes were installed in eleven borings 21A-1-B2, 21A-1-B3, 21A-1-B4, 21A-1-B5, 21A-5-B1, 21A-5-B2, 21A-5-B3, 21A-5-B4, 21A-6-B1, 21A-6-B2, and 21A-6-B3. Soil gas probe installation was conducted in accordance with the *Active Soil Gas Investigation Advisory* (LARWQCB/DTSC, 2003). Soil gas probe locations for 21 Area Locations 1, 5, and 6 are shown on Figures 4, 8, and 9, respectively. Thirteen soil gas samples (including two duplicate samples) were collected using Summa canisters and submitted to the laboratory for volatile organic compound (VOC) analysis using method TO-15. Soil samples from these borings were also analyzed for geotechnical parameters, including total porosity, permeability, bulk density, grain size distribution, moisture content, and total organic carbon (TOC) (Table 2). Analytical results for soil gas samples collected during this investigation are discussed in Section 3.0.

2.2 Soil Sampling

Twenty-one soil borings were drilled during this investigation at 21 Area and Camp de Luz:

- 21 Area Location 1 - four borings (21A-1-B2, 21A-1-B3, 21A-1-B4, and 21A-1-B5)
- 21 Area Location 2 - two borings (21A-2-B2 and 21A-2-B3)
- 21 Area Location 3 - one boring (21A-3-B1)
- 21 Area Location 4 - four borings (21A-4-B1, 21A-4-B2, 21A-4-B3, and 21A-4-B4)
- 21 Area Location 5 - four borings (21A-5-B1, 21A-5-B2, 21A-5-B3, and 21A-5-B4)
- 21 Area Location 6 - three borings (21A-6-B1, 21A-6-B2, and 21A-6-B3)
- Camp de Luz - three borings (CDL-B1, CDL-B2, and CDL-B3)

Soil boring locations for each site are shown on Figures 3 through 9. Soil sampling was conducted at each boring using direct push methods. Total drilled depths and survey information are presented in Table 3. Continuous soil logging was conducted using the Unified Soil Classification System (USCS) and Munsell® soil charts. Soil boring logs are included in Appendix A.

Soil samples were collected at various depths and analyzed for site specific COPCs, as detailed in Table 1. COPCs include VOCs including methyl tert-butyl ether (MTBE) and ether-based oxygenates, total petroleum hydrocarbons (TPH), semi-volatile organic compounds (SVOCs), metals, and dioxins/furans. Analytical results for soil samples collected during this investigation are discussed in Section 3.0.

2.3 Groundwater Sampling

Groundwater samples were collected from six borings using Hydropunch®-type samplers (21A-2-B3, 21A-3-B1, and 21A-5-B4) or temporary wells (CDL-B1, CDL-B2, and CDL-B3). Groundwater was encountered in these borings at approximately the following depths:

- 21A-2-B3 - 11.5 feet below ground surface (bgs),
- 21A-3-B1 - 9 feet bgs,
- 21A-5-B4 - 42 feet bgs,
- CDL-B1 - 13.9 feet bgs,
- CDL-B2 - 16.5 feet bgs, and
- CDL-B3 - 14 feet bgs.

Groundwater samples were analyzed for site specific COPCs (Table 1). COPCs include VOCs, including MTBE and ether-based oxygenates; SVOCs; TPH; and metals, including mercury. Analytical results for groundwater analyses conducted during this investigation are discussed in Section 3.0.

3.0 INVESTIGATION RESULTS

This section presents the analytical results for soil gas, soil, and groundwater samples collected during December 2007 and January 2008 at 21 Area and Camp de Luz. Data are presented with the emphasis on those analytes that exceed health-based screening-level concentrations (i.e., CHHSLs for soil gas, residential RSLs, and MCLs).

The discussions are based on validated analytical data. The data quality assessment is presented in Appendix B of this report. Chain-of-custody forms are provided in Appendix C. Validated analytical data are included in Appendix D. COPCs detected are included in the following tables:

- Table 4 Discovery Sites, VOCs Detected in Soil Gas
- Table 5 Discovery Sites, VOCs Detected in Soil
- Table 6 Discovery Sites, SVOCs Detected in Soil
- Table 7 Discovery Sites, Dioxins and Furans Detected in Soil
- Table 8 Discovery Sites, Organochlorine Pesticides Detected in Soil

- Table 9 Discovery Sites, Total Petroleum Hydrocarbons Detected in Soil
- Table 10 Discovery Sites, Metals Detected in Soil
- Table 11 Discovery Sites, VOCs Detected in Groundwater
- Table 12 Discovery Sites, TPH Detected in Groundwater
- Table 13 Discovery Sites, Metals Detected in Groundwater

3.1 21 Area, Location 1 – Former Assault Amphibian School Buildings

The area is located in the south central portion of the 21 Area (Figure 2) and was formerly occupied by buildings used for maintenance and training of tracked amphibious vehicles. Based on historic operations at this location and personnel accounts, COPCs include VOCs, SVOCs, dioxins/furans, TPH, and metals. Four borings (21A-1-B2, 21A-1-B3, 21A-1-B4, and 21A-1-B5) were drilled at the site as shown on Figure 3.

3.1.1 Soil Gas

Samples for soil gas were collected from four borings at 5 feet bgs and analyzed for the presence of VOCs using method TO-15 (Table 4). All of the VOCs detected were below the soil gas CHHSLs (CalEPA, 2005), with the exception of one vinyl chloride result. Vinyl chloride was detected in one sample (21A-1-B5) at 1,600 micrograms per meters cubed ($\mu\text{g}/\text{m}^3$), which exceeds the shallow soil gas residential and industrial land use soil gas CHHSLs of $13.3 \mu\text{g}/\text{m}^3$ and $44.8 \mu\text{g}/\text{m}^3$, respectively. Concentrations of PCE, TCE, 1,1,1-TCA, 1,1-DCE, *cis*-1,2-DCE, and 1,1-DCA were detected in the same sample, but were below CHHSLs.

3.1.2 Soil

Soil sample results for 21 Area Location 1 for VOCs, SVOCs, dioxins/furans, TPH, and metals are shown on Tables 5, 6, 7, 9, and 10, respectively. No VOCs, SVOCs, or dioxins/furans were detected above residential or industrial soil RSLs (USEPA, 2008). TPH in soils were detected in seven samples; the highest concentrations of 810 milligrams per kilogram (mg/kg) and 200 mg/kg were detected in soil samples from boring 21A-1-B3 at depths of 0.0 to 0.5 and 2.0 to 2.5 feet bgs, respectively. These samples were collected at a former disposal pit near the Boat Basin, just west the intersection of Basin Road and 9th Street.

Arsenic was the only metal detected at concentrations above its residential soil RSL of 0.39 mg/kg. Arsenic was detected in all samples at concentrations exceeding the residential soil RSLs. However, the arsenic detections in soil at this location (and at the other locations described in subsequent sections) are considered to be within naturally-occurring background concentrations for several reasons as outlined below:

1. The detections of arsenic at this location range from less than 1 mg/kg to approximately 8.48 (J) mg/kg (in sample 21A-1-B5-D (D)). These levels are within the range that is widely considered to occur naturally in southern California soils. For example, a recent document published by CalEPA/DTSC (DTSC 2008) provides a statistical analysis that concludes that the upper-bound background concentration of arsenic in southern California soils is 12 mg/kg.
2. The highest concentrations of arsenic in soil at this site were from samples obtained at depths of 10 to 10.5 feet bgs, and the samples obtained at shallower

depths exhibited lower arsenic concentrations. This indicates that a site release of arsenic is unlikely, because a typical release would exhibit higher concentrations near the surface, with decreasing concentrations at greater depths.

3. The highest arsenic concentrations are reported in a soil layer composed of clays, and lower concentrations are reported in the sandier soil layers. This is consistent with the concept that arsenic-containing minerals are generally more prevalent in clays and less common in sands, and that the higher arsenic concentrations are confined to a particular stratigraphic unit, which further reinforces that the observed concentrations occur naturally.

3.2 21 Area, Location 2 – Trench between Two Buildings and Clarifier

This site is located in the northwestern portion of the 21 Area (Figure 2) and is occupied by several buildings, which were used as a machine shop, a paint shop, a welding shop, a small arms repair center, and vehicle maintenance, including a transmission shop and engine overhaul and replacement. Based on historic operations and personnel accounts, VOCs, SVOCs, TPH, and metals have been identified as COPCs at this location. Two borings (21A-2-B2 and 21A-2-B3) were drilled at the site as shown on Figure 4.

3.2.1 Soil

Soil sample results for 21 Area Location 2 for VOCs, SVOCs, TPH, and metals are shown on Tables 5, 6, 9, and 10, respectively. No VOCs or SVOCs were detected above residential or industrial soil RSLs (USEPA, 2008). TPH in soils were detected in four samples; the highest TPH concentrations of 120 mg/kg and 90 mg/kg were reported from surface samples (0.0 to 0.5 feet bgs) in both sampling locations 21A-2-B3 and 21A-2-B2, respectively. Only arsenic was detected above its residential soil RSL of 0.39 mg/kg (USEPA, 2008), but results were lower than those at 21 Area Location 1 and are, therefore, considered to be naturally-occurring background (see Section 3.1.1).

3.2.2 Groundwater

One groundwater sample (plus a duplicate) was collected from boring 21A-2-B3. Groundwater samples were collected from about 24 feet bgs and analyzed for VOCs, SVOCs, TPH-carbon chain, and metals. SVOCs were not detected in groundwater. Groundwater sample results for VOCs, TPH, and metals are shown on Tables 11, 12, and 13, respectively. No VOCs or metals were detected above MCLs or tap water RSLs. TPH-carbon chain was detected in samples 21A-2-B3 and 21A-2-B3 (D) at 430 µg/L and 470 µg/L, respectively.

3.3 21 Area, Location 3 – Topographic Low Near Beach

This area is located south of Location 2 in the northwestern-most portion of 21 Area (Figure 2). Personal accounts of historic operations prepared by former military personnel indicate that the area immediately up-slope of the topographic low area was used to stage Ontos, tanks, and shipping containers. The COPCs identified at this location included VOCs, SVOCs, TPH, and metals. One boring (21A-3-B1) was drilled at the site (Figure 5).

3.3.1 Soil

Soil sample results for 21 Area Location 3 for VOCs, SVOCs, TPH, and metals are shown on Tables 5, 6, 9, and 10, respectively. No SVOCs were detected in soil. VOCs were not detected above residential or industrial soil RSLs (USEPA, 2008). TPH was only detected in one sample at 89 mg/kg. Only arsenic was detected above its residential soil RSL of 0.39 mg/kg, but results were lower than those at 21 Area Location 1 and are, therefore, considered to be naturally-occurring background (see Section 3.1.1).

3.3.2 Groundwater

One groundwater sample was collected at boring 21A-3-B1. The sample was collected from about 12 feet bgs and was analyzed for VOCs, SVOCs, TPH-carbon chain, and metals. SVOCs and TPH-carbon chain were not detected in groundwater. Groundwater sample results for VOCs and metals are shown on Tables 11 and 13, respectively. No VOCs were detected above MCLs or tap water RSLs. Iron, manganese, and vanadium were detected above secondary drinking water MCLs, but below tap water RSLs at concentrations of 0.377 mg/L, 0.141 mg/L, and 0.139 mg/L, respectively (Table 13).

3.4 21 Area, Location 4 – Paved and Fenced Area

This area is located in the central portion of the 21 Area, approximately 1,500 feet from the coastline (Figure 2). Personal accounts of historical operations indicated this area was used as a maintenance facility, and that operations included lawnmower repair, weed control, herbicide/pesticide storage and mixing, spray rigs, fertilizers, and use of diesel fuel. The COPCs at this site included chlorinated herbicides, organochlorine pesticides, and dioxins/furans. Four borings (21A-4-B1, 21A-4-B2, 21A-4-B3, and 21A-4-B4) were drilled at the site (Figure 6).

Soil sample results for 21 Area Location 4 for dioxins/furans and organochlorine pesticides are shown on Tables 7 and 8, respectively. No chlorinated herbicides were detected. No organochlorine pesticides were detected above residential or industrial soil RSLs (USEPA, 2008).

Multiple congeners of dioxins/furans were detected, as shown on Table 7. Heptachlorodibenzo-p-dioxin, hexachlorodibenzo-p-dioxin, heptachlorodibenzofuran, and hexachlorodibenzofuran were detected above the residential soil RSLs in one sample (21A-4-B2-A; 0.0 to 0.5 feet bgs). Hexachlorodibenzofuran was also detected above the residential soil RSLs in sample 21A-4-B1-A (0.0 to 0.5 feet bgs). The 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity equivalents (TEQs) were below the residential soil RSLs of 4.5 nanograms per kilogram (ng/kg) in all samples, except for sample 21A-4-B2-A (0.0 to 0.5 feet bgs). The TEQ was calculated to be 5.97 ng/kg for this sample.

3.5 21 Area, Location 5 – Former Dry Cleaner Facility

This area is located in the eastern portion of the 21 Area, just south of the Interstate 5 Freeway (Figure 2) and adjacent to Building 21600 (Figure 7). Based on personal accounts of historic operations, a former dry cleaning facility existed in this area. The primary COPCs are VOCs. Four borings (21A-5-B1, 21A-5-B2, 21A-5-B3, and 21A-5-B4) were drilled at the site (Figure 7). It should be noted that the Base historically has had dry cleaning drop-off points, and this site was apparently one of these based on the

very small size of the building seen in the aerial photo, and also based on an absence of utilities, former tanks, piping, or any other evidence that there would have been actual dry cleaning operations at this location. Building 2666 is the only known facility that actually performed dry cleaning on the premises.

3.5.1 Soil Gas

Samples for soil gas were collected from four borings at 10 feet bgs and analyzed for the presence of VOCs using method TO-15 (Table 4). All of the VOCs detected were below the soil gas CHHSLs (CalEPA, 2005).

3.5.2 Soil

Soil sample results for 21 Area Location 5 for VOCs are shown on Table 5. No VOCs were detected above residential or industrial soil RSLs (USEPA, 2008).

3.5.3 Groundwater

Groundwater has been analyzed for VOCs in one sample (21A-5-B4) collected at approximately 55 feet bgs. Groundwater sample results for VOCs are shown on Table 11. No VOCs were detected above MCLs and/or tap water RSLs.

3.6 21 Area, Location 6 – Possible Disposal Area Northeast of Track

This area is located west and northwest of the baseball field and running track (Figure 2), along the chain link fence that separates the developed recreational area and the undeveloped brush covered slopes leading down to the saltwater slough. Location of the soil borings are shown on Figure 8. According to personal accounts of historical operations, this area was used as an unofficial disposable area for wax removal chemicals, paint/dye stripping chemicals, and red concrete dye. The COPCs included TPH, VOCs, and metals. Three borings (21A-6-B1, 21A-6-B2, and 21A-6-B3) were drilled at the site as shown on Figure 8.

3.6.1 Soil Gas

Samples for soil gas were collected from three borings (21A-6-B1, 21A-6-B2, and 21A-6-B3) at 5 feet bgs and analyzed the presence of VOCs using method TO-15 (Table 4). All of the VOCs detected were below the soil gas CHHSLs (CalEPA, 2005).

3.6.2 Soil

Soil sample results for 21 Area Location 6 for VOCs, TPH, and metals are shown on Tables 5, 9, and 10, respectively. VOCs were not detected above residential or industrial soil RSLs (USEPA, 2008). TPH-carbon chain in soils was detected in nine samples; the highest TPH concentrations of 700 and 140 mg/kg were detected in the surface soil samples (0.0 to 0.5 feet bgs) from 21A-6-B1-A and 21A-6-B2-A, respectively. Only arsenic was detected above its residential soil RSL of 0.39 mg/kg, but results were lower than those at 21 Area Location 1 and are, therefore, considered to be naturally-occurring background (see Section 3.1.1).

3.7 Camp de Luz

Camp de Luz is located adjacent to de Luz Creek on a flat floodplain area (Figures 1 and 9). According to the personal accounts of former military personnel regarding historic

operations, the area was used to dispose of kerosene and solvents used during the repair and maintenance of kerosene drum heaters. The kerosene and solvents were reportedly dumped onto the ground near the former basketball court as shown on Figure 9. Therefore, the COPCs at this location included VOCs and TPH. Three borings (CDL-B1, CDL-B2, and CDL-B3) were drilled at the site (Figure 9).

3.7.1 Soil

Soil sample results for Camp de Luz for VOCs and TPH are shown on Tables 5 and 9, respectively. No VOCs were detected above residential or industrial soil RSLs (USEPA, 2008). No TPH concentrations were detected in volatile range. TPH concentrations in diesel range were detected in four samples and ranged from 6.1 mg/kg (CDL-B2-D; 10.0 to 10.5 feet bgs) to 34 mg/kg (CDL-B1-B (D); 2.0 to 2.5 feet bgs). TPH concentrations in oil range were detected in two samples; CDL-B1-B (2.0 to 2.5 feet bgs) at 81 mg/kg and CDL-B1-B (D) (2.0 to 2.5 feet bgs) at 89 mg/kg (Table 9).

3.7.2 Groundwater

Groundwater samples from three borings were analyzed for VOCs and TPH. Groundwater samples were collected from 16.9 to 26.9 feet bgs in CDL-B1, 17.8 to 27.8 feet bgs in CDL-B2, and 18 to 28 feet bgs in CDL-B3. No VOCs were detected above MCLs or tap water RSLs (Table 11). TPH concentrations in the volatile and oil ranges were not detected (Table 12). TPH concentrations in the diesel range were detected at 52 and 60 µg/L in samples CDL-B2 and CDL-B3, respectively.

4.0 CONCLUSIONS

Sampling results indicate COPCs may be present at the sites, but below the health-based screening concentrations (i.e., CHHSLs, RSLs, and MCLs), with the following exceptions:

- Arsenic was detected in soils above the residential soil RSLs in soil samples from the locations where samples were analyzed for metals, with the highest concentrations of arsenic detected in soils at 21 Area Location 1.. However, these arsenic detections are considered to be within the range that occurs naturally at the Base. This conclusion is based on several lines of evidence, including a document published by CalEPA/DTSC (DTSC 2008) that concludes that background concentrations of arsenic in southern California soils may be up to 12 mg/kg. Also, the highest arsenic results were obtained from a specific layer of clay soils at approximately 10 feet bgs, which further indicates that observed detections occur naturally in site soils.
- Based on calculated TEQs, dioxins/furans concentrations exceed the residential soil RSLs at Location 4, in boring 21A-4-B2 in the surface soil sample (0.0 to 0.5 feet bgs). Historical operations included herbicides and pesticides storage and mixing. Herbicides are known to contain dioxins and furans (Harte et al., 1991; Hay, 1982) and are likely responsible for the reported dioxins/furans concentrations in shallow soil at this location.
- Vinyl chloride was detected above the residential soil gas CHHSL in soil gas at 21A-1-B5, Location 1 in the 21 Area. In addition, tetrachloroethene (PCE), trichloroethane (TCE), 1,1,1-(TCA), 1,1-dichloroethene (DCE), *cis*-1,2-DCE, and 1,1-dichloroethane (DCA) were detected in the same sample. The sampling

