THE PRESIDIO TRUST

January 23, 2013

Mr. George Chow
California Department of Toxic Substances Control
700 Heinz Avenue
Berkeley, CA 94710-2721

Subject: Draft Removal Action Work Plan (RAW), Barnard Avenue Protected Range (BAPR), Presidio of San Francisco, California, dated January 2013

Dear Mr. Chow:

Enclosed are two hard copies and two electronic copies of the *Draft Removal Action Work Plan (RAW), Barnard Avenue Protected Range (BAPR), Presidio of San Francisco, California* prepared by Geosyntec Consultants for the Presidio Trust. Please contact me at (415) 561-4293 if you have any questions.

Sincerely,

Genevieve Coyle

Genevieve Coyle
Environmental Remediation Project Manager

Enclosure

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Prepared for

The Presidio Trust
103 Montgomery Street
San Francisco, California

DRAFT REMOVAL ACTION WORK PLAN BARNARD AVENUE PROTECTED RANGE (BAPR)

PRESIDIO OF SAN FRANCISCO, CALIFORNIA

Prepared by

Geosyntec consultants

engineers | scientists | innovators

1111 Broadway, 6th Floor
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Project Number WR1512

January 2013

Draft Removal Action Work Plan
Barnard Avenue Protected Range (BAPR)
Presidio of San Francisco, California

Prepared by

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Project Number: WR1512

January 2013

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EXECUTIVE SUMMARY

On behalf of the Presidio Trust (Trust), Geosyntec Consultants (Geosyntec) has prepared this Draft Removal Action Work Plan (RAW) for the Barnard Avenue Protected Range (BAPR) (the Site), a former small arms firing range located between Barnard Avenue and Quarry Road at the Presidio of San Francisco, California (Presidio) (Figure 1). The purpose of this report is to present and evaluate existing site conditions, establish appropriate removal action objectives (RAOs) for the protection of human health and the environment, evaluate removal alternatives, propose a removal action for the BAPR, and present an implementation work plan for the removal action.

This Draft RAW was prepared pursuant to California Health and Safety Code Section 25356.1(h) to propose a nonemergency removal action that is estimated to cost less than $2 million and follows the California Department of Toxic Substances Control (DTSC) guidance on Removal Action Work Plans (DTSC, 1995). In accordance with regulations, this Draft RAW is being released for a 30-day public comment period. After the public comment period ends, DTSC, in consultation with the Trust, will respond to comments received and prepare a Final RAW. The Final RAW will serve as the decision document for remediation of the BAPR.

The BAPR is a former small arms firing range within the western tributary of the Tennessee Hollow Watershed. It is believed to have been constructed prior to 1907 within the western drainage of the Tennessee Hollow area. As shown in Figure 1, much of the southwestern portion of the firing range is covered by Landfill E (LFE), which was remediated with a soil cover in accordance with the *Final Feasibility Study/Remedial Action Plan* (Geosyntec, 2011) and documented in the *Construction Completion Report, Landfill E* (Geosyntec, 2012b). The portion of the firing range that underlies the LFE soil cover is included in the remedy for LFE and is not the subject of this RAW. This RAW covers the portion of the firing range extending to the northeast of LFE. The Site boundary is shown on Figure 2.

Over 85 soil samples have been collected from the BAPR during remedial investigations conducted between 2003 and 2012 (Geosyntec, 2012a). Metals, pesticides, and total petroleum hydrocarbons as diesel (TPH-d) were identified as the potential chemicals of concern (PCOCs) for soil at the BAPR. These PCOCs were detected in soil at concentrations exceeding preliminary remediation goals (PRGs) protective of the ecological receptors and background threshold levels.

Based on the conceptual site model, the only potential exposure risk to PCOCs are for ecological species in the drainage area and western upslope area of the Site. Concentrations of PCOCs are below levels protective of human health. Risks to ecological receptors were evaluated in this RAW for baseline conditions at the BAPR, which assumed no remediation of soil. Based on this analysis, antimony, copper, lead, zinc, TPH-d, chlordane, 4,4'-DDE, and 4,4'-DDT in soil pose a potential risk to ecological receptors within the drainage area at the BAPR. These contaminants are identified as chemicals of concern (COCs) in soil within the drainage area at the BAPR.

Based on the risk evaluation, the remedial action area at the BAPR was delineated as the drainage area of the BAPR containing concentrations of COCs in soil that pose an unacceptable risk to the BAPR ecosystem and are not associated with background concentrations. Three removal action alternatives (No Further Action, Containment, and Excavation and Disposal) were developed and evaluated to mitigate the unacceptable risk within the drainage area.

Based on the comparative analysis of the removal action alternatives and the intended land use for the BAPR, Excavation and Disposal is the selected removal action alternative for the Site. This alternative was selected for the Site because it is the most cost-effective and protective remedy for the Site. The proposed excavation covers an area of approximately 20,900 square feet or 0.5 acre. The depth of the excavation is primarily surficial, ranging in depth from 0.5 to 1.5 feet throughout the drainage. The anticipated volume of soil is estimated at 1,305 cubic yards Confirmation sampling will be conducted following excavation to confirm concentrations of COCs are below cleanup levels. However, within tree protection zones, soil will not be excavated deeper than 1.5 ft bgs to protect trees that are planned to be preserved. The removal action is scheduled to commence in early 2013 and will last approximately four weeks. The estimated cost of the removal action is $449,400.

Following excavation activities, a Removal Action Completion Report will be prepared to summarize and present data collected during the removal action.

ACRONYMNS AND ABBREVIATIONS (ORIGINAL DOCUMENT)

Army	U.S. Army
ARARs	Applicable or Relevant and Appropriate Requirements
BAPR	Barnard Avenue Protected Range
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	constituent of concern
CRP	Community Relations Plan
CSM	Conceptual Site Model
DTSC	Department of Toxic Substances Control
EPA	United States Environmental Protection Agency
ft bgs	feet below ground surface
HASP	Health and Safety Plan
HERO	Office of Human and Ecological Risk
LFE	Landfill E
MEC	munitions and explosives of concern
mg/kg	milligrams per kilogram
NAVD88	1988 North American Vertical Datum
NCP	National Oil and Hazardous Substances Pollution Prevention Contingency Plan
NPS	National Park Service
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PAHs	polycyclic aromatic hydrocarbons
PCOC	Potential constituent of concern
PE	Professional Engineer
PLLW	Presidio Lower Low Water

PM	Particulate matter
PPE	personal protective equipment
Presidio Cleanup Levels Document	*Development of Presidio-wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water*
PRG	Preliminary remediation goal
PTMP	Presidio Trust Management Plan
RAO	Remedial Action Objective
RAW	Removal Action Work Plan
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
SMP	Soil Management Plan
SWPPP	Stormwater Pollution and Prevention Plan
TBC	to-be-considered advisory
THEA	*Tennessee Hollow Upper Watershed Revitalization Project Environmental Assessment*, Tennessee Hollow
TPH-d	total petroleum hydrocarbons as diesel
UCL	Upper Confidence Limit
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
UXO	Unexploded ordinance
VMP	Vegetation Management Plan for the Presidio Trust U.S. Environmental Protection Agency
VOC	volatile organic compound

1. INTRODUCTION

On behalf of the Presidio Trust (Trust), Geosyntec Consultants (Geosyntec) has prepared this Draft Removal Action Work Plan (RAW) for the Barnard Avenue Protected Range (BAPR) (the Site), a former small arms firing range located between Barnard Avenue and Quarry Road at the Presidio of San Francisco, California (Presidio) (Figure 1).

1.1 Purpose

The purpose of this report is to present and evaluate existing site conditions, establish appropriate removal action objectives (RAOs) for the protection of human health and the environment, evaluate removal alternatives, propose a removal action for the BAPR, and present an implementation work plan for the removal action. This Draft RAW was prepared pursuant to California Health and Safety Code Section 25356.1(h) to propose a nonemergency removal action that is estimated to cost less than $2 million and follows the California Department of Toxic Substances Control (DTSC) guidance on Removal Action Work Plans (DTSC, 1995). In accordance with regulations, this Draft RAW is being released for a 30-day public comment period. After the public comment period ends, DTSC, in consultation with the Trust, will respond to comments received and prepare a Final RAW. The Final RAW will serve as the decision document for remediation of the BAPR.

1.2 Report Organization

The remaining sections of this RAW include the following:

- Section 2, *Background*, describes the regulatory framework for the project and public participation activities;
- Section 3, *Summary of Site Conditions*, presents a general Site background, the geology, hydrogeology and surface water features of the Site, and a summary of the remedial investigations;
- Section 4, *Nature, Extent, and Source of Contaminants*, describes the nature and extent of potential constituents of concern (PCOCs), the sources of PCOCs at the site, the potential exposure pathways to PCOCs, and receptors that could

potentially be exposed to PCOCs; and includes a risk evaluation to select constituents of concern (COCs) that pose an unacceptable risk to the environment at the BAPR;

- Section 5, *Development of Removal Action Objectives*, summarizes the planned land use for the BAPR, identifies cleanup objectives and applicable or relevant and appropriate requirements (ARARs), and present the RAOs;
- Section 6, *Removal Action Alternative Evaluation*, identifies and evaluates the removal action alternatives for the BAPR and selects the preferred alternative for the Site;
- Section 7, *Implementation Plan* presents the implementation plan of the selected removal action alternative;
- Section 8, *Removal Action Completion Report*, outlines the elements of the completion report that will be prepared following implementation of the selected removal action;
- Section 9, *Schedule*, presents the schedule for completing the removal action; and
- Section 10, *References*, provides the references used to prepare this RAW.

Tables, figures, and appendices are presented following the text of the RAW.

2. BACKGROUND

This section describes the project regulatory framework and public participation activities.

2.1 Project Regulatory Framework

Pursuant to a Consent Agreement with the DTSC and the National Park Service (NPS) (DTSC, 1999), the Trust is responsible for cleanup of releases of hazardous substances and hazardous waste at the Presidio under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource Conservation and Recovery Act (RCRA). The Consent Agreement applies to cleanup of nine Operable Units (OUs). The BAPR is in the Firing Ranges Operable Unit (OU)-3. This Draft RAW meets requirements specified in California Health and Safety Code Section 25356.1(h) as a nonemergency removal action that is estimated to cost less than $2 million.

As shown in Figure 1, much of the southwestern portion of the BAPR firing range is covered by Landfill E (LFE), which was remediated with a soil cover in accordance with the *Final Feasibility Study/Remedial Action Plan* (Geosyntec, 2011) and documented in the *Construction Completion Report, Landfill E* (Geosyntec, 2012b). The portion of the firing range that underlies the LFE soil cover is included in the remedy for LFE and is not the subject of this RAW. This RAW covers the portion of the firing range extending to the northeast of LFE. The Site boundary is shown on Figure 2. A Draft Feasibility Study (FS) for the small arms firing ranges, including the portion of the BAPR shown in Figure 2, was prepared in November 2004 (Treadwell & Rollo, 2004b).

2.2 California Environmental Quality Act Compliance

The RAW for the BAPR is categorically exempt from the requirement for preparation of environmental documents under Section 15330 of the California Environmental Quality Act (CEQA). The Class 30 exemption applies to “minor cleanup actions taken to prevent, minimize, stabilize, mitigate or eliminate the release or threat of release of a hazardous waste or substance which are small or medium removal actions costing $1 million or less” (Cal. Code Regs. § 15330). The RAW for the BAPR is a small removal action costing less than $1 million taken to eliminate the release of a hazardous

substance. As such, the BAPR qualifies for the Class 30 exemption under CEQA. DTSC has prepared a Notice of Exemption (NOE) which will be filed at the time of final project approval. The NOE is available in Appendix F.

2.3 Public Participation Activities

In accordance with Section 25356.1(h) of the California Health and Safety Code, this Draft RAW is subject to public review and comment. To facilitate information exchange between the Trust and the public, the Trust prepared a Community Relations Plan (CRP) for the Presidio environmental remediation program (Trust, 2001). The CRP provides information on public participation in the environmental cleanup decisions at the Presidio and opportunities for public input.

Pursuant to regulations and the CRP, this Draft RAW is subject to public review and comment as follows:

1. Distribution of a fact sheet on the Draft RAW to the Presidio Environmental Remediation mailing list, DTSC RAW mailing list, and tenants near the project site.

2. Notice of the release of the Draft RAW for public review advertised in the San Francisco Chronicle and in a Presidio E-Newsletter (distributed to Presidio tenants), and posted on the Trust's public website and DTSC's EnviroStor website.

3. A 30-day public comment period on the Draft RAW that was announced by a public notice.

4. A public meeting to present the contents of the Draft RAW and receive public comment.

5. Preparation of a Responsiveness Summary that will respond to oral and written comments on the Draft RAW received during the public comment period. The Responsiveness Summary will be included as Appendix G in the Final RAW.

6. Availability of the Administrative Record. Documents related to the Draft RAW are available for public review as part of the Administrative Record, maintained at the Presidio Library at 103 Montgomery Street, Presidio of San Francisco. The Administrative Record List is included as Appendix A.

3. SUMMARY OF SITE CONDITIONS

This section describes the general Site background, the geology, hydrogeology, and surface water features of the Site, and the previous investigations conducted at the BAPR.

3.1 Site Background

The Presidio is located in the City of San Francisco, at the northern tip of the San Francisco peninsula (Figure 1). The Presidio is a 1,491-acre former military post, bounded by San Francisco Bay on the north and the Pacific Ocean on the west. Densely populated residential areas of San Francisco border the Presidio to the south and east.

Between the 1800s and the early to mid-1900s the U.S. Army (Army) used several small arms firing ranges throughout the Presidio (Treadwell & Rollo, Inc., 2004a). The small arms firing ranges were used by the Army for the training of military personnel. Presidio outdoor firing ranges were generally constructed with a target stop and target butt, an impact berm to capture fired rounds of ammunition behind the target. Natural dune deposits or hillside slopes were often used as impact berms or butts.

The BAPR was constructed prior to 1907 within the western drainage of the Tennessee Hollow area within Area B, the 1,168 acre inland area of the Presidio. The firing line was located in the lowermost (northeastern) extent of the drainage and the target area was located in the uppermost (southwestern) extent of the drainage (Figure 1). The BAPR had four target butts with the furthest located approximately 1,000 feet from the firing line. Although the exact dates of operation for the firing range are unknown, the BAPR was not operational after 1934 (Treadwell and Rollo, 2004b).

A significant area of the northeastern portion of the BAPR is covered by one to seven feet of compacted construction fill from Buildings 808 and 809, which is not fill associated with LFE (Figure 2) (Treadwell & Rollo, 2004a). The uncovered portion of the BAPR to the west of residential Buildings 808, 809, and 810 is heavily vegetated with trees, shrubs, and ivy. However, in October 2012, 16 trees planned for removal under the Presidio Vegetation Management Plan (VMP; Trust and NPS, 2001) were removed from the area. The southern portion of the firing range was covered by the fill placed in LFE, which was remediated with a soil cover in 2011 (Geosyntec, 2012b) and is not the subject of this RAW. See Figure 2 for the Site boundary.

3.2 Site Geology

The BAPR is situated within a natural canyon that has been cut into the bedrock, along the western tributary of the Tennessee Hollow Watershed. Colma Formation Quaternary deposits have been deposited on top of the bedrock. The BAPR is directly underlain by the Colma Formation which is primarily composed of sand and silty sand with lesser clay with some scattered occurrences of dune sand (Treadwell & Rollo, 2004a). The Colma Formation dips north toward San Francisco Bay. The Colma Formation appears to be greater than 40 feet thick thinning towards the boundaries of the canyon, with underlying Franciscan Formation bedrock. At the northeastern portion of the BAPR, construction fill material was placed over the Colma Formation to provide foundations for residential Buildings 808, 809, and 810 that were constructed following operations at the BAPR. In the western half of the BAPR, upslope from the Tennessee Hollow drainage, medium-brown clay loam over yellow-brown sandy clay loam, consistent with the Colma formation, was observed during construction of a rain garden (see Section 3.6). Scattered serpentine rubble and small cobbles were also uncovered during excavation of the rain garden.

3.3 Site Hydrogeology

The BAPR is located along the western tributary of the Tennessee Hollow area, a 270-acre watershed in the southeastern portion of the Presidio. Groundwater beneath this area sits atop bedrock in the sand and silty sand of the Colma Formation (Treadwell and Rollo, 2004a). The hydrogeologic boundaries in the Tennessee Hollow area, and the western drainage specifically, are defined largely by the topography of the bedrock surface, which exerts significant control over groundwater flow in the basin. The bedrock surface appears to form a relatively impermeable boundary along the east and west edges of the watershed. To the north, the bedrock surface broadens toward the Bay. Groundwater flow in Tennessee Hollow is generally to the north and the depth to groundwater ranges from the ground surface to 65 feet below ground surface (ft bgs) (Treadwell and Rollo, 2004a). Shallow groundwater in the Tennessee Hollow watershed groundwater basins occurs in the Colma Formation.

At the BAPR, depth to groundwater is approximately 24 ft bgs based on historical water levels for former LFE well DAEGW08 (Treadwell & Rollo, 2011), which was located at the edge of LFE waste in the BAPR drainage (Figure 2). Shallower water was observed in former LFE well DAEGW07, which was located part way up the LFE slope

from the BAPR (Figure 2). Groundwater levels in this well fluctuated significantly (between 2.3-9 ft bgs), while the water levels in neighboring well DAEGW08 did not. Because of the variation in water levels and its location, well DAEGW07 appears to have been influenced by the seasonal perched water table at LFE that is distinct from the shallow groundwater in the Colma Formation (Geosyntec, 2011). Groundwater has not been encountered in BAPR soil borings drilled to a maximum depth of 8.5 ft bgs near Building 809 (BAPSB05) and to 5 ft bgs in the BAPR drainage (BAPSB208 and BAPSB209).

Based on investigations conducted at LFE, groundwater flow beneath the northern portion of the BAPR is anticipated to be generally from southwest to northeast and follows the orientation of the western drainage feature (Geosyntec, 2011).

3.4 Surface Water

The BAPR is within the Western Tributary of the Tennessee Hollow Watershed. The Tributary is fed by runoff from LFE to the south and the surrounding canyon that comprises the Western Tributary. Remedial work at LFE created both channelized and piped flow of this runoff, releasing to energy dissipation pads at the southern boundary of the BAPR (at the toe of the LFE slope). From here flow follows the topography as it has historically done, with discharge to a culvert pipe at the northern perimeter of the BAPR, running under Fernandez Street. This short culvert then opens up to the historical, topographically-controlled channel, merging with the Central Tributary and then with the Eastern Tributary of the Tennessee Hollow watershed, which are both spring-fed and drain year round. Eventually surface water drains to the Crissy Field Marsh in the northern Presidio, on the perimeter of the San Francisco Bay (Trust, 2007).

3.5 Summary of Remedial Investigations

A comprehensive summary of remedial investigations conducted at the BAPR was presented in the *Remedial Investigation Summary Report* (RI Summary; Geosyntec, 2012a). Two phases of investigation were conducted. In 2003, eighteen (18) soil borings (BAPSB01 through BAPSB18) were advanced on a 50-foot grid (Figure 2), and soil samples were collected from the borings at depths ranging from approximately four inches to 9 ft bgs (Treadwell & Rollo, 2004a). All soil samples were analyzed for the five firing range metals of potential concern (antimony, barium, copper, lead, and zinc)

and four of the soil samples were analyzed for the full suite of Title 22 metals. In 2010, eighteen (18) soil borings (BAPSB201 through BAPSB218) were advanced (Figure 2) and soil samples were collected at depths ranging from four inches to 5 ft bgs (Geosyntec, 2012a). All samples were analyzed for zinc. Samples in the LFE drainage were also analyzed for metals, pesticides, polycyclic aromatic hydrocarbons (PAHs), and total petroleum hydrocarbons as diesel (TPH-d) to assess potential impacts from LFE runoff.

In total, over 72 remedial investigation soil samples have been collected at the BAPR. The results of the BAPR investigations are summarized in Tables 1 and 2.

Groundwater was not investigated at the BAPR. As discussed in Section 2.4, groundwater beneath the BAPR occurs at approximately 24 ft bgs. Given the depth to water and the shallow nature (<5 ft bgs) of contaminant impacts to soil, investigation of groundwater at the BAPR was not warranted.

3.6 Building 42 Rain Garden

In January 2012, the Trust excavated soil to construct the Building 42 rain garden within the northwestern portion of the BAPR (Figure 2). The purpose of the rain garden is to manage storm water and runoff from Building 42 which lies approximately 175 feet northwest of the BAPR. Since the rain garden was constructed within the BAPR where certain metals, TPH-d, and pesticides were detected during investigations, the Trust prepared a Soil Management Plan (SMP) which included a soil confirmation sampling plan to document residual concentrations in the soil following excavation (Trust, 2011).

The rain garden consists of a curved oval pond-shaped excavation, with a surrounding formed berm. In addition to the “pond” at the bottom of the ravine, excavation included an approximate 3-foot depth removal along the western slope below Barnard Avenue at the north end, and two drain channels in the slope. The soil along the western slope consisted of medium brown clay loam over yellow-brown sandy clay loam. Scattered serpentine rubble and small cobbles turned up during excavation of the slope. This soil profile continued at the bottom where the slope leveled out near to an old brick manhole. Overall, the soil in the lower slope/plateau area was consistently light to medium brown clay loam. The finish grade surface of the rain garden consists of clean and compact yellow-brown sandy clay loam, at approximately 4.5 feet from the surface

of the lower western slope. The finished depth of the rain garden from the top of the created berm is approximately 2.5 to 3 feet.

In accordance with the SMP, fourteen (14) confirmation soil samples were collected along the sidewalls (BAPSB301 through BAPSB310) and bottom (BAPSB211 through BAPSB314) of the rain garden following excavation. Soil samples were collected from the surface of the excavation using a stainless steel trowel and glass jars. Four samples (BAPSB315 through BAPSB318) were also collected from the surface of a berm constructed along the southeastern edge of the rain garden using excavation spoils. Following collection, jars were sealed, labeled, packaged, and shipped under chain of custody protocol to Curtis & Tompkins as specified in the Presidio's Quality Assurance Project Plan/Sampling and Analysis Plan (QAPP/SAP: Tetra Tech, 2001). Samples were analyzed for Title 22 metals by EPA Method 6010B, TPH-d by EPA Method 8015 with silica gel cleanup, and pesticides by EPA Method 8081A. The analytical results from the Building 42 rain garden are summarized in Tables 3 and 4.

4. NATURE, EXTENT, AND SOURCE OF CONTAMINANTS

The following section describes the nature and extent of PCOCs for the BAPR, presents the conceptual site model, and includes a risk evaluation to select COCs that pose an unacceptable risk to the environment at the BAPR.

4.1 Nature and Extent of Potential Chemicals of Concern (PCOCs)

The nature and extent of contamination at the BAPR was previously evaluated in the RI Summary Report (Geosyntec, 2012a). To date, a significant amount of data has been collected to identify and characterize the nature and extent of PCOCs in soil at the Site, with over 85 soil samples collected since investigation activities began in 2003 (Geosyntec, 2012a). For Site investigation purposes, the Site has been divided into three general areas depicted on Figure 2:

1) Drainage Area: represented by sample locations BAPSB205-209, -213, -215, and -218. These samples are within the low-lying drainage fed by runoff from LFE to the south.

2) Western Upslope Area: represented by sample locations BAPSB210-212, -214, -216 and -217 and samples from the rain garden. This area is upslope and to the west of the drainage area.

3) Eastern Upslope Area: represented by sample locations BAPSB01-18 and BAPSB201-204. This area is upslope and to the east of the drainage area and includes Buildings 808, 809, 810 and surrounding landscaping.

To evaluate the significance of the analytical results collected during the investigations within each of these areas, results were compared with preliminary remediation goals (PRGs) protective of human health and the environment in the *Development of Presidio-wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water* (Presidio Cleanup Levels Document) (EKI, 2002). The soil PRGs applicable to the BAPR are based on criteria protective of human health, ecological receptors (buffer zone and special status), groundwater, and/or freshwater sediment. Tables 1 through 4, show the comparison of Site data to PRGs.

For metals, background threshold concentrations for the Colma formation from the Cleanup Level Document (EKI, 2002) were used as screening levels if they were higher than the PRGs. For zinc, the background level used for screening in the RI Summary Report was 60 milligrams per kilogram (mg/kg). However, in January 2013, a new background level for zinc for Colma formation at the Presidio was developed using updated information and data. Based on the evaluation, the background screening concentration for zinc in the Colma formation is 79 mg/kg (AMEC, 2013; Appendix E). DTSC's Office of Human and Ecological Risk (HERO) provided comments on the development of the new background level and agreed with the proposed upper tolerance limit of 79 mg/kg as the background level for zinc in Colma and mixed Colma/Beach Dune soils at the Presidio. The screening evaluation in Tables 1 through 4 reflects the 79 mg/kg background level for zinc in Colma formation.

In the RI Summary Report (Geosyntec, 2012a), antimony, copper, lead, zinc, selenium, TPH-d, 4,4'-DDE, and 4,4'-DDT were identified as the PCOCs for soil at the BAPR (Tables 1 and 2). These PCOCs have concentrations exceeding ecological PRGs for special status species or freshwater sediment criteria and are present above Colma formation background levels in the drainage area of the Site. Concentrations of PCOCs do not exceed human health screening levels.

Chromium and nickel were detected above background levels during the RI, but were not selected as PCOCs for the BAPR because they were only detected in one sample at 5 ft bgs from the same location (Geosyntec, 2012a). This sample likely contained fragments of serpentinite rock because the higher chromium and nickel concentrations are indicative of a serpentinite signature and are within the background range for serpentinite soils. Furthermore, the surface sample collected at this location did not contain these metals above PRGs. These metals were also detected in samples collected at LFE, but at concentrations below background levels and were not COCs for LFE.

Aldrin was detected slightly above the ecological special status PRG during the RI, but was not retained as a PCOC for the BAPR because it was only detected in one sample at a shallow depth of 1 ft bgs and appeared to be the result of the general application of pesticides rather than firing range impacts (Geosyntec, 2012a).

At the rain garden, in the western upslope area, zinc and three pesticides (4,4'-DDT, alpha-chlordane, and gamma-chlordane) were detected above special-status ecological PRGs in soil confirmation samples. As shown in Tables 3 and 4, the detected

concentrations of PCOCs do not exceed human health PRGs. Samples collected from the berm also contained constituents above PRGs. The berm material (represented by samples BAPSB315 through BAPSB318) was subsequently removed and disposed offsite.

Chlordane was not selected as a PCOC in the RI Summary Report because it was only detected in one of 21 soil samples. In the subsequent sampling of the rain garden, chlordane (alpha- and or gamma-) was detected in 3 of 14 samples. Due to these additional detections, chlordane was retained as a PCOC in this Draft RAW.

The extent of PCOC impacts in soil is laterally and vertically bounded and observed within the drainage area and western upslope area (Figures 3 through 9).

PCOCs are not likely to be present in groundwater based on the separation between the soil impacts and groundwater and the fate and transport of the PCOCs in the environment. As described above, the soil impacts are less than 5 ft bgs, with the majority of the exceedances occurring in samples collected at less than 1 ft bgs. Groundwater at the BAPR occurs at approximately 24 ft bgs (Section 3.3). The PCOCs identified for the BAPR are chemically and physically persistent in shallow soil and are not readily soluble under existing site conditions.

4.2 Conceptual Site Model

The Conceptual Site Model (CSM) has been prepared to describe the sources of PCOCs at the Site, the potential exposure pathways to PCOCs, and receptors that could potentially be exposed to PCOCs.

The former firing range activities do not appear to be the source of PCOCs in shallow soil and sediment at the BAPR. No spent ammunition, munitions debris, or other evidence of firing range activities was observed during the investigations.

The source of the PCOCs in shallow sediment within the drainage area is likely a result of runoff from LFE and/or accumulation of naturally occurring metals. The PCOCs antimony, copper, lead, selenium, zinc, TPH-d, chlordane, 4,4’-DDE, and 4,4’-DDT were detected above cleanup levels in the drainage area and were all COCs in soil at LFE (Geosyntec, 2011). LFE is not a continuing source of contaminants to the drainage

area at the BAPR because the site was remediated and closed with a soil cover in 2011 (Geosyntec, 2012b).

The source of the zinc in shallow soil in the western upslope area of the BAPR is unknown and most likely accumulation of naturally occurring metals, reflective of background conditions (see Section 4.3.1.1). The source of zinc in soil around Building 809, in the eastern upslope area, is not likely associated with former firing range activity but rather a result of the imported fill material that was placed in this area during construction of the building. Furthermore, although this area is mapped as ecological buffer zone, it contains landscaping and paved areas for the buildings and does not have significant ecological uses nor is it proposed for future enhancement as an ecological habitat.

The source of chlordane, 4,4'-DDE and 4,4'-DDT in the western upslope area is likely from the general application of pesticides (see Section 4.3.1.1).

The detections of selenium in shallow soil in the western upslope area are likely due to analytical interference. The samples with detected concentrations were all collected during the 2010 investigation and analyzed by EPA Method 6010, while those samples collected during the 2003 investigation and during the construction of the rain garden (located on the western side of the BAPR), were analyzed for selenium by EPA Method 6020 and had no detections above the laboratory reporting limits. Spectral interferences are often a main contributor to high biases in concentrations of selenium determined by EPA Method 6010 (Curtis & Tompkins, 2012).

In their current condition, the mobility of PCOCs in surface soil at the BAPR can be affected by several mechanisms including erosion caused by surface water runoff, infiltration of ponded surface water into the underlying soil, or soil disturbance caused by natural or man-made forces. Infiltration of rain or ponded water can carry dissolved phases of PCOCs from the surface soil to the underlying soil horizons and potentially groundwater. In the sediments deposited in the Western Tributary seasonal drainage, benthic organisms can disturb and redistribute sediments containing COCs through burrowing. Human activities such as earth moving activities can also redistribute the PCOCs in the soil at the BAPR. In the event of future construction, PCOCs can be released into the air by construction-generated fugitive dust.

The potential pathways of migration for PCOCs currently present in the near surface soil associated with the BAPR are:

- Air migration – emissions of airborne particulates containing PCOCs;
- Surface water migration – transport of dissolved PCOCs in surface water as surface water migrates across the affected soil;
- Sediment migration – transport of sediments containing PCOCs via surface water erosion; and
- Uptake of PCOCs by benthic organisms or plants rooted in the affected soil.

Potentially exposed populations include current and future residents in Buildings 808, 809, and 810, construction workers participating in cleanup and restoration activities, future recreational users of the area, and animal populations and vegetation that may be present at the Site. The Trust has established Presidio-wide cleanup levels for PCOCs at the BAPR to provide for the protection of potentially exposed populations.

With respect to human health, none of the PCOCs are present in soil at levels that are above human health cleanup levels for residential users. Therefore, the PCOCs in soil at the BAPR do not pose an exposure risk for current and future residents in Buildings 808, 809, and 810, construction workers participating in maintenance, cleanup, and restoration activities, or recreational users of the area. In the Tennessee Hollow drainage, it is not expected that the influences of any of the potential migration mechanisms (air, surface water or sediment erosion) would substantially mobilize the PCOCs under the current conditions.

It is not expected that residual munitions debris, if any, represent a significant continuing source of lead or zinc to the subsurface soil. There was no evidence of bullet or shell casing fragments observed in the BAPR during the 2003 and 2010 Site investigations. However, if some isolated occurrences of bullet or casing fragments exist, they would likely undergo a very slow and prolonged decomposition.

4.3 Risk Evaluation and Selection of Chemicals of Concern (COCs) in Soil

Based on the conceptual site model, the only potential exposure risk to PCOCs are for ecological species in the drainage area and western upslope area of the Site. Concentrations of PCOCs are below levels protective of human health.

Risks to ecological receptors were evaluated in this RAW for baseline conditions at the BAPR, which assumed no remediation of soil. To evaluate risk, the 95 percent upper confidence limit on the arithmetic mean (95 percent UCL) concentrations in soil using all data (including the data from the rain garden) collected in the western half of the Site (i.e., the drainage area and western upslope area) were estimated for each of the PCOCs (see Appendix B). The 95 percent UCLs were also calculated without the data from the rain garden to evaluate how the clustered data from this area would affect the 95 percent UCLs.

The 95 percent UCLs were calculated using data from the upper 3 feet of soil because this is the exposure interval for ecological receptors. No 95 percent UCL concentrations were calculated separately for data in the drainage area due to insufficient data.

The 95 percent UCL concentrations were compared with the cleanup levels for special status species and freshwater sediment (EKI, 2002). For metals, background concentrations for the Colma formation were used for screening if they were higher than the cleanup levels (EKI, 2002; AMEC, 2013). The calculations of the 95 percent UCL concentrations and comparisons with cleanup levels are included in Appendix B.

As presented in Appendix B, the inclusion of data from the rain garden increased the 95 percent UCLs for some PCOCs and decreased the 95 percent UCLs for others. Using either data set, the 95 percent UCL concentrations for the following four PCOCs in soil in the western half of the BAPR exceed their respective special status PRGs: antimony, selenium, zinc, and 4,4’-DDT. The following PCOCs have 95 percent UCL concentrations exceeding their respective freshwater sediment criteria: antimony, selenium, and TPH-d.

4.3.1.1 Evaluation of Background Metals and Ambient Pesticides

Zinc

The concentrations of zinc observed in soil of the western upslope area appear to be representative of background conditions. The former firing range activities are not the source of zinc as no spent ammunition, munitions debris, or other evidence of firing range activities was observed during the investigations. LFE is also likely not the source of zinc upslope of the drainage because runoff from LFE would not be deposited upslope; rather, LFE runoff would have collected in the low-lying drainage. The concentrations of zinc across the area range from 26 to 120 mg/kg and are close to the background level of 79 mg/kg for the Colma Formation. Furthermore, serpentine rubble and small cobbles are scattered over the area. The background threshold level for zinc in serpentine soil at the Presidio is 160 mg/kg (EKI, 2002). Because zinc concentrations are representative of Colma formation with scattered serpentine, zinc in soil of the western upslope area is likely naturally occurring.

In comparison, the concentrations of zinc within the BAPR drainage area are substantially higher (ranging from 42 to 350 mg/kg). Zinc was detected at a minimum of 150 mg/kg at every sample location within the drainage. The higher concentrations observed within the drainage area are most likely a result of runoff from LFE.

Selenium

Selenium is not a PCOC for firing range activities, and the detected selenium concentrations observed in soil in the drainage area and western upslope area appear to be due to analytical interference. The detected concentrations of selenium in these areas were collected during the 2010 investigation and analyzed by EPA Method 6010B. As shown in Figure 7, the lab reported low levels of selenium in these samples ranging from 1.6 to 4.0 mg/kg. However, for those samples collected during the 2003 investigation and during the construction of the rain garden (located in the western upslope area), selenium was analyzed by EPA Method 6020 and was not detected in any of the samples above laboratory reporting limits (which were below the current selenium background level of 0.5 mg/kg). Spectral interferences are often a main contributor to high biases in concentrations of selenium determined by EPA Method 6010 (Curtis & Tompkins, 2012). For this reason, selenium is not believed to be present at levels above background at the BAPR.

Pesticides

The pesticides 4,4-DDT, alpha-chlordane, and gamma-chlordane were detected above ecological special status PRGs in soil of the western upslope area. Based on the following lines of evidence, the pesticides observed in these samples are believed to be legally-applied pesticides.

Historical Army records indicate that pesticides were not spilled, discharged, or disposed of in the area. Pesticides were mixed, stored, and/or spilled at designated Presidio facilities: Buildings 269, 278, and 293 (in the Directorate of Engineering & Housing Study Area at Crissy Field), Building 609 (in the Commissary/PX at Crissy Field), and Building 1827 (in the Public Health Services Hospital (PHSH) district) (USACE, 1991; Earth Tech, 1995; USATHAMA, 1989). No such facilities were located in the vicinity of the BAPR. Also, the area is upslope from the LFE drainage and does not show evidence of LFE impacts.

Pesticides were applied for general grounds maintenance purposes at the Presidio (Earth Tech, 1995). Following cessation of firing range activities by 1934, the Army planted eucalyptus and other trees in the area. The area remains as open space, densely vegetated with trees and shrubs. No other prior land uses are known in the area.

Low-level concentrations of the pesticides were detected in surficial soil samples throughout the area, indicating a pattern of general application. The pesticide concentrations are above special status ecological PRGs, but well below buffer zone and human health residential PRGs. In boring samples, pesticides were detected in surface samples but were not detected in underlying samples. The application of pesticides to a site would result in low-level concentrations detected in surficial samples over a large area.

CERCLA, 42 U.S.C. § 9607(i), excludes "application" of pesticides registered under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) from the scope of a CERCLA release. If pesticides are applied in their intended use (e.g., not spilled, leaked, discharged, disposed of, etc.), then they are not a "release" under CERCLA. Therefore, the pesticides detected in soil upslope of the LFE drainage are not included in the remedial action area for this RAW.

In contrast, LFE is a known source of pesticides to the low-lying drainage through the BAPR. The detections in the drainage area samples are generally co-located with

detections of other PCOCs above screening levels. Therefore, 4,4'-DDT, 4,4'-DDE, and chlordane concentrations in the drainage area above area-wide levels are likely related to LFE runoff.

4.3.1.2 Chemicals of Concern

Based on a comparison of 95 percent UCL concentrations to cleanup levels and evaluation of background/ambient levels, antimony, zinc 4,4'-DDT, and TPH-d in soil pose a potential risk to ecological receptors within the drainage area at the BAPR. Concentrations of these chemicals are higher in this area as compared to those observed upslope of the drainage, which appear to be representative of background or from the application of pesticides. Therefore, antimony, zinc, 4,4'-DDT, and TPH-d are identified as COCs in soil in the BAPR drainage area.

Selenium is not a COC because the detected concentrations in soil at the BAPR appear to be due to analytical interference as discussed above. Although not considered a COC, selenium will be included in the confirmation sampling and analyzed by EPA Method 6020 to confirm that no elevated concentrations are present at unacceptable levels after the removal action.

The remaining PCOCs, copper, lead, 4,4'-DDE, and chlordane had 95 percent UCL concentrations below PRGs (for both data sets) indicating that these chemicals do not pose a risk to ecological receptors within the western half of the BAPR (Appendix B). However, a 95 percent UCL for only data collected in the drainage area could not be calculated due to insufficient data. These four chemicals were detected at higher concentrations in the drainage area than the surrounding area. Therefore, these four chemicals may pose a risk to ecological receptors and are selected as COCs in soil in the BAPR drainage area.

In summary, the following chemicals are COCs in the BAPR drainage area: antimony, copper, lead, zinc, TPH-d, chlordane, 4,4-'DDE, and 4,4'-DDT.

4.4 Remedial Action Area

Based on the risk evaluation, the remedial action area at the BAPR was delineated as the drainage area of the BAPR containing concentrations of COCs in soil that pose an unacceptable risk to the BAPR ecosystem and are not associated with background

concentrations. As shown in Figure 10, the remedial action area at the BAPR covers approximately 20,900 square feet (ft^2) or 0.5 acre to depths ranging from 0.5 to 1.5 ft bgs. The anticipated volume of soil in the remedial action area is 1,305 cubic yards.

Following remediation of soil in the remedial action area, COC concentrations in soil are not expected to pose an unacceptable risk to ecological receptors. In Appendix B, post-remediation 95 percent UCL concentrations for the PCOCs were calculated using the existing data set and assuming removal of soil from the remedial action area. As shown in Appendix B, the post-remediation 95 percent UCL concentrations of the COCs antimony, copper, lead, TPH-d and 4,4'-DDE would be reduced to acceptable levels as the concentrations remaining are below cleanup levels. For 4,4'-DDT, post-remediation concentrations would be reduced to concentrations that are consistent with ambient levels in the area.

For zinc, following removal of soil from the Remedial Action Area, the post-remediation 95 percent UCL for zinc in soil is estimated to range from 83 to 89 mg/kg which only slightly exceeds the background upper tolerance limit of 79 mg/kg. Zinc detections of 120 mg/kg at BAPSB207 (at 3 feet) and 180 mg/kg at BAPSB213 (at 4.5 feet) would not be removed from the Remedial Action Area. These samples were collected at the edge of a redwood tree protection zone (see Figure 11). The redwood tree protection zone was established by the Trust's Forester to protect healthy redwoods. Digging to depths of 3 to 4.5 feet at these locations would require removal of redwood trees. Removal of the redwood trees to remove zinc levels that are marginally above background levels for the protection of ecological species and the environment is not warranted. It is noted that the expected post-remediation levels of zinc (83 to 89 mg/kg) are only slightly above the background upper tolerance limit of 79 mg/kg, and are below the residential human health cleanup level of 22,000 mg/kg and the freshwater sediment cleanup level of 230 mg/kg.

The post-remediation 95 percent UCL concentrations for the other PCOCs are also below cleanup levels protective of ecological receptors or are within background. Post-remediation confirmation sampling following soil removal in the remedial action area would confirm that COC concentrations have been reduced to acceptable risk levels.

5. DEVELOPMENT OF REMOVAL ACTION OBJECTIVES

CERCLA requires that remedial measures be protective of human health and the environment. CERCLA guidance states that remedial action objectives (RAOs) should include criteria for COC concentration levels and exposure routes. RAOs have been developed for the BAPR based on the Trust's intended land use plans. The following sections summarize the planned land use and cleanup objectives for BAPR, and present the RAOs.

5.1 Planned Land Use for BAPR

The PTMP and the THEA identify future land use of the BAPR as a public open space. Multi-family residential housing exists in the eastern half of the BAPR. The Trust intends that these housing facilities be maintained into the foreseeable future.

The eastern half of the BAPR including the area surrounding Buildings 808, 809, and 810 is designated in the VMP as an open space vegetation (Trust and NPS, 2001) and mapped as an ecological buffer zone in the Cleanup Level Document (EKI, 2002). The western half of the Site is mapped as a special status species zone (EKI, 2002) because it is planned for future a mixture of forest and native plant restoration (Trust and NPS, 2001). Currently, the site contains non-native, low-lying vegetation. In October 2012, 16 trees planned for removal under the VMP were removed from the area. Figure 11 identifies remaining trees within the tree protection zones. The Tennessee Hollow drainage is designated as a freshwater ecological protection zone (RWQCB, 2003).

5.2 Applicable or Relevant and Appropriate Requirements

In accordance with Section 121(d)(1) of CERCLA (42 USC Section 9621[d]), remedial actions performed under CERCLA must achieve a level of cleanup and control of hazardous substances, pollutants, or contaminants that assures protection of human health and the environment. Additionally, remedial actions that propose to leave hazardous substances onsite must meet the substantive requirements of federal environmental laws or more stringent state environmental and facility siting laws, referred to as applicable or relevant and appropriate requirements (ARARs).

ARARs fall into three general categories: chemical-specific, action-specific, and location-specific, as follows:

- Chemical-specific ARARs are health-based or risk-based concentration limits that are established for a specific chemical in a specific medium (typically groundwater, soil, surface water, or air). Chemical-specific ARARs represent the acceptable amount of concentration of a chemical that may be found in, or discharged to, the ambient environment. These criteria have been developed to protect potential receptors from adverse health effects from hazardous substances.
- Action-specific ARARs are activity- or technology-based requirements that establish how to perform a specific action. These ARARs either restrict or direct specific types of remedial or waste management activities.
- Location-specific ARARs are requirements that either restrict or direct certain activities, based solely on their location.

Chemical-specific ARARs are the primary criteria used to establish cleanup levels, while action- and location-specific ARARs are used to identify and evaluate remedial action alternatives.

ARARs can be further categorized as either federal or state ARARs. State regulations are ARARs only if they are more stringent than federal requirements. In addition to promulgated laws and regulations, federal, state, and local agencies develop various guidance documents, criteria, and advisories (TBCs) that can provide useful information or procedures. There may also be local permitting requirements and ordinances that need to be complied with in performing remedial actions.

ARARs and TBCs for the BAPR are presented in Table 5.

5.3 Removal Action Objectives

Considering the current and planned future land use and the Presidio-Wide Cleanup Levels Document the RAOs for the BAPR are:

- **Protection of human health and the environment consistent with the intended future land use:** As required by CERCLA, the remedial alternatives

considered must be protective of human health and the environment. Protection of human health and the environment can be met in several ways, including cleanup of COCs to meet the applicable BAPR cleanup levels or using land use and engineering controls to prevent exposure to COCs.

- **Protection of water quality and ecological resources.**
- **Preference for permanent ("clean closure") remedies whenever practicable, cost-effective, and consistent with planned land use.**

5.4 Cleanup Levels

The cleanup levels applicable to the BAPR are based on criteria protective of the following for the current and future uses of the BAPR:

- Protection of human health (recreational and residential): Buildings 808, 809, and 810 on the eastern half of the site are residential apartments. The western half of the site is a heavily vegetated open space area with limited access or exposure to humans, except for an occasional recreational user or children from the nearby housing. Residential cleanup levels are applied for the BAPR.
- Protection of ecological receptors (buffer zone and special status): The eastern half of the Site including the area surrounding Buildings 808, 809, and 810 is designated in the VMP as an open space vegetation (Trust and NPS, 2001) and mapped as an ecological buffer zone in the Cleanup Level Document (EKI, 2002). The western half of the Site is mapped as a special status species zone (EKI, 2002) because it is planned for a mixture of forest and future native plant restoration (Trust and NPS, 2001). Currently, the site contains non-native, low-lying vegetation and trees. As designated in the VMP and mapped in the Cleanup Level Document, the approximate boundary between the ecological buffer and special status zones is illustrated on Figure 2.
- Protection of freshwater sediment receptors: The Tennessee Hollow drainage is designated as a freshwater ecological protection zone (RWQCB, 2003). Freshwater sediment criteria only apply within the drainage area.
- Protection of groundwater: Cleanup levels for groundwater protection at the Presidio have been established for petroleum compounds by the RWQCB and incorporated into the Cleanup Level Document (EKI, 2002). As discussed in Section 2.4, groundwater beneath the BAPR occurs at approximately 24 ft bgs.

Based on the approximate depth to groundwater, groundwater protection (greater than 5 feet above groundwater) criteria apply for petroleum compounds in soil and sediment.

Table 6 presents applicable cleanup levels for the PCOCs in soil and sediment at the BAPR. Except for metals, the most conservative cleanup level was selected as the site-specific cleanup level for a specific chemical based on potential endpoints (e.g., protection of human health, ecological receptors). For each metal, if the background threshold level (or upper tolerance limit) for Colma Formation was higher than the most stringent human health or ecological cleanup level, then the background threshold value is shown as the site-specific cleanup level.

6. REMOVAL ACTION ALTERNATIVE EVALUATION

6.1 Description of Removal Action Alternatives

The following removal action alternatives were developed for the BAPR to achieve the RAOs:

- Alternative 1: No Further Action.
- Alternative 2: Containment.
- Alternative 3: Excavation and Disposal.

6.1.1 Alternative 1 – No Further Action

The No Further Action alternative provides a baseline for comparing other alternatives, which is consistent with the National Oil and Hazardous Substances Pollution Prevention Contingency Plan (NCP). Because no remedial activities would be conducted under this alternative, the long-term health and environmental risks would be the same as those currently identified for the BAPR.

6.1.2 Alternative 2 – Containment

This alternative consists of importing and placing clean soil material over the existing soil and sediment within the drainage area where COCs exceed applicable ecological and sediment cleanup levels. The placement of clean material over the impacted soil would isolate the area and prevent exposure of ecological receptors to COCs in soil. Clean material would be placed over an area of approximately 20,900 square feet (ft^2) or 0.5 acre within the drainage area of the Site. To provide long-term effectiveness, the soil cover would need to be maintained and intrusive activities would need to be restricted by specific institutional controls. It is anticipated that this alternative would take approximately four weeks to complete followed by long-term maintenance.

6.1.3 Alternative 3 – Excavation and Disposal

This alternative consists of the excavation, characterization, transportation, and disposal of shallow soil within the drainage area where COCs exceed applicable ecological and sediment cleanup levels. As shown in Figure 10, the area that would require excavation is approximately 20,900 ft^2 or 0.5 acre. Given the shallow nature of the impacts, the excavation would be conducted at depths ranging from approximately 0.5 to 1.5 ft bgs. In total, up to approximately 1,960 tons (1,305 cubic yards) of potentially impacted soil would be excavated from the area. For cost estimation purposes, it is assumed that all of the excavated soil would be land-filled at a Class II disposal facility. Confirmation sampling of the excavation bottom and sidewalls would be conducted to verify cleanup levels are met. Areas within tree protection zones would not be excavated deeper than 1.5 ft bgs to protect trees that are planned to be preserved. Following excavation, the area would be backfilled and vegetation at the surface would be restored, if necessary. It is anticipated that this alternative could be completed in four weeks.

6.2 Removal Action Alternative Evaluation Criteria

The goal of the remedial selection process under CERCLA is to develop and select removal action alternatives that protect human health and the environment, maintain protection over time, and minimize untreated waste (USEPA 40 CFR 300.430(a)(1)(I)).

Screening of removal action alternatives consisted of evaluating each alternative according to three criteria and assigning a relative ranking to each alternative based on the evaluation. The three criteria consist of the following:

Effectiveness: Effectiveness is the degree to which an alternative meets the RAOs. More specifically, the alternative's effectiveness at providing long-term and short-term protection of human health and the environment, minimizing residual risk, providing adequate and reliable controls for long-term management, complying with ARARs, and achieving protection of human health and the environment in the most efficient manner possible.

Implementability: Implementability is the technical, practical, and administrative feasibility of applying an alternative. For example, alternatives that require equipment, specialists, or facilities that are unavailable may not be implementable and would be eliminated from further consideration.

Cost: Costs of construction, long-term monitoring, and maintenance are considered. Costs are assigned based on a conceptual level of design and assumptions for unknown conditions are applied consistently among all alternatives. A component of the cost evaluation is to ascertain the level of effectiveness and implementability for the cost expended. Alternatives providing equal or less effectiveness and implementability for a greater cost than another alternative that provides equal or greater effectiveness may be eliminated from further consideration.

6.3 Analysis of Removal Action Alternatives

6.3.1 Alternative 1 – No Further Action

No remediation measures would occur under this alternative. The No Action alternative would not comply with ARARs or achieve the RAOs. This alternative would not be protective of ecological receptors in the long-term. This alternative can be implemented easily, and costs are negligible because no further activities are performed.

6.3.2 Alternative 2 – Containment

This removal action alternative would be effective in preventing ecological exposure to COCs in surface soil; however it would not result in a reduction of the toxicity or volume of COCs present at the Site and it would require ongoing inspection and maintenance to remain effective. The alternative could be designed to meet ARARs. This alternative would be fairly easy to implement, but would require long-term maintenance. The estimated cost of this alternative is $451,900 (Appendix C).

6.3.3 Alternative 3 – Excavation and Disposal

This alternative is protective of the environment because the COCs above the ecological and sediment cleanup levels are removed from the site. It would comply with ARARs and achieve the RAOs in a reasonable timeframe. This alternative is effective at providing long-term and short-term protection of human health and the environment in the most efficient manner possible and is consistent with the proposed future land use (i.e., maintaining the drainage area and planned future native plant restoration). The estimated cost of this alternative is $449,400 (Appendix C).

6.4 Comparative Analysis of Removal Action Alternatives

The comparative analysis of the removal action alternatives is shown in Table 7. In comparing the three alternatives, Alternative 1 does not comply with the ARARs and would not meet the RAOs. Alternative 2 could be designed to meet ARARs and RAOs. Alternative 3 would comply with all of the ARARs and achieves the RAOs in a reasonable timeframe.

Alternative 1 would not be protective of ecological receptors in the long-term. Alternatives 2 and 3 would be protective of ecological receptors, but Alternative 2 would also require long-term maintenance to be protective in the long-term.

Alternative 1 is easily implementable as no removal actions would take place. Alternatives 2 and 3 are fairly easy to implement, but Alternative 2 requires long-term maintenance.

There is no cost associated with Alternative 1 as no removal actions will be implemented. Alternative 3 is more cost-effective as compared to Alternative 2 because it provides for more permanent removal of COCs for a lower cost and does not require long-term maintenance or restrictions.

6.5 Recommended Removal Action Alternative

Based on the comparative analysis of the removal action alternatives and the intended land use for the BAPR, Alternative 3 – Excavation and Disposal, is the selected removal action alternative for the Site. This alternative was selected for the Site because it is the most cost-effective and protective remedy for the site. This alternative addresses the objectives of the evaluation criteria most completely and achieves the RAOs for the Site in a reasonable timeframe.

7. IMPLEMENTATION PLAN

The Trust will implement the selected removal action of excavation and disposal in accordance with applicable local, state, and federal regulations, as well as specific regulations and/or operating procedures established for work within the Presidio. The Trust will select a Prime Contractor to implement the removal action. The pre-excavation, excavation, and post-excavation activities associated with the selected alternative are described below.

7.1 Pre-Excavation Activities

Pre-excavation activities include protection of natural and cultural resources, obtaining approvals and permits for performing the work, providing public outreach prior to the start of the excavation, and taking measures to reroute traffic (vehicular and pedestrian) before and during excavation.

7.1.1 Regulatory Approvals

The Trust will receive necessary approvals from DTSC, the state lead regulatory agency for the removal action at the BAPR. Field activities described in this RAW will not commence until a Final RAW is prepared and approved by DTSC.

Prior to the start of construction, the Trust will:

- Notify DTSC two (2) weeks prior to commencing with excavation activities.
- Hold a project kickoff meeting attended by the Trust and other stakeholders to coordinate site activities.
- Obtain a Trust Excavation Permit.
- If necessary, obtain approval from the Trust Utility Department for a power drop for any work requiring utilities.
- Review the Prime Contractor's Health and Safety Plan.
- Provide a schedule that shows coordination with the other potentially concurrent construction activities in the vicinity of the Site.

- Notify nearby tenants and neighbors of the commencement of project activities, roadway detours, hours of operation, and expected length of time that the project will take.

Any conditions, restrictions, and/or requirements imposed by the above activities will be incorporated by addendum into the scope of remedial activities described in this RAW.

7.1.2 Construction Oversight

Following is the organization and reporting of personnel within each of the principal groups performing field implementation activities.

- DTSC – George Chow of DTSC will serve as the primary point of contact for the lead regulatory agency, DTSC, during remedial activities.

- Trust – Genevieve Coyle of the Trust will serve as the Owner's representative and will directly contract with the Prime Contractor. She will regularly communicate the status of the project to DTSC and other stakeholders.

- EKI - John DeWitt, EKI will serve as the Construction Manager and will directly oversee the Prime Contractor's work. EKI will report to the Trust.

- Geosyntec – Geosyntec will represent the Trust as their design engineer and address issues related to the plans and technical specifications included in the Remedial Design Documents. Geosyntec will also conduct soil confirmation sampling services during excavation.

7.2 Protection of Cultural Resources

The treatment of archaeological resources will be handled pursuant to the *Archeological Management Assessment, BAPR Remediation* (Presidio Archeology Lab, 2012; Appendix D). A small portion of the proposed remediation area is within the predicted extent of *El Presidio de San Francisco,* a contributing archaeological area of the Presidio National Historic Landmark District. The planned excavation is shallow and will be completed largely by hand and with small mechanical equipment. The potential to encounter significant historical archaeological materials during project activities is, therefore, considered very low. However, because the area is within the predicted

extents of *El Presidio de San Francisco*, the monitoring and inadvertent discovery requirements specified in the Archeological Management Assessment will be followed.

7.3 Protection of Natural Resources

There are no known special-status biological resources at the Site. Following are specific natural resource issues identified at the Site and project controls to be followed during implementation of the remedial action.

- Migratory Birds – Natural resources include migratory birds that may be present at the Site. The bird nesting period for the area typically occurs between March 1 and July 31 for songbirds, and January 1 to July 31 for raptors and hummingbirds. Vegetation will be scheduled to occur outside of bird nesting season. However, vegetation removal may occur during bird nesting season provided a nesting survey indicates no disruption to nesting birds (including ground nesting birds) and approval is obtained from Trust natural resource staff.
- Native Plant Habitat – Following remedial actions, areas impacted by project activities will be restored in accordance with the VMP and under the direction of a Trust natural resource specialist. No or minimal tree removal is expected as part of the removal action.
- Other Vegetative Resources – Prior to excavation activities, existing ground vegetation within the limits of work will be cleared and off hauled from the site as green waste. Removal of vegetation will be coordinated with the Trust forestry and natural resource staff to avoid impacts to existing trees and vegetation, as practicable.

A seasonal drainage swale, identified as Lower Landfill E, was previously in the footprint of the BAPR. The swale was identified as having U.S. Fish and Wildlife Service wetland habitat (NPS and URS, 2003). This swale was largely disturbed during the Landfill E remediation in 2011. As required by the Landfill E Feasibility Study/Remedial Action Plan, the drainage swale will be reestablished and enhanced at the conclusion of the BAPR remediation activities (Geosyntec, 2011).

7.4 Health and Safety

The Trust will require the Prime Contractor, through Specifications included in the Contract Documents for BAPR, to develop and implement health and safety protocols that at a minimum, conform to the general requirements of Occupational Safety and Health Administration (OSHA) standards for hazardous waste operations (29 CFR 1910.120). The Prime Contractor must take responsibility for all job-site safety issues as required by the general industry safety orders and all laws and regulations.

The Prime Contractor will be required to submit for the Trust's review prior to the start of excavation activities a project-specific Health and Safety Plan (HASP) for implementation of the removal action at BAPR. Actual, potential, or anticipated hazards to be addressed in the HASP include, but are not limited to: a) hazardous substances; b) excavations, c) heat/cold stress, d) munitions and explosives of concern (MEC) and chemical warfare agents, e) respiratory hazards, and f) hearing conservation.

It is anticipated that the Prime Contractor's HASP will include the following at a minimum:

- The name and contact information of individual(s) who has been designated as the Prime Contractor's Project Manager and Project Health and Safety Representative.
- Requirements for workers who have current 40-hour OSHA 1910.120 training.
- Site controls to be implemented during excavation activities to prevent the public from entering the work area.
- Identification of potential physical and chemical hazards.
- Requirements for personal protective equipment (PPE).
- An emergency action plan in the event of an accident, or serious unplanned event (e.g. fire, structure collapse, etc.) that requires notifying any response agencies (e.g.: fire departments, PG&E, rescue teams, etc.), including emergency telephone numbers and hospital routes.

The Prime Contractor's HASP will reflect a commitment to exercise extreme care when handling or disposing of materials or substances that are identified as hazardous substances.

A copy of the Prime Contractor's HASP will be available within the work area at all times and will apply to all personnel working at, or visiting the work area including, but not limited to, Prime Contractor's employees, suppliers, vendors, truckers, and the Trust's representatives. The Prime Contractor's Project Health and Safety Representative will verify that site workers and visitors are in compliance with applicable health and safety requirements, and take action to ensure compliance where deficiencies are identified.

7.4.1 Munitions and Explosives of Concern (MEC) On-Call Support

Based on U.S. Army Corps of Engineers (USACE) protocols, on-call MEC support is required. Unexploded ordnance (UXO) monitors will be on-call during all ground disturbance activities, including fence erection and site grading, to safely handle and manage MEC that may be encountered.

If potential MEC is discovered, excavation activities will cease, the object will be isolated from onsite personnel, and the Trust Remediation Manager will be notified. The object will not be handled or moved until assessed by the UXO-qualified personnel. The Remediation Manager, in coordination with the Trust’s Safety Officer, will then coordinate a response with Presidio staff, US Park Police (Park Dispatch), and the USACE. The USACE is responsible for MEC response at the Presidio. In some instances, the USACE will not be able to respond in a timely manner, in which case Park Dispatch may call the local police or sheriff bomb squads.

7.5 Erosion Control Protection

The project must substantially comply with the State Water Resources Control Board General Permit to Discharge Stormwater Associated with Construction Activity (SWRCB Order No. 2009-0009-DWQ) requirements, but does not require a Notice of Intent because the remedial action falls under CERCLA on Federal land and the area of disturbance is estimated to be less than one acre. The contractor will be required to implement the practices in accordance with the Stormwater Pollution Prevention Plan (SWPPP) in Appendix D.

7.6 Temporary Facilities and Surveying

Prior to the start of excavation activities, the Prime Contractor will establish and maintain temporary facilities and controls at the Site as follows:

- Establish temporary parking, truck, and equipment staging areas at the locations indicated by the Trust.
- Mobilize temporary facilities, including sanitary facilities for workers.
- Install perimeter fencing around the project work area.
- Establish survey control points.

Details of these activities are summarized below.

7.6.1 Temporary Facilities

The Prime Contractor will mobilize temporary sanitary facilities for their employees and will arrange for sanitary waste to be removed and disposed at an offsite facility in accordance with applicable laws and regulations.

7.6.2 Perimeter Fencing

The Prime Contractor will install a temporary perimeter fence around the project work area prior to the start of excavation. On-call MEC services are required for this task (see Section 7.4.1).

7.6.3 Truck and Heavy Equipment Staging Area

The Prime Contractor will use an area designated by the Trust for truck and equipment staging. To reduce noise impacts from site work, equipment will be placed away from adjacent residential areas on the eastern portion of the BAPR. The staging area for equipment will be at the south end of Barnard Ave.

7.6.4 Stockpile Staging Area

The Prime Contractor will prepare and maintain staging facilities for stockpiling of excavated soil and fill material, as necessary. Clean fill material may be temporarily

stored in unlined stockpiles within the BAPR. When material is not being placed, the Prime Contractor will cover the stockpiles with a weighted plastic cover. To prevent contact of rain water with the stockpiled soil, stockpiling activities will not take place on rainy days or immediately prior to predicted precipitation. The staging area for remedial activities will be at the south end of Barnard Ave.

7.6.5 Establishment of Survey Control Points

The Prime Contractor will subcontract with a licensed land surveyor to establish a field grid system to help locate key features at the Site. The grid system will be used to locate soil samples, excavation and fill limits, and other pertinent Site features. Upon completion of the work, the Prime Contractor will contract with a licensed land surveyor who will survey the final horizontal locations and elevations of Site improvements and final graded topography.

The licensed surveyor will be a State of California Licensed Land Surveyor. Locations will be surveyed within 0.5 foot relative to the North American Datum of 1927 (NAD27), California State Plane Coordinate System, Zone 3. Elevations will be surveyed to within 0.1 foot relative to 1907 Presidio Lower Low Water (PLLW) datum and relative to the 1988 North American Vertical Datum (NAVD88). The Prime Contractor will provide the surveying results to the Trust.

7.7 Excavation Activities

7.7.1 Excavation Methodology

The area of the proposed excavation is shown in Figure 10. The excavation area is based on observed concentrations of COCs above ecological and sediment cleanup levels in the remedial action area. The proposed excavation covers an area of approximately 20,900 square feet or 0.5 acre. The depth of the excavation is primarily surficial, ranging in depth from 0.5 to 1.5 feet throughout the drainage.

Because there are a number of trees within the proposed excavation area that are to be preserved, excavation of impacted soil will be completed using various removal methods. These methods could include using small backhoes, vac-truck, hand digging, or other appropriate means. The methods to be used will be provided by the Prime Contractor in the bid documents.

Excavated material will either be stockpiled in a designated area or directly loaded onto trucks for disposal at an appropriate facility. The contractor will be required to remove excavated soil in accordance with the Transportation Plan included in Appendix D

During excavation activities dust control will be conducted as described in Section 7.6.2. Once the planned extent of excavation has been reached, confirmation soil samples will be collected in accordance with the sampling plan described in Section 7.6.3. Once the confirmation soil sampling demonstrates that the Site no longer poses an ecological risk, the excavated area will be backfilled to desired grades, as described in Section 7.2.4.

7.7.2 Dust Control

Excavation activities at the Site may result in the generation of dust in the form of particulate matter (PM). To mitigate the potential fugitive emissions of PM and maintain acceptable concentrations of PM in air at the perimeter of the Site during excavation activities, dust control practices are required. The Prime Contractor will be required to implement the practices in accordance with the *Dust Control Plan* included in Appendix D. The objective of the *Dust Control Plan* is to minimize the occurrence of visual dust at and downwind of the construction site. The *Dust Control Plan* identifies specific procedures to be used during implementation of the remedial activities to reduce impacts due to dust.

7.7.3 Noise Control

Noise generated by remediation activities will be intermittent, dispersed, and limited to the duration of construction. Noise impacts will be generally limited to nearby sensitive receptors (residents), intermittent users, such as trail hikers, and other transitory visitors during daylight hours. Trucks traveling along Barnard Ave. could result in indoor sound levels of up to approximately 60 dBA. Construction activities could result in indoor sound levels of up to approximately 70 dBA. During construction, contractors and other equipment operators will comply with the San Francisco noise ordinance, which requires that each piece of powered equipment, other than impact tools, emit noise levels no higher than 80 dBA measured at 100 feet from the equipment during daytime hours (7 a.m. to 8 p.m.). Control measures will be implemented to manage construction noise, as necessary. Control measures will include, but not be limited to, proper maintenance and tuning of equipment, placement of noisy equipment away from

sensitive receptors as practicable, noise-control mufflers, and scheduling noisier operations during periods of low visitor use, to the extent feasible.

7.7.4 Soil Confirmation Sampling and Analysis Plan

Based on the results of the remedial investigation sampling, which indicates that contamination above cleanup levels is limited to shallow soil, it is expected that following excavation of the drainage area to the depths shown in Figure 10, COC concentrations in soil will be below cleanup levels. To confirm, soil confirmation samples will be collected from the excavation as follows:

- Bottom samples will be collected on 50-by 50-foot sampling grid across the bottom of the excavation.
- One sidewall sample per each 50-foot lateral distance around the perimeter.

Soil samples will be collected using a stainless steel trowel and glass jars. Sealed and capped jars will be labeled, packaged, and shipped under chain of custody protocol as specified in the Presidio's Quality Assurance Project Plan/Sampling and Analysis Plan (QAPP/SAP; Tetra Tech, 2001). Samples will be analyzed for:

- Antimony, copper, lead, selenium, and zinc by EPA Method 6020B,
- TPH as diesel by EPA Method 8015 with silica gel cleanup, and
- Chlordane, 4,4’-DDE and 4,4’-DDT by EPA Method 8081A.

These contaminants were also COCs in soil for LFE. Although PAHs were COCs for LFE they will not be analyzed during the confirmation sampling because they were not detected above cleanup levels in 21 samples collected from the BAPR and as such were not retained as PCOCs. Although not a COC for the BAPR, selenium will be included in the confirmation sampling to confirm that no elevated concentrations are present at unacceptable levels after the removal action.

The samples will be analyzed at a State of California-certified offsite analytical laboratory. Target reporting limits will be set at or below cleanup levels, to the extent possible.

Results of confirmation soil analyses will be compared to the BAPR cleanup levels in Table 6 to assess whether additional excavation should be conducted. If the concentrations of all contaminants analyzed are below cleanup levels, then excavation activities will be terminated. For confirmation samples containing one or more contaminants at concentrations exceeding cleanup levels, the confirmation sample results for the constituent exceeding the cleanup level will be evaluated using a 95 percent UCL of the mean and the 95 percent UCL compared to the cleanup level to assess whether the contaminant poses residual risk. Concentrations of metals and pesticides that appear to represent background in naturally occurring soil or ambient levels, respectively, will be evaluated using existing site data and background/ambient data to assess whether the metal and pesticide concentrations are representative of background or ambient conditions, respectively.

Outside of tree protection zones, if the contaminant concentration poses residual risk and the concentration is not associated with background or ambient levels, soil will be further excavated and the newly excavated area will be re-sampled and analyzed for the contaminant that triggered the additional excavation. Within tree protection zones, over-excavation will not proceed deeper than 1.5 ft bgs to protect trees that are planned to be preserved (Figure 11). Confirmation soil samples will be collected within tree protection zones only to document residual soil concentrations.

The excavation is expected to be limited to the drainage area of the Site. In the eastern upslope area, sample concentrations have already demonstrated that contaminants do not pose a risk to ecological species and nearby residents. The western upslope area is populated with a dense tree protection zone (Figure 11). If concentrations of COCs or selenium are found in sidewall samples upslope to the west of the drainage area that may pose a risk to ecological species, the excavation may not proceed westward into the dense forest. As a contingency, the Trust may adopt a Land Use Notification (LUN) for this area to notify land managers of the presence of low-levels of contaminants that remain in soil in the area. The Trust will consult with DTSC regarding confirmation sample results, potential additional excavation, and the LUN contingency.

7.7.5 Excavation Backfill

The excavated area will be backfilled to the desired grade with clean fill or with borrow material from a source identified by the Trust. The potential backfill material will meet the following minimum requirements prior to use as backfill:

- Potential fill material will be sampled and analyzed at each source at a frequency and analytical suite consistent with DTSC guidance (DTSC, 2001).
- The concentration of chemical constituents in potential fill material will be compared to site-specific cleanup and background levels identified in this RAW to protect human health and the environment.
- Potential fill material will be compatible with site-specific restoration plans.

7.7.6 Decontamination

The decontamination process will involve the removal of contaminants such as accumulated soil, dust, and other contamination from equipment, vehicles and personnel, while these items are physically located in the decontamination station. The proper onsite management and offsite disposal of decontamination wastes, such as wash water and contaminated protective equipment used by onsite personnel, will be required.

The Prime Contractor will be required to implement a decontamination process in accordance with the Decontamination Plan included in Appendix D. The Decontamination Plan describes specific procedures to be used during implementation of the soil removal activities to reduce the soil tracking offsite.

7.7.7 Contingency Plan

A contingency plan will be implemented during soil excavation if unanticipated hazardous materials or hazardous material sources are encountered. Possible hazardous material sources include underground storage tanks (USTs) and associated product lines, sumps and/or vaults, landfill material, construction debris, and soils exhibiting potential hazardous characteristics such as chemical odors or discoloration. If any of these hazardous conditions are encountered, the Trust will notify DTSC. If USTs or other petroleum releases are encountered, the Trust will implement UST removal, excavation, confirmation sampling, and sampling and disposal of stockpiled soil in accordance with the Trust's Petroleum Contingency Plan (EKI, 2004). Hazardous materials, if any, will be removed and disposed of at licensed disposal facility under the supervision of the Trust's environmental remediation staff.

7.8 Post-Excavation Activities

Post-excavation activities include the tasks required to finalize the removal action and restore the Site to stable conditions. These activities include the contractor's demobilization of construction equipment, facilities, and site controls, and restoration of vegetation.

7.8.1 Demobilization

The Contractor will demobilize from the Site in the following sequence of operations:

- Clean the project limits and potentially impacted areas beyond the project limits of debris that may have been left behind or deposited during the excavation activities.
- Remove temporary gates, fences, and barricades.
- Remove trail closure signs.
- Remove temporary facilities, including decontamination pads, parking areas, etc.
- Repair roadways or objects damaged by remediation activities, if necessary.

Prior to the Contractor's demobilization activities, the Trust will perform a final walk through of the Site with DTSC and the Contractor. A punch list of remaining activities will be prepared for the Contractor to implement during the demobilization phase of the project.

7.9 Project Documentation

During implementation of the removal action, project documentation including daily site logs and photographs will be collected and maintained as described below.

7.9.1 Daily Site Log

During the removal action, a log of field activities will be completed each day. The daily reports will include the following information:

- The date, project name, location, and other identification information.

- A summary of weather conditions.
- List of onsite equipment and personnel.
- A summary of meetings held onsite with a listing of attendees.
- A description of activities performed, atypical events or findings.

7.9.2 Photographic Documentation

Photographs of the removal action will be collected to document field observations, implementation issues or deficiencies, and work in progress. Documentation will include:

- Pre-excavation photographs.
- Site security features.
- Natural resource, cultural resource, and water quality protection measures.
- Earthwork activities.
- Stockpiling and truck loading operations.
- Any unforeseen conditions observed.

Representative photographs will be included as an appendix to the Removal Action Completion Report.

8. REMOVAL ACTION COMPLETION REPORT

The Removal Action Completion Report will be certified by a California Registered Professional Engineer (PE). The report will summarize and present data collected during the removal action, including:

- Detailed summary of the remedial action completed.
- Tabulated confirmation soil sample analytical data.
- Copies of any laboratory analytical reports and chain-of-custody records.
- Summary tables of any waste manifests and supporting waste disposal information.
- Photographic documentation of the field work.

A draft of the report will be provided to the Trust and DTSC for review and comment, followed by final submittal, signed and stamped by a Professional Engineer.

9. SCHEDULE

The remedial actions described in Section 7 are scheduled to commence in early 2013 and will last approximately four weeks. The project schedule, including contractor mobilization and field work, is included as Figure 12. The Removal Action Completion Report will be submitted to DTSC within six weeks of completion of all remedial activities.

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TABLES

Table 1
Analytical Results - Metals
Draft Removal Action Work Plan
Barnard Avenue Protected Range
Presidio of San Francisco, California

		Aluminum[3]	Antimony	Arsenic	Barium	Beryllium	Cadmium by ICP/MS	Chromium	Cobalt	Copper	Iron[3]	Lead (Total)	STLC Lead (ug/L)[3]	Magnesium[3]	Manganese[3]	Mercury by Cold Vapor AA[2]	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Samples Locations in Area Mapped as an Ecological Buffer Zone[4]																							
Soil PRG: Ecological Buffer, Residential, Colma Lithology[1]	Ecological Buffer Zone PRGs	-	**5**	64	**500**	**10**	0.23	23	**48**	**120**	-	**300**	-	-	-	**1.6**	**300**	71	**1.1**	**2**	1	5	50
	Human Health PRGs - Residential	-	29	0.36	5,000	140	1.70	1,200	4,000	-	-	400	-	-	-	20	360	1,400	360	360	5.7	650	22,000
	Presidio Background Metals Concentrations by Colma Lithology	-	3.0	**6.2**	180	0.99	**0.8**	**140**	21	49	-	7.5	-	-	-	0.2	2.0	**110**	0.5	1.0	**1.0**	**90**	**79**
Sample Identifier	**Sample Date**																						
BAPSB01 [4.5]	7/25/2003	NA	<2.9 R	NA	170	NA	NA	NA	NA	15	NA	3.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	38
BAPSB01 [5.5]	7/25/2003	NA	<3.3 R	NA	88	NA	NA	NA	NA	8.5	NA	1.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	21
BAPSB02 [3]; dup	7/25/2003	NA	<2.8 R / <3.1 R	NA	130 / 170	NA	NA	NA	NA	15 / 18	NA	27 / 18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**81** / 73
BAPSB02 [5.5]	7/25/2003	NA	<3.1 R	NA	96	NA	NA	NA	NA	6.4	NA	1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	14
BAPSB03R [5.5]	8/1/2003	NA	<3.1 UJ	NA	140	NA	NA	NA	NA	23	NA	230	< 1,500	NA	NA	NA	NA	NA	NA	NA	NA	NA	**200**
BAPSB03R [6.5]	8/1/2003	NA	<3.1 UJ	NA	100	NA	NA	NA	NA	7.8	NA	5.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	28
BAPSB04 [1]; dup	8/1/2003	NA	<2.9 UJ / <2.6 UJ	NA	140 / 56	NA	NA	NA	NA	14 / 7.1	NA	67 / 13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**100** / 38
BAPSB04 [3]	8/1/2003	NA	<2.8 UJ	NA	40	NA	NA	NA	NA	4.8	NA	3.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20
BAPSB05 [7]; dup	8/1/2003	NA	<3.4 UJ / <3.3 UJ	NA	110 / 110	NA	NA	NA	NA	10 / 9.6	NA	17 / 9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	33 / 30
BAPSB05 [8.5]	8/1/2003	NA	<3.6 UJ	NA	94	NA	NA	NA	NA	6.9	NA	5.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22
BAPSB06 [5.5]	7/25/2003	NA	<2.9 R	NA	110	NA	NA	NA	NA	8.2	NA	4.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25
BAPSB07 [5.5]	8/1/2003	NA	<2.7 UJ	NA	31	NA	NA	NA	NA	6.5	NA	9.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	23
BAPSB08R [6.5]	8/1/2003	NA	<3.1	NA	60	NA	NA	NA	NA	6.3	NA	2.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	21
BAPSB08R [7.5]	8/1/2003	NA	<3.2	NA	39	NA	NA	NA	NA	5.8	NA	2.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20
BAPSB09 [0.3]	7/25/2003	NA	<2.3 R	NA	52	NA	NA	NA	NA	6.5	NA	19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	33
BAPSB09 [1]	7/25/2003	NA	<2.6 R	NA	30	NA	NA	NA	NA	5.2	NA	< 0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22
BAPSB10 [1]	8/1/2003	7,200	<2.9 R	1.8	33	0.23	< 0.25	50	8.8	5.6	12,000	12	NA	2,100	250	NA	NA	39	< 0.24 UJ	< 0.24	< 0.24 UJ	29	30
BAPSB10 [2]	8/1/2003	NA	<2.9 UJ	NA	31	NA	NA	NA	NA	3.7	NA	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18
BAPSB11 [2]	7/25/2003	NA	<2.7 R	NA	69	NA	NA	NA	NA	5.2	NA	0.89	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	24
BAPSB11 [3]	8/1/2003	NA	<2.7	NA	60	NA	NA	NA	NA	6	NA	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	27

Table 1
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Barnard Avenue Protected Range
Presidio of San Francisco, California

		Aluminum[3]	Antimony	Arsenic	Barium	Beryllium	Cadmium by ICP/MS	Chromium	Cobalt	Copper	Iron[3]	Lead (Total)	STLC Lead (ug/L)[3]	Magnesium[3]	Manganese[3]	Mercury by Cold Vapor AA[2]	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Samples Locations in Area Mapped as an Ecological Buffer Zone[4]																							
Soil PRG: Ecological Buffer, Residential, Colma Lithology[1]	Ecological Buffer Zone PRGs	-	**5**	64	**500**	**10**	0.23	23	**48**	**120**	-	**300**	-	-	-	**1.6**	**300**	71	**1.1**	**2**	1	5	50
	Human Health PRGs - Residential	-	29	0.36	5,000	140	1.70	1,200	4,000	-	-	400	-	-	-	20	360	1,400	360	360	5.7	650	22,000
	Presidio Background Metals Concentrations by Colma Lithology	-	3.0	**6.2**	180	0.99	**0.8**	**140**	21	49	-	7.5	-	-	-	0.2	2.0	**110**	0.5	1.0	**1.0**	**90**	**79**
Sample Identifier	**Sample Date**																						
BAPSB12 [1]; dup	8/1/2003	590	<2.9 R / <2.5 R	2.5 / 2.8	35 / 38	0.19 / 0.22	< 0.25 / < 0.25	56 / 60	7.2 / 6.9	8.8 / 8.4	1,100 / 12,000	15 / 16	NA	680 / 5,500	180 / 180	NA	NA	70 / 58	< 0.24 UJ / < 0.21 UJ	< 0.24 / < 0.21	< 0.24 UJ / < 0.21 UJ	24 / 29	21 / 23
BAPSB12 [3]	8/1/2003	NA	<2.6 UJ	NA	34	NA	NA	NA	NA	8.3	NA	18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	30
BAPSB13 [0.3]	7/28/2003	7,700	<3.1 UJ	3	98	0.37	<0.25	57	11	19	14,000	160	NA	3,600	360	NA	NA	68	< 0.26	< 0.26	< 0.26	39	**210**
BAPSB13 [1]	7/28/2003	6,800	<3.3 UJ	2.2	77	0.3	< 0.25	52	9.8	12	13,000	39	NA	2,700	430	NA	NA	49	< 0.28	< 0.28	< 0.28	31	48
BAPSB14 [0.3]	7/28/2003	NA	<3 UJ	NA	57	NA	NA	NA	NA	11	NA	36	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	48
BAPSB14 [1]	7/28/2003	NA	<3.3 UJ	NA	37	NA	NA	NA	NA	6.7	NA	6.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	31
BAPSB15 [0.3]	7/25/2003	NA	<2.8 R	NA	40	NA	NA	NA	NA	6.1	NA	16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	29
BAPSB15 [1]	7/25/2003	NA	<2.7 R	NA	30	NA	NA	NA	NA	2.6	NA	0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18
BAPSB16 [0.3]	8/1/2003	NA	<3 UJ	NA	41	NA	NA	NA	NA	5.7	NA	5.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25
BAPSB16 [1]	8/1/2003	NA	<2.9 UJ / <3 UJ	NA	38 / 55	NA	NA	NA	NA	4.7 / 6.7	NA	4.8 / 24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20 / 29
BAPSB17 [0.3]	7/28/2003	NA	<3.1 UJ	NA	48	NA	NA	NA	NA	9.4	NA	44	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	41
BAPSB17 [1]	7/28/2003	NA	<3 UJ / < 3.1 UJ	NA	41 / 31	NA	NA	NA	NA	6.5 / 7.5	NA	11 / 91	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	31 / 22
BAPSB18 [0.3]	7/28/2003	NA	<3.1 UJ	NA	81	NA	NA	NA	NA	70	NA	150	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**350**
BAPSB18 [1]	7/28/2003	NA	<3.2 UJ	NA	58	NA	NA	NA	NA	13	NA	52	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**98**
BAPSB201 [3]	6/17/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**180**
BAPSB201 [6]	6/17/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	27
BAPSB202 [5]	6/17/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	29
BAPSB202 [7]	6/17/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	23
BAPSB203 [1]	6/17/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	29 / 38
BAPSB203 [3]	6/17/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	32

Table 1
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		Aluminum[3]	Antimony	Arsenic	Barium	Beryllium	Cadmium by ICP/MS	Chromium	Cobalt	Copper	Iron[3]	Lead (Total)	STLC Lead (ug/L)[3]	Magnesium[3]	Manganese[3]	Mercury by Cold Vapor AA[2]	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample Locations in Area Mapped as an Ecological Special Status Zone[5]																							
Soil PRG: Ecological Special Status, Residential, Colma Lithology[1]	Ecological Special Status PRGs	-	5	10	**320**	**10**	0.017	4	20	30	-	160	-	-	-	**0.4**	**12**	30	0.2	2	0.15	2	4
	Human Health PRGs - Residential	-	29	0.36	5,000	140	1.70	1,200	4,000	-	-	400	-	-	-	20	360	1,400	360	360	5.7	650	22,000
	Presidio Background Metals Concentrations by Colma Lithology	-	3.0	**6.2**	180	0.99	**0.8**	**140**	**21**	**49**	-	7.5	-	-	-	0.2	2.0	**110**	**0.5**	1.0	**1.0**	**90**	**79**
Sample Identifier	**Sample Date**																						
BAPSB204 [0.3]	6/17/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**170**
BAPSB204 [1]	6/17/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**110**
BAPSB210 [0.3]	8/26/2010	NA	<3.2	2.1	51	0.23	NA	60	8.4	17	NA	29	NA	NA	NA	0.091	<1.1	34	**2.7**	<0.27	<0.50	46	49
BAPSB210 [1.3]	8/26/2010	NA	<3.1	2.9	70	0.32	NA	85	17	5.4	NA	3.7	NA	NA	NA	<0.021	<1.0	50	**3.2**	<0.26	<0.48	61	30
BAPSB211 [0.3]	8/26/2010	NA	<3.2	2.6	55	0.27	NA	71	10	**53**	NA	15	NA	NA	NA	0.03	<1.1	39	<0.53	<0.26	<0.52	52	62
BAPSB211 [1.3]	8/26/2010	NA	<3.1	2.9	61	0.29	NA	85	11	11	NA	2.5	NA	NA	NA	0.034	<1.0	43	**3.1**	<0.26	<0.51	60	32
BAPSB212 [0.3]	8/26/2010	NA	<3.2	2.6	71	0.30	NA	63	8.6	28	NA	55	NA	NA	NA	0.15	<1.1	53	**2.3**	<0.27	<0.52	43	68
BAPSB212 [2.3]	8/26/2010	NA	<3.2	2.8	84	0.31	NA	74	8.5	18	NA	20	NA	NA	NA	0.026	<1.1	39	**3.0**	<0.27	<0.52	49	47
BAPSB214 [0.3]	8/26/2010	NA	<3.3	3.7	95	0.39	NA	77	12	21	NA	34	NA	NA	NA	0.082	<1.1	55	**3.9**	<0.27	<0.50	62	64
BAPSB214 [1.25]	8/26/2010	NA	<3.3	3.6	130	0.41	NA	77	12	40	NA	10	NA	NA	NA	0.049	<1.1	45	**3.4**	<0.27	<0.52	54	54
BAPSB216 [0.3]	8/26/2010	NA	<3.3	3.4	120	0.39	NA	60	12	24	NA	40	NA	NA	NA	0.097	<1.1	37	**2.9**	<0.27	<0.50	51	60
BAPSB216 [1.3]	8/26/2010	NA	<3.3	3.3	140	0.43	NA	63	13	27	NA	11	NA	NA	NA	0.027	<1.1	35	**3.3**	<0.27	<0.54	54	58
BAPSB217 [0.3]	8/26/2010	NA	<3.3	3.9	130	0.46	NA	74	13	42	NA	120	NA	NA	NA	0.12	<1.1	51	**3.6**	<0.28	<0.54	58	**120**
BAPSB217 [2.3]	8/26/2010	NA	<3.2	3.1	130	0.41	NA	59	11	13	NA	6.1	NA	NA	NA	<0.022	<1.1	30	**2.5**	<0.27	<0.52	52	35

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		Aluminum[3]	Antimony	Arsenic	Barium	Beryllium	Cadmium by ICP/MS	Chromium	Cobalt	Copper	Iron[3]	Lead (Total)	STLC Lead (ug/L)[3]	Magnesium[3]	Manganese[3]	Mercury by Cold Vapor AA[2]	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample Locations within the Tennessee Hollow Drainage Area Designated by the RWQCB as a Freshwater Ecological Protection Zone[6]																							
Soil PRG: Ecological Special Status, Residential, Colma Lithology[1]	Ecological Special Status PRGs	-	5	10	**320**	**10**	0.017	4	20	30	-	160	-	-	-	**0.4**	**12**	30	0.2	2	0.15	2	4
	Human Health PRGs - Residential	-	29	0.36	5,000	140	1.70	1,200	4,000	-	-	400	-	-	-	20	360	1,400	360	360	5.7	650	22,000
	Presidio Background Metals Concentrations by Colma Lithology	-	3.0	**6.2**	180	0.99	**0.8**	**140**	**21**	**49**	-	7.5	-	-	-	0.2	2.0	**110**	**0.5**	1.0	**1.0**	**90**	**79**
Sediment Screening Level[7]	Sediment Ecological Special Status PRGs	-	**3.0**	19	3,100	7,200	1.1	140	50	114	-	**82**	-	-	-	0.62	522	110	1.6	**1.0**	3.7	90	230
Sample Identifier	**Sample Date**																						
BAPSB205 [0.3]	6/17/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**110**
BAPSB205 [1]	6/17/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**330**
BAPSB205 [3]	6/17/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**87**
BAPSB206 [0.3]	6/17/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**150**
BAPSB206 [1]	6/17/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**80** / 75
BAPSB206 [3]	6/17/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	43
BAPSB207 [0.3]	6/17/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**150**
BAPSB207 [1]	6/17/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	42
BAPSB207 [3]	6/17/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**120**
BAPSB208 [1]	6/17/2010	NA	**8.6**	2.9	84	NA	NA	NA	NA	42	NA	**100**	NA	NA	NA	0.091	NA	NA	**1.9**	<0.27	NA	44	**150**
BAPSB208 [5]	6/17/2010	NA	**8.1 / 8.6**	1.8 / 1.7	120 / 110	NA	NA	NA	NA	33 / 15	NA	3.3 / 12	NA	NA	NA	<0.024 / 0.036	NA	NA	**1.7 / 1.7**	<0.29 / <0.3	NA	39 / 38	68 / 46
BAPSB209 [1]	6/17/2010	NA	**6.9**	2.5	91	NA	NA	NA	NA	14	NA	26	NA	NA	NA	0.049	NA	NA	**1.6**	<0.27	NA	40	45
BAPSB209 [5]	6/17/2010	NA	**7**	2.4	49	NA	NA	NA	NA	10	NA	3.2	NA	NA	NA	<0.023	NA	NA	**1.6**	<0.28	NA	48	31
BAPSB213 [0.3]	8/26/2010	NA	<3.3	4	110	0.44	NA	87	17	37	NA	60	NA	NA	NA	0.18	<1.1	93	**3.8**	<0.28	<0.52	54	**160**
BAPSB213 [4.5]	8/26/2010	NA	<3.5	3.8	170	0.43	NA	**180**	15	**70**	NA	**140**	NA	NA	NA	0.29	<1.2	**160**	**4.0**	<0.29	<0.52	61	**180**
BAPSB215 [0.3]	8/26/2010	NA	<3.6	4.3	110	0.42	NA	69	12	38	NA	**140**	NA	NA	NA	0.22	<1.2	66	**4.0**	<0.30	<0.59	48	**160**
BAPSB215 [3.3]	8/26/2010	NA	<3.4	4	160	0.50	NA	81	12	**53**	NA	28	NA	NA	NA	0.04	<1.1	45	**3.3**	<0.28	<0.53	60	**96**
BAPSB218 [0.3]	8/26/2010	NA	<3.4	4.6	130	0.49	NA	95	15	40	NA	**110**	NA	NA	NA	0.20	<1.1	94	**3.5**	<0.29	<0.55	63	**150**

Table 1
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	Aluminum[3]	Antimony	Arsenic	Barium	Beryllium	Cadmium by ICP/MS	Chromium	Cobalt	Copper	Iron[3]	Lead (Total)	STLC Lead (ug/L)[3]	Magnesium[3]	Manganese[3]	Mercury by Cold Vapor AA[2]	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc

Notes:

All metals reported in units of mg/kg, measured on a dry basis, except as noted for STLC Lead.

Not detected values presented as less than Reporting Limit

NA = Not analyzed

PRG = Preliminary remediation goal

All 2003 results are as reported by Treadwell and Rollo, 2004. *Draft Small Arms Firing Ranges Remedial Investigation Report*. February. Geosyntec relied upon the information as provided in that report, and did not verify its accuracy.

Analytical method for 2003 metals analysis was SW6010/6020 (Treadwell and Rollo, 2004).

Analytical method for 2011 metals analysis was EPA 6010B, except Mercury which was analyzed by low-level method EPA 7471A.

Sample depths indicated in square brackets in sample name.

QA/QC samples including source decontamination water and rinsate were analyzed for metals, and all analytes were not detected above the reporting limit. Results are depicted in the laboratory analytical reports, included as Appendix A.

1. Soil PRGs are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-2: "Summary of Selection of Preliminary Remediation Goals and Proposed Cleanup Levels for Non-Petroleum Compounds in Soil". Listed criteria for non-metals represent the applicable value of the following criteria: Proposed Buffer Zone PRGs, Proposed Special Status PRGs, Human Health Residential PRGs, Colma fm. Background. Listed PRGs for metals are selected as applicable per EKI 2002 Table 7-2 footnote f. Background level for zinc based on revised value reported in the *Draft Development of Zinc Background Levels for Colma Formation and Mixed Beach Dune and Colma Formation Soils (AMEC, 2012).*

2. Analytical method not specified in soil PRG reference

3. Soil PRG not available.

4. Sample locations on the east side of the site in the area mapped as an ecological buffer zone in the Cleanup Level Document (EKI, 2002) were compared to the Ecological Buffer Zone PRGs.

5. Sample locations on the west side of the site (outside of the drainage area) in the area mapped as a special status species zone in the Cleanup Level Document (EKI, 2002) were compared to the Ecological Special Status Zone PRGs.

6. Sample locations within the Tennessee Hollow drainage area, which is designated as a freshwater ecological protection zone (RWQCB, 2003), were compared to the more stringent of the PRGS between the Ecological Special Status and Freshwater Sediment criteria.

7. Sediment PRGs are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-3: "Ecological Cleanup Levels for Non-Petroleum Compounds in Sediment at the Presidio of San Francisco (Freshwater)".

J- Data validation qualifier, "The analyte was positively identified; the associated numerical values is biased low due to a low surrogate recovery and should be considered an approximate concentration of the analyte in the sample."

UJ - Data validation qualifier, "The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample."

R - Data validation qualifier, "The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified."

* Cadmium detections were found to be a laboratory artifact, and re-analysis found cadmium was not detected in these soil samples at concentrations exceeding the PRGs.

Table 2
Analytical Results – OCP, PAHs, TPH-d
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			Sample Locations in Area Mapped as an Ecological Special Status Zone[1]											
Analyte	**Soil PRGs: Residential, Ecological Special Status[2]**	**Soil PRGs: Protection of Groundwater[3]**	**BAPSB210 [0.3]**	**BAPSB210 [1.3]**	**BAPSB211 [0.3]**	**BAPSB211 [1.3]**	**BAPSB212 [0.3]**	**BAPSB212 [2.3]**	**BAPSB214 [0.3]**	**BAPSB214 [1.25]**	**BAPSB216 [0.3]**	**BAPSB216 [1.3]**	**BAPSB217 [0.3]**	**BAPSB217 [2.3]**
Sample Date			8/26/2010	8/26/2010	8/26/2010	8/26/2010	8/26/2010	8/26/2010	8/26/2010	8/26/2010	8/26/2010	8/26/2010	8/26/2010	8/26/2010
TOTAL EXTRACTABLE HYDROCARBONS - EPA Method 8015M - dry basis, mg/Kg														
TPH Diesel C12-C24	700	15,000	51 Y	19 Y	64 Y	13 Y	130 Y	13 Y	460 Y	210 Y	58 Y	2.9 Y	13 Y	1.1 Y
POLYNUCLEAR AROMATIC HYDROCARBONS - EPA Method 8270C - dry basis, ug/Kg														
Naphthalene	30,000	-	<5.4	<5.2	<5.2	<5.2	<5.3	<5.3	<5.5	<5.4	<5.5	<5.4	1.4 J	<5.4
2-Methylnaphthalene	30,000	-	<5.4	<5.2	<5.2	<5.2	<5.3	<5.3	<5.5	<5.4	<5.5	<5.4	1.9 J	<5.4
Acenaphthylene	30,000	-	<5.4	<5.2	<5.2	1.3 J	<5.3	<5.3	<5.5	<5.4	<5.5	<5.4	2.0 J	<5.4
Acenaphthene	30,000	-	<5.4	<5.2	<5.2	<5.2	<5.3	<5.3	<5.5	<5.4	<5.5	<5.4	<5.5	<5.4
Fluorene	30,000	-	<5.4	<5.2	<5.2	<5.2	<5.3	<5.3	<5.5	<5.4	<5.5	<5.4	<5.5	<5.4
Phenanthrene	30,000	-	2.4 J	<5.2	6.1	3.0 J	9	<5.3	3.6 J	<5.4	3.3 J	<5.4	8.2	<5.4
Anthracene	30,000	-	<5.4	<5.2	1.3 J	<5.2	3.3 J	<5.3	<5.5	<5.4	<5.5	<5.4	2.6 J	<5.4
Fluoranthene	30,000	-	5.1 J	<5.2	9.8	4.6 J	22	<5.3	8.2	1.2 J	6.7	<5.4	19	<5.4
Pyrene	30,000	-	3.3 J	<5.2	7.8	3.1 J	15	<5.3	5.6	<5.4	3.4 J	<5.4	11	<5.4
Benzo(a)anthracene	270	-	2.2 J	<5.2	3.7 J	1.6 J	9.8	<5.3	3.5 J	<5.4	2.1 J	<5.4	7.1	<5.4
Chrysene	2,700	-	4.0 J	<5.2	5.6	2.4 J	13	<5.3	5.7	<5.4	4.7 J	<5.4	12	<5.4
Benzo(b)fluoranthene	270	-	4.8 J	<5.2	7.7	4.5 J	15	<5.3	7.2	1.1 J	12	<5.4	13	<5.4
Benzo(k)fluoranthene	270	-	<5.4	<5.2	1.6 J	<5.2	5.8	<5.3	1.5 J	<5.4	1.6 J	<5.4	3.9 J	<5.4
Benzo(a)pyrene	27	-	2.3 J	<5.2	4.2 J	1.8 J	12	<5.3	3.3 J	<5.4	2.3 J	<5.4	7.5	<5.4
Indeno(1,2,3-cd)pyrene	270	-	1.7 J	<5.2	2.6 J	1.1 J	6.7	<5.3	2.2 J	<5.4	<5.5	<5.4	4.8 J	<5.4
Dibenz(a,h)anthracene	78	-	<5.4	<5.2	<5.2	<5.2	<5.3	<5.3	<5.5	<5.4	<5.5	<5.4	2.2 J	<5.4
Benzo(g,h,i)perylene	30,000	-	2.0 J	<5.2	3.1 J	1.5 J	7.3	<5.3	2.6 J	<5.4	<5.5	<5.4	6.0	<5.4
ORGANOCHLORINE PESTICIDES - EPA Method 8081A - dry basis, ug/Kg														
alpha-BHC	62	-	<1.8	<1.7	<1.8	<1.7	<8.9	<1.8	<1.8	<1.8	<1.9	<1.8	<9.3	<1.8
beta-BHC	62	-	<1.8	<1.7	<1.8	<1.7	<8.9	<1.8	<1.8	<1.8	<1.9	<1.8	<9.3	<1.8
gamma-BHC	10	-	<1.8	<1.7	<1.8	<1.7	<8.9	<1.8	<1.8	<1.8	<1.9	<1.8	<9.3	<1.8
delta-BHC	62	-	<1.8	<1.7	<1.8	<1.7	<8.9	<1.8	<1.8	<1.8	<1.9	<1.8	<9.3	<1.8
Heptachlor	17	-	<1.8	<1.7	<1.8	<1.7	<8.9	<1.8	<1.8	<1.8	<1.9	<1.8	<9.3	<1.8
Aldrin	3.9	-	<1.8	<1.7	<1.8	<1.7	<8.9	<1.8	<1.8	<1.8	<1.9	<1.8	<9.3	<1.8
Heptachlor epoxide	17	-	<1.8	<1.7	<1.8	<1.7	<8.9	<1.8	<1.8	<1.8	<1.9	<1.8	<9.3	<1.8
Isodrin	3.9	-	<1.8	<1.7	<1.8	<1.7	<8.9	<1.8	<1.8	<1.8	0.95 J	<1.8	<9.3	<1.8
Endosulfan I[6]	1,100	-	<1.8	<1.7	<1.8	<1.7	<8.9	<1.8	<1.8	<1.8	<1.9	<1.8	<9.3	<1.8
Dieldrin	30	-	<3.5	<3.4	<3.5	<3.4	<17	<3.5	<3.6	<3.6	<3.6	<3.6	<18	<3.5
4,4'-DDE	98	-	4.3 C	<3.4	<3.5	<3.4	<17	<3.5	2.8 J	<3.6	2.3 C J	<3.6	13 J	<3.5
Endrin	4	-	<3.5	<3.4	<3.5	<3.4	<17	<3.5	<3.6	<3.6	<3.6	<3.6	<18	<3.5
Endosulfan II[6]	1,100	-	<3.5	<3.4	<3.5	<3.4	<17	<3.5	<3.6	<3.6	<3.6	<3.6	<18	<3.5
Endosulfan sulfate	1,100	-	<3.5	<3.4	<3.5	<3.4	<17	<3.5	<3.6	<3.6	<3.6	<3.6	<18	<3.5
4,4'-DDD	49	-	<3.5	<3.4	<3.5	<3.4	<17	<3.5	<3.6	<3.6	<3.6	<3.6	3.3 J	<3.5
Endrin ketone	4	-	<3.5	<3.4	<3.5	<3.4	<17	<3.5	<3.6	<3.6	<3.6	<3.6	<18	<3.5
Endrin aldehyde	4	-	<3.5	<3.4	<3.5	<3.4	<17	<3.5	<3.6	<3.6	<3.6	<3.6	<18	<3.5
4,4'-DDT	8.2	-	1.3 J	<3.4	<3.5	<3.4	4.9 J	<3.5	1.9 C J	<3.6	0.69 J	<3.6	12 J	<3.5
alpha-Chlordane[6]	9	-	<1.8	<1.7	<1.8	<1.7	<8.9	<1.8	<1.8	<1.8	<1.9	<1.8	<9.3	<1.8
gamma-Chlordane[6]	9	-	<1.8	<1.7	<1.8	<1.7	<8.9	<1.8	<1.8	<1.8	<1.9	<1.8	<9.3	<1.8
Methoxychlor	440	-	<18	<17	<18	<17	<89	<18 #	<18 #	<18	<19	<18	<93	<18
Toxaphene	-	-	<64	<62	<63	<62	<310	<63	<65	<65	<66	<65	<330	<64

Notes:

1.Sample locations on the west side of the site (outside of the drainage area) in the area mapped as a special status species zone in the Cleanup Level Document (EKI, 2002) were compared to the Ecological Special Status Zone PRGs

2. Soil preliminary remediation goals (PRGs) are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-2: "Summary of Selection of Preliminary Remediation Goals and Proposed Cleanup Levels for Non-Petroleum Compounds in Soil" and Table 7-5 "Human Health and Ecological Cleanup Levels for Petroleum Hydrocarbons and Constituents in Soil and Sediments". Listed criteria for non-metals represent the applicable value of the following criteria: Proposed Special Status PRGs, Human Health Residential PRGs. Shaded PRG used for screening comparison.

3. Soil and sedimnet PRGs for protection of groundwater are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-5 "Human Health and Ecological Cleanup Levels for Petroleum Hydrocarbons and Constituents in Soil and Sediments". Listed criteria represent PRGs for soil or sediment to Maintain Drinking Water Standard in Groundwater, Greater than 5 Feet above Groundwater (for petroleum products only).

4. Sample locations within the Tennessee Hollow drainage area, which is designated as a freshwater ecological protection zone (RWQCB, 2003), were compared to the more stringent of the PRGS between the Ecological Special Status and Freshwater Sediment criteria.

5. Sediment PRGs are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-3: "Ecological Cleanup Levels for Non-Petroleum Compounds in Sediment at the Presidio of San Francisco (Freshwater)" and Table 7-5 "Human Health and Ecological Cleanup Levels for Petroleum Hydrocarbons and Constituents in Soil and Sediments". Listed criteria represent the lowest value of the following criteria Ecological Special Status PRG, Human Health Residential PRG, and PRG for soil or sediment to Maintain Drinking Water Standard in Groundwater, Greater than 5 Feet above Groundwater (for petroleum compounds only). Shaded PRG used for screening comparison.

6. Endosulfan PRG was used for Endosulfan I and Endosulfan II. Chlordane PRG was used for alpha-Chlordane and gamma-Chlordane.

All 2003 results are as reported by Treadwell and Rollo, 2004.*Draft Small Arms Firing Ranges Remedial Investigation Report*. February. Geosyntec relied upon the information as provided in that report

Results from 17 June 2010 sample date taken from Curtis and Tompkins Analytical Lab Report # 220817, report date 6 July 2010.

Results from 26 August 2010 sample date taken from Curtis and Tompkins Analytical Lab Report # 222104, report date 9 September 2010

Sample depths indicated in square brackets in sample name

QA/QC samples including source decontamination water and rinsate were analyzed for total extractable hydrocarbons, polynuclear aromatic hydrocarbons, and organochlorine pesticides, and all analytes were not detected above the reporting limit. Results are depicted in the laboratory analytical reports, included as Appendix A.

Not detected values presented as less than Reporting Limit

#= CCV drift outside limits; average CCV drift within limits per method requirements

C = Presence confirmed, but RPD between columns exceeds 40%.

J = Estimated value

PRGs = Preliminary remediation goals

NA = Not analyzed

RL= Reporting Limit

Y= Sample exhibits chromatographic pattern which does not resemble standard

TPH Diesel = Total petroleum hydrocarbons, diesel range

Table 2
Analytical Results – OCP, PAHs, TPH-d
Draft Removal Action Work Plan
Barnard Avenue Protected Range
Presidio of San Francisco, California

Analyte	Soil PRGs: Residential, Ecological Special Status[2]	Sediment PRG[5]	Soil and Sediment PRGs: Protection of Groundwater[3]	Sample Locations within the Tennessee Hollow Drainage Area Designated by the RWQCB as a Freshwater Ecological Protection Zone[4]								
				BAPSB208 [1]	BAPSB208 [5]	BAPSB209 [1]	BAPSB209 [5]	BAPSB213 [0.3]	BAPSB213 [4.5]	BAPSB215 [0.3]	BAPSB215 [3.3]	BAPSB218 [0.3]
Sample Date				6/17/2010	6/17/2010	6/17/2010	6/17/2010	8/26/2010	8/26/2010	8/26/2010	8/26/2010	8/26/2010
TOTAL EXTRACTABLE HYDROCARBONS - EPA Method 8015M - dry basis, mg/Kg												
TPH Diesel C12-C24	700	144	15,000	86 Y	<1.2 / 4.5	50 Y	2.2 Y	**190 Y**	120 Y	**230 Y**	18 Y	**280 Y**
POLYNUCLEAR AROMATIC HYDROCARBONS - EPA Method 8270C - dry basis, ug/Kg												
Naphthalene	30,000	300	-	<5.5	<5.8 / < 5.9	<5.5	<5.5	<5.5	4.9 J	<59	<5.6	1.4 J
2-Methylnaphthalene	30,000	110	-	<5.5	<5.8 / < 5.9	<5.5	<5.5	1.2 J	9.8	<59	<5.6	1.8 J
Acenaphthylene	30,000	67	-	1.5 J	<5.8 / 1.2	1.2 J	<5.5	1.7 J	1.5 J	<59	1.4 J	<5.7
Acenaphthene	30,000	310	-	1.4 J	<5.8 / < 5.9	<5.5	<5.5	<5.5	<5.8	<59	<5.6	<5.7
Fluorene	30,000	280	-	2.2 J	<5.8 / < 5.9	1.1 J	<5.5	<5.5	<5.8	<59	<5.6	<5.7
Phenanthrene	30,000	610	-	14	<5.8 / 2.4	<5.5	<5.5	11	11	17 J	2.4 J	11
Anthracene	30,000	450	-	3.9 J	<5.8 / < 5.9	<5.5	<5.5	2.5 J	2.8 J	<59	<5.6	3.5 J
Fluoranthene	30,000	1,500	-	25	<5.8 / 2.7	1.1 J	<5.5	21	18	39 J	6.1	25
Pyrene	30,000	790	-	31	<5.8 / 3.5	1.4 J	<5.5	16	12	32 J	4.5 J	15
Benzo(a)anthracene	270	540	-	16	<5.8 / 1.5	<5.5	<5.5	10	9	18 J	3.3 J	11
Chrysene	2,700	670	-	17	<5.8 / 1.7	1.4 J	<5.5	13	10	26 J	4.6 J	16
Benzo(b)fluoranthene	270	790	-	17	<5.8 / 1.6	1.2 J	<5.5	13	13	27 J	6.1	18
Benzo(k)fluoranthene	270	790	-	5.7	<5.8 / < 5.9	<5.5	<5.5	4.3 J	3.4 J	<59	1.2 J	4.8 J
Benzo(a)pyrene	27	740	-	15	<5.8 / 1.6	<5.5	<5.5	10	9.4	17 J	3.4 J	12
Indeno(1,2,3-cd)pyrene	270	260	-	10	<5.8 / < 5.9	<5.5	<5.5	6.8	6.4	<59	1.7 J	7.2
Dibenz(a,h)anthracene	78	71	-	3.5 J	<5.8 / < 5.9	<5.5	<5.5	2.3 J	2.0 J	<59	<5.6	2.9 J
Benzo(g,h,i)perylene	30,000	250	-	11	<5.8 / 1.5	1.5 J	<5.5	8.2	7.1	16 J	2.3 J	8.3
ORGANOCHLORINE PESTICIDES - EPA Method 8081A - dry basis, ug/Kg												
alpha-BHC	62	8	-	<1.9	<2.0 / <2.0	<1.9	<1.9	<1.9	<2.0	<10	<1.9	<19
beta-BHC	62	13	-	<1.9	<2.0 / <2.0	<1.9	<1.9	<1.9	<2.0	<10	<1.9	<19
gamma-BHC	10	3	-	<1.9	0.21 C J / < 2.0	<1.9	<1.9	<1.9	<2.0	<10	<1.9	<19
delta-BHC	62	7.5	-	<1.9	<2.0 / <2.0	<1.9	<1.9	<1.9	<2.0	<10	<1.9	<19
Heptachlor	17	8.3	-	1.1 J	<2.0 / <2.0	<1.9	<1.9	<1.9	<2.0	<10	<1.9	<19
Aldrin	3.9	5	-	<1.9	3.6 / <2.0	**5.0 C**	<1.9	<1.9	<2.0	<10	<1.9	<19
Heptachlor epoxide	17	8.3	-	<1.9	<2.0 / <2.0	<1.9	<1.9	<1.9	<2.0	<10	<1.9	<19
Isodrin	3.9	5	-	<1.9	<2.0 / <2.0	<1.9	<1.9	<1.9	<2.0	<10	<1.9	<19
Endosulfan I[6]	1,100	5.4	-	<1.9	<2.0 / <2.0	<1.9	<1.9	<1.9	<2.0	<10	<1.9	<19
Dieldrin	30	32	-	<3.6	<3.9 / <3.9	<3.6	<3.6	2.5 C J	<3.8	<20	<3.7	22 J
4,4'-DDE	98	16	-	10	<3.9 / <3.9	1.2 C J	<3.6	6.6	<3.8	**19 C J**	2.9 C J	**27 J**
Endrin	4	100	-	0.56 C J	<3.9 / <3.9	<3.6	<3.6	<3.6	<3.8	<20	<3.7	<37
Endosulfan II[6]	1,100	5.4	-	<3.6	<3.9 / <3.9	<3.6	<3.6	<3.6	<3.8	<20	<3.7	<37
Endosulfan sulfate	1,100	5.4	-	<3.6	<3.9 / <3.9	<3.6	<3.6	<3.6	<3.8	<20	<3.7	<37
4,4'-DDD	49	16	-	2.6 J	<3.9 / <3.9	<3.6	<3.6	3.2 C J	<3.8	3.7 C J	<3.7	<37
Endrin ketone	4	100	-	<3.6	<3.9 / <3.9	<3.6	<3.6	<3.6	<3.8	<20	<3.7	<37
Endrin aldehyde	4	100	-	<3.6	<3.9 / <3.9	<3.6	<3.6	<3.6	<3.8	<20	<3.7	<37
4,4'-DDT	8.2	32	-	**12**	<3.9 / 0.65	<3.6	<3.6	6.2 C	<3.8	**23**	2.0 J	**46**
alpha-Chlordane[6]	9	10	-	2.4 C	<2.0 / <2.0	<1.9	<1.9	8.2 C	<2.0	<10	<1.9	**32 C**
gamma-Chlordane[6]	9	10	-	<1.9	0.48 C J / <2.0	2.9	0.63 C J	<1.9	<2.0	<10	<1.9	<19
Methoxychlor	440	19	-	<19 #	<20 / <20	<19	<19	<19	<20	<100	<19	<190
Toxaphene	-	-	-	<66	<70 / <71	<65	<66	<66	<70	<360	<67	<680

Notes:

1.Sample locations on the west side of the site (outside of the drainage area) in the area mapped as a special status species zone in the Cleanup Level Document (EKI, 2002) were compared to the Ecological Special Status Zone PRGs

2. Soil preliminary remediation goals (PRGs) are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-2: "Summary of Selection of Preliminary Remediation Goals and Proposed Cleanup Levels for Non-Petroleum Compounds in Soil" and Table 7-5 "Human Health and Ecological Cleanup Levels for Petroleum Hydrocarbons and Constituents in Soil and Sediments". Listed criteria for non-metals represent the applicable value of the following criteria: Proposed Special Status PRGs, Human Health Residential PRGs. Shaded PRG used for screening comparison.

3. Soil and sedimnet PRGs for protection of groundwater are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-5 "Human Health and Ecological Cleanup Levels for Petroleum Hydrocarbons and Constituents in Soil and Sediments". Listed criteria represent PRGs for soil or sediment to Maintain Drinking Water Standard in Groundwater, Greater than 5 Feet above Groundwater (for petroleum products only).

4. Sample locations within the Tennessee Hollow drainage area, which is designated as a freshwater ecological protection zone (RWQCB, 2003), were compared to the more stringent of the PRGS between the Ecological Special Status and Freshwater Sediment criteria.

5. Sediment PRGs are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-3: "Ecological Cleanup Levels for Non-Petroleum Compounds in Sediment at the Presidio of San Francisco (Freshwater)" and Table 7-5 "Human Health and Ecological Cleanup Levels for Petroleum Hydrocarbons and Constituents in Soil and Sediments". Listed criteria represent the lowest value of the following criteria Ecological Special Status PRG, Human Health Residential PRG, and PRG for soil or sediment to Maintain Drinking Water Standard in Groundwater, Greater than 5 Feet above Groundwater (for petroleum compounds only). Shaded PRG used for screening comparison.

6. Endosulfan PRG was used for Endosulfan I and Endosulfan II. Chlordane PRG was used for alpha-Chlordane and gamma-Chlordane.

All 2003 results are as reported by Treadwell and Rollo, 2004.*Draft Small Arms Firing Ranges Remedial Investigation Report.* February. Geosyntec relied upon the information as provided in that report

Results from 17 June 2010 sample date taken from Curtis and Tompkins Analytical Lab Report # 220817, report date 6 July 2010.

Results from 26 August 2010 sample date taken from Curtis and Tompkins Analytical Lab Report # 222104, report date 9 September 2010

Sample depths indicated in square brackets in sample name.

QA/QC samples including source decontamination water and rinsate were analyzed for total extractable hydrocarbons, polynuclear aromatic hydrocarbons, and organochlorine pesticides, and all analytes were not detected above the reporting limit. Results are depicted in the laboratory analytical reports, included as Appendix A.

Not detected values presented as less than Reporting Limit.

#= CCV drift outside limits; average CCV drift within limits per method requirements

C = Presence confirmed, but RPD between columns exceeds 40%.

J = Estimated value

PRGs = Preliminary remediation goals

NA = Not analyzed

RL= Reporting Limit

Y= Sample exhibits chromatographic pattern which does not resemble standard

TPH Diesel = Total petroleum hydrocarbons, diesel range

Table 3
Rain Garden Confirmation Sampling Analytical Results - Metals
Draft Removal Action Work Plan
Barnard Avenue Protected Range
Presidio of San Francisco, California

		Antimony	Arsenic	Barium	Beryllium	Cadmium by ICP/MS	Chromium	Cobalt	Copper	Iron [3]	Lead (Total)	STLC Lead (ug/L) [3]	Magnesium[3]	Manganese[3]	Mercury by Cold Vapor AA[2]	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Soil PRG: Ecological Special Status, Residential, Colma Lithology[1]	Ecological Special Status PRGs	**5**	10	**320**	**10**	0.017	4	20	30.0	-	**160**	-	-	-	**0.4**	**12**	30	0.2	**2**	0.15	2	4
	Human Health PRGs - Residential	29	0.36	5,000	140	1.70	1,200	4,000	-	-	400	-	-	-	20	360	1,400	360	360	5.7	650	22,000
	Presidio Background Metals Concentrations by Colma Lithology	3	**6.2**	180	0.99	**0.8**	**140**	**21**	**49**	-	7.5	-	-	-	0.2	2.0	**110**	**0.5**	1.0	**1.0**	**90**	**79**
Sample Identifier	**Sample Date**																					
BAPSB301[0.5]	1/13/2012	<0.46 / <0.47	3.1 / 3	130 / 130	0.29 / 0.29	<0.23 / <0.23	65 / 67	12 / 12	19 / 18	NA	42 / 33	NA	NA	NA	0.067 / 0.09	0.23 / <0.2	42 / 43	<0.46 / <0.47	0.16 / 0.52	<0.46 / <0.47	54 / 58	53 / 52
BAPSB302[1]	1/13/2012	0.81	3	130	0.31	<0.23	61	13	17	NA	26	NA	NA	NA	0.054	0.36	37	<0.47	0.46	<0.47	53	44
BAPSB303[1]	1/13/2012	<0.46	3.2	120	0.26	0.58	66	12	28	NA	140	NA	NA	NA	0.13	<0.23	46	<0.46	0.53	<0.46	49	**96**
BAPSB304[1]	1/13/2012	0.84	3	120	0.27	0.43	63	12	24	NA	110	NA	NA	NA	0.098	<0.23	40	<0.46	0.49	<0.46	51	**83**
BAPSB305[1]	1/13/2012	1	3.2	120	0.27	<0.24	69	11	23	NA	80	NA	NA	NA	0.13	<0.24	53	<0.48	0.51	<0.48	51	**85**
BAPSB306[1]	1/13/2012	<0.47	3.9	120	0.25	0.25	66	12	30	NA	160	NA	NA	NA	0.23	<0.23	54	<0.47	0.62	<0.47	55	**110**
BAPSB307[0.5]	1/13/2012	<0.48 / 0.68	3 / 2.9	120 / 110	0.24 / 0.23	0.26 / 0.32	70 / 60	13 / 10	22 / 22	NA	78 / 86	NA	NA	NA	0.14 / 0.12	0.24 / <0.2	52 / 44	<0.48 / <0.46	0.45 / 2	<0.48	50	77
BAPSB308[0.5]	1/13/2012	0.95	3	120	0.25	0.32	63	11	21	NA	91	NA	NA	NA	0.13	<0.23	44	<0.47	0.47	<0.47 /< 0.46	50 / 45	77 / **90**
BAPSB309[0.5]	1/13/2012	1.1	3.4	130	0.27	0.48	66	12	31	NA	120	NA	NA	NA	0.16	0.4	52	<0.48	0.49	<0.48	52	**110**
BAPSB310[0.5]	1/13/2012	<0.47	2.4	110	0.24	<0.23	59	10	12	NA	5	NA	NA	NA	<0.018	<0.23	30	<0.47	0.38	<0.47	52	26
BAPSB311[2]	1/13/2012	<0.46	3	140	0.27	0.38	61	13	23	NA	76	NA	NA	NA	0.13	<0.23	46	<0.46	0.46	<0.46	53	76
BAPSB312[2]	1/13/2012	0.9	3.1	130	0.27	0.37	72	12	24	NA	100	NA	NA	NA	0.1	<0.23	51	<0.46	0.51	<0.46	54	**81**
BAPSB313[2]	1/13/2012	0.83	2.7	140	0.26	<0.25	64	11	16	NA	27	NA	NA	NA	0.089	<0.25	41	<0.5	0.45	<0.5	51	48
BAPSB314[2]	1/13/2012	0.64	2.9	140	0.27	<0.24	76	12	19	NA	30	NA	NA	NA	0.074	<0.24	46	<0.49	0.5	<0.49	54	58
BAPSB315[0.25]	1/13/2012	0.65	2.9	130	0.27	<0.24	63	13	17	NA	39	NA	NA	NA	0.048	<0.24	36	<0.47	0.46	<0.47	52	46
BAPSB316[0.25]	1/13/2012	1.1	3.5	120	0.27	0.67	62	12	31	NA	**200**	NA	NA	NA	0.16	0.45	44	<0.49	0.53	<0.49	48	**130**
BAPSB317[0.25]	1/13/2012	0.83	3.1	120	0.26	0.44	63	11	26	NA	120	NA	NA	NA	0.14	0.26	46	<0.5	0.49	<0.5	49	**94**
BAPSB318[0.25]	1/13/2012	<0.47	3.1	120	0.24	0.28	64	11	25	NA	92	NA	NA	NA	0.17	<0.23	50	<0.47	0.51	<0.47	50	**100**

Notes:

All metals reported in units of mg/kg, measured on a dry basis, except as noted for STLC Lead.

Not detected values presented as less than Reporting Limit

NA = Not analyzed

PRG = Preliminary remediation goal

Results shaded in gray = Samples BAPSB315 through BAPSB3318 shaded in gray were collected from the surface of a berm constructed along the southeastern edge of the rain garden using excavation spoils. The berm material was subsequently removed and disposed offsite.

Analytical method for metals analysis was EPA 6010B, except Mercury which was analyzed by low-level method EPA 7471A.

Sample depths indicated in square brackets in sample name.

QA/QC samples including source decontamination water and rinsate were analyzed for metals, and all analytes were not detected above the reporting limit. Results are depicted in the laboratory analytical reports.

1. Soil PRGs are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-2: "Summary of Selection of Preliminary Remediation Goals and Proposed Cleanup Levels for Non-Petroleum Compounds in Soil". Listed criteria for non-metals represent the applicable value of the following criteria: Proposed Buffer Zone PRGs, Proposed Special Status PRGs, Human Health Residential PRGs, Colma fm. Background. Listed PRGs for metals are selected as applicable per EKI 2002 Table 7-2 footnote f. Background level for zinc based on revised value reported in *Draft Development of Zinc Background Levels for Colma Formation and Mixed Beach Dune and Colma Formation Soils (AMEC, 2012).*

2. Analytical method not specified in soil PRG reference

3. Soil PRG not available.

Results taken from Curtis and Tompkins Analytical Lab Report # 233803, report date 18 January 2012.

J- Data validation qualifier, "The analyte was positively identified; the associated numerical values is biased low due to a low surrogate recovery and should be considered an approximate concentration of the analyte in the sample."

UJ - Data validation qualifier, "The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample."

R - Data validation qualifier, "The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verifi

* Cadmium detections were found to be a laboratory artifact, and re-analysis found cadmium was not detected in these soil samples at concentrations exceeding the PRGs.

Table 4
Rain Garden Confirmation Sampling Analytical Results – OCP and TPH-d
Remedial Investigation Summary Report
Barnard Avenue Protected Range
Presidio of San Francisco, California

Analyte	Soil PRGs: Residential, Ecological Special Status[1]	Soil PRGs: Protection of Groundwater[2]	BAPSB301 [0.5]	BAPSB302 [1]	BAPSB303 [1]	BAPSB304 [1]	BAPSB305 [1]	BAPSB306 [1]	BAPSB307 [0.5]	BAPSB308 [0.5]	BAPSB309 [0.5]	BAPSB310 [0.5]	BAPSB311 [2]	BAPSB312 [2]	BAPSB313 [2]	BAPSB314 [2]	BAPSB315 [0.25]	BAPSB316 [0.25]	BAPSB317 [0.25]	BAPSB318 [0.25]
Sample Date			1/13/12	1/13/12	1/13/12	1/13/12	1/13/12	1/13/12	1/13/12	1/13/12	1/13/12	1/13/12	1/13/12	1/13/12	1/13/12	1/13/12	1/13/12	1/13/12	1/13/12	1/13/12
TOTAL EXTRACTABLE HYDROCARBONS - EPA Method 8015M - dry basis, mg/Kg																				
TPH Diesel C12-C24	700	15,000	32 Y	4.4 Y	25 Y	42 Y	94 Y	77 Y	140 Y	74 Y	110 Y	<1.0	20 Y	49 Y	3.3 Y	25 Y	12 Y	58 Y	86 Y	**150 Y**
ORGANOCHLORINE PESTICIDES - EPA Method 8081A - dry basis, ug/Kg																				
alpha-BHC	62	-	<5.1 / <5.2	<1.7	<5	<5	<5.1	<8.4	<5.1 / <5.1	<5.1	<5.1	<5.1	<5	<5.1	<5	<5.2	<5.1	<8.4	<5.1	<5
beta-BHC	62	-	<5.1 / <5.2	<1.7	<5	<5	<5.1	<8.4	<5.1 / <5.1	<5.1	<5.1	<5.1	<5	<5.1	<5	<5.2	<5.1	<8.4	<5.1	<5
gamma-BHC	10	-	<5.1 / <5.2	<1.7	<5	<5	<5.1	<8.4	<5.1 / <5.1	<5.1	<5.1	<5.1	<5	<5.1	<5	<5.2	<5.1	<8.4	<5.1	<5
delta-BHC	62	-	<5.1 / <5.2	<1.7	<5	<5	<5.1	<8.4	<5.1 / <5.1	<5.1	<5.1	<5.1	<5	<5.1	<5	<5.2	<5.1	<8.4	<5.1	<5
Heptachlor	17	-	<5.1 / <5.2	<1.7	<5	<5	<5.1	<8.4	<5.1 / <5.1	<5.1	<5.1	<5.1	<5	<5.1	<5	<5.2	<5.1	<8.4	<5.1	<5
Aldrin	3.9	-	<5.1 / <5.2	<1.7	<5	<5	<5.1	<8.4	<5.1 / <5.1	<5.1	<5.1	<5.1	<5	<5.1	<5	<5.2	<5.1	<8.4	<5.1	<5
Heptachlor epoxide	17	-	<5.1 / <5.2	<1.7	<5	<5	<5.1	<8.4	<5.1 / <5.1	<5.1	<5.1	<5.1	<5	<5.1	<5	<5.2	<5.1	<8.4	<5.1	<5
Isodrin	3.9	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I[3]	1,100	-	<5.1 / <5.2	<1.7	<5	<5	<5.1	<8.4	<5.1 / <5.1	<5.1	<5.1	<5.1	<5	<5.1	<5	<5.2	<5.1	<8.4	<5.1	<5
Dieldrin	30	-	<9.9 / <10	<1.7	13	<9.8	<9.9	17	<9.8 / <9.8	<9.8	<9.9	<9.9	<9.7	<9.9	<9.7	<10	<9.9	<16	<9.8	<9.8
4,4'-DDE	98	-	<9.9 / <10	<3.3	13	11 C	<9.9	<16	<9.8 / <9.8	<9.8	10 C	<9.9	<9.7	<9.9	<9.7	<10	<9.9	**32 C**	10 C	<9.8
Endrin	4	-	<9.9 / <10	<3.3	<9.8	<9.8	<9.9	<16	<9.8 / <9.8	<9.8	<9.9	<9.9	<9.7	<9.9	<9.7	<10	<9.9	<16	<9.8	<9.8
Endosulfan II[3]	1,100	-	<9.9 / <10	<3.3	<9.8	<9.8	<9.9	<16	<9.8 / <9.8	<9.8	<9.9	<9.9	<9.7	<9.9	<9.7	<10	<9.9	<16	<9.8	<9.8
Endosulfan sulfate	1,100	-	<9.9 / <10	<3.3	<9.8	<9.8	<9.9	<16	<9.8 / <9.8	<9.8	<9.9	<9.9	<9.7	<9.9	<9.7	<10	<9.9	<16	<9.8	<9.8
4,4'-DDD	49	-	<9.9 / <10	<3.3	<9.8	<9.8	<9.9	<16	<9.8 / <9.8	<9.8	<9.9	<9.9	<9.7	<9.9	<9.7	<10	<9.9	<16	<9.8	<9.8
Endrin ketone	4	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	4	-	<9.9 / <10	<3.3	<9.8	<9.8	<9.9	<16	<9.8 / <9.8	<9.8	<9.9	<9.9	<9.7	<9.9	<9.7	<10	<9.9	<16	<9.8	<9.8
4,4'-DDT	8.2	-	<9.9 / <10	<3.3	**28 C**	**30 C**	**12 C**	**20 C**	**12 C / 15 C**	**15 C**	**17 C**	<9.9	**19 C**	**18 C**	<9.7	<10	**12 C**	**67 C**	**27 C**	<9.8
alpha-Chlordane[3]	9	-	<5.1 / <5.2	3.9 C	**36**	**9.7 C**	<5.1	<8.4	<5.1 / 5.7 C	5.8 C	<5.1	<5.1	6.1	6.7 C	<5	<5.2	6 C	**26 C**	**9.3 C**	<5
gamma-Chlordane[3]	9	-	<5.1 / <5.2	<1.7	**25**	**13 C**	5.6 C	<8.4	7.9 / 8.6	8.6	6.3 C	<5.1	8.2 C	**9.4 C**	<5	<5.2	**9.3**	**33**	**13**	7
Methoxychlor	440	-	<51 / <51	<17	<50	<50	<51	<84	<51 / <51	<51	<51	<51	<50	<51	<50	<52	<51	<84	<51	<50
Toxaphene	-	-	<180 / <180	<60	<180	<180	<180	<300	<180 / <180	<180	<180	<180	<180	<180	<180	<180	<180	<300	<180	<180

Notes:

1. Soil preliminary remediation goals (PRGs) are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-2: "Summary of Selection of Preliminary Remediation Goals and Proposed Cleanup Levels for Non-Petroleum Compounds in Soil" and Table 7-5 "Human Health and Ecological Cleanup Levels for Petroleum Hydrocarbons and Constituents in Soil and Sediments". Listed criteria for non-metals represent the applicable value of the following criteria: Proposed Special Status, Human Health Residential PRGs.

2. Soil and sedimnet PRGs for protection of groundwater are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-5 "Human Health and Ecological Cleanup Levels for Petroleum Hydrocarbons and Constituents in Soil and Sediments". Listed criteria represent PRGs for soil or sediment to Maintain Drinking Water Standard in Groundwater, Greater than 5 Feet above Groundwater (for petroleum products only).

3. Endosulfan PRG was used for Endosulfan I and Endosulfan II. Chlordane PRG was used for alpha-Chlordane and gamma-Chlordane.

Results shaded in gray = Samples BAPSB315 through BAPSB3318 shaded in gray were collected from the surface of a berm constructed along the southeastern edge of the rain garden using excavation spoils. The berm material was subsequently removed and disposed offsite.

Results taken from Curtis and Tompkins Analytical Lab Report # 233803, report date 18 January 2012.

Sample depths indicated in square brackets in sample name.

QA/QC samples including source decontamination water and rinsate were analyzed for total extractable hydrocarbons, polynuclear aromatic hydrocarbons, and organochlorine pesticides, and all analytes were not detected above the reporting limit. Results are depicted in the laboratory analytical reports, included as Appendix A.

Not detected values presented as less than Reporting Limit.

#= CCV drift outside limits; average CCV drift within limits per method requirements.

C = Presence confirmed, but RPD between columns exceeds 40%.

J = Estimated value

PRGs = Preliminary remediation goals

NA = Not analyzed

RL= Reporting Limit

Y= Sample exhibits chromatographic pattern which does not resemble standard.

TPH Diesel = Total petroleum hydrocarbons, diesel range

TABLE 5
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
***DRAFT* REMOVAL ACTION WORK PLAN, BARNARD AVENUE PROTECTED RANGE**
Presidio of San Francisco, California

ARAR	Citation	Description	ARAR Determination [1]	Comments
CHEMICAL-SPECIFIC ARARs AND TBCs				
Federal Chemical-Specific ARARs and TBCs				
Residential Lead-Based Paint Hazard Reduction Act of 1992 (Title X of TSCA)	15 U.S.C. §2681,2683, and 2688; 40 Code of Federal Regulations (CFR) Section 745.65(c) and 745.227(h)(4)	66 Fed. Reg. 1206, 1238 (5 January 2001) revised 40 CFR Part 745 to establish a hazard standard of 400 mg/kg for lead in bare soil in a play area at residential sites and child-occupied facility sites.	Relevant and appropriate	Lead has not been detected in soil at the BAPR at concentrations above the human health residential lead cleanup level for the Presidio of 400 mg/kg.
U.S. EPA Office of Solid Waste and Emergency Response (OSWER) Lead Guidance	OSWER Directive #9355.4-12 (Revised Interim Soil Lead Guidance for CERCLA sites and RCRA Corrective Action Facilities, July 1994); OSWER #9200.4-27P (Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, August 27, 1998)	Outlines approach to determining protective levels for lead in soils at CERCLA sites and identifies 400 parts per million (ppm) as screening level for lead in soil for residential land use.	To be considered	Lead has not been detected in soil at the BAPR at concentrations above the human health residential lead cleanup level for the Presidio of 400 mg/kg.
U.S. EPA, Region 9, Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites	U.S. EPA (May, 2010) (http://www.epa.gov/region9/superfund/prg/index.html)	RSLs are risk-based concentrations which can be used to evaluate whether a chemical release may pose a risk that warrants further investigation. RSLs are not legally enforceable standards. They are used for site "screening" and should not be used as cleanup levels for a CERCLA site until the other remedy selections identified in the relevant portions of the National Contingency Plan (NCP), 40 CFR Part 300, have been evaluated and considered.	To be considered	The cleanup levels for the BAPR were developed using a risk-based approach similar to the development of RSLs.
State Chemical-Specific ARARs and TBCs				
Water Board Order No. R2-2003-0080, Revised Site Cleanup Requirements and Rescission of Order No. 91-082 and Order No. 96-070. 96-070; U.S. Army Corps of Engineers (USACE), Fuel Product Action Level Development Report (FPALDR), Final, Oct. 1995 (soil cleanup levels)	Porter-Cologne Water Quality Control Act promulgated under California Water Code	Order No. R2-2003-0080 includes soil cleanup levels for petroleum hydrocarbons and a number of petroleum-related constituents including carcinogenic and noncarcinogenic polynuclear aromatic hydrocarbons (PAHs), benzene, toluene, ethylbenzene, xylenes (BTEX), methyl tert-butyl ether (MTBE), and lead: soil cleanup levels for the protection of human health (Table 1); soil cleanup levels for the protection of ecological receptors (Table 2); soil cleanup levels for the protection of water quality at detectable levels (Table 3); soil cleanup levels for the protection of water quality at drinking water standards (Table 4); and soil cleanup levels for Crissy Field (Table 5).	To be considered	The cleanup levels for petroleum hydrocarbons and related constituents in soil for the BAPR meet or are more stringent than Board Order R2-2003-0080 Site Cleanup Requirements and FPALDR soil cleanup levels.
		Order No. R2-2003-0080 also includes point-of-compliance concentrations for soil and water for petroleum hydrocarbons, BTEX, and/or MTBE for the saltwater protection zone of the Presidio (Table 6) and the proposed freshwater stream (Table 7).		The BAPR is located within the freshwater ecological protection zone as defined in Order No. R2-2003-0080.
Water Board Environmental Screening Levels (ESLs)	Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Interim Final, May 2008 (http://www.swrcb.ca.gov/sanfranciscobay/esl.shtml)	ESLs can be used to evaluate whether a chemical release may pose a risk that warrants further investigation. ESLs are not legally enforceable standards. They are used for site "screening".	To be considered	The cleanup levels for the BAPR were developed using a risk-based approach similar to the development of ESLs.

TABLE 5
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
***DRAFT* REMOVAL ACTION WORK PLAN, BARNARD AVENUE PROTECTED RANGE**
Presidio of San Francisco, California

ARAR	Citation	Description	ARAR Determination [1]	Comments
DTSC Leadspread, Computer Model, Version 8	Leadspread 8, DTSC Lead Risk Assessment Spreadsheet (http://www.dtsc.ca.gov/AssessingRisk/leadspread8.cfm)	A State of California computer model which calculates preliminary remediation goals for lead in soil based on DTSC default factors and exposure assumptions for a residential child.	To be considered	Using default Leadspread 8 exposure assumptions for a residential child, the preliminary remediation goal for lead in soil is 77 mg/kg. The exposure point concentrations for lead in soil under baseline conditions at the BAPR range from 75 to 82 mg/kg (see Appendix B of the RAW), which approximate the 77 mg/kg preliminary remediation goal.
Presidio-Wide Cleanup Levels	*Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water*, October 2002 (Revised May 2006)	The Cleanup Level Document presents cleanup levels for soil, sediment, groundwater, and surface water that are protective of human health and ecological habitat at the Presidio. The cleanup levels were developed under DTSC guidance and are anticipated to be applied to new decision documents for the Presidio.	To be considered	The soil and sediment cleanup levels for the BAPR are based on the criteria established in the Cleanup Level Document.
LOCATION-SPECIFIC ARARs AND TBCs				
Federal Location-Specific ARARs and TBCs				
National Historic Preservation Act (NHPA)	16 USC §§ 470–470x-6; 36 CFR §§ 800.1–.16, 60.2 (effect of listing in National Register), 65.2 (effect of designation as National Historic Landmark), 68.1–.4 (Dept. of Interior [DOI] standards for historic property projects assisted by the National Historic Preservation Fund)	This Act is applicable to the entire Presidio, since it is designated in the National Register as a historic landmark.	Applicable	
	The Trust Programmatic Agreement	The Programmatic Agreement between the Advisory Council on Historic Preservation, the State Historic Preservation Officer, the Trust and NPS, sets forth the procedures to implement the historic compliance process of Section 106 of the NHPA.	To be considered	
Archeological Resources Protection Act (ARPA)	16 USC §§ 470aa–470mm; 43 CFR §§ 7.1–.37 (DOI regulations for protection of archeological and historical resources)	ARPA prohibits excavation of, damage to, or destruction of archeological resources on public lands without a permit issued by the federal land manager.	Applicable	The procedural permit requirement is not applicable to on-site remedial action. However, the substantive requirements of ARPA apply to remedial actions affecting archeological resources, Native American resources, or artifacts at the Presidio.
Federal Endangered Species Act (ESA)	16 USC §§ 1531(c)(1); 1532; 1533(d); 1536(a)–(d), (g), (h); 1538(a)(1)(B), (a)(1)(G), (a)(2)(B), (a)(2)(E); 1539(a), (c), (d); 1540(a)–(c); 50 CFR §§ 11.1–11.26, 13.1–13.29, 402.01–402.16, 424.01–424.21	Under the ESA, federal agencies must make sure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or cause the destruction or adverse modification of critical habitat. Two federal endangered or threatened bird species have been recorded as casual visitors to the Presidio and vicinity: marbled murrulet, and snowy plover. Four federal threatened or endangered plant species have been identified at various locations at the Presidio: Raven's manzanita, Presidio clarkia, Marin dwarf flax, and San Francisco lessingia.	Applicable	Threatened or endangered species are not known to occur in the vicinity of the BAPR.
Archeological and Historic Preservation Act (AHPA)	16 USC §§ 469–469c-2; 43 CFR §§ 7.1-3.7 (DOI regulations for protection of archeological and historic resources)	AHPA requires federal agencies, prior to engaging in activities that could cause irreparable loss of scientific, prehistorical, historical, or archeological data, to notify the Secretary of the Interior of the threatened data and the proposed activities, and to preserve the data or request that the Secretary do so. The DOI must conduct a survey and recovery effort if it finds the data are significant and may be irrevocably lost without such action.	Applicable	

TABLE 5
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
***DRAFT* REMOVAL ACTION WORK PLAN, BARNARD AVENUE PROTECTED RANGE**
Presidio of San Francisco, California

ARAR	Citation	Description	ARAR Determination (1)	Comments
Native American Graves Protection and Repatriation Act (NAGPRA)	25 USC §§ 3001-3013; 43 CFR §§ 10.1-.17	NAGPRA establishes a system for determining ownership and proper disposal/removal of Native American cultural items discovered in federal lands and requires inventorying and identification of those items. Such items must be returned to the relevant tribe.	Applicable	
Migratory Bird Treaty Act	16 USC §§ 703–708; 50 CFR §§ 10.12, 10.13	The Act prohibits the taking of migratory birds, their nests and their eggs, unless permitted by the Secretary of the Interior. Migratory birds have been observed at the Presidio.	Applicable	
Golden Gate National Recreation Area (GGNRA) Act	16 USC § 460bb–460bb-5, purposes of Section 1	Among the purposes stated in Section 1 of the GGNRA Act are to preserve the recreation area, to the degree possible, in its natural setting, and protect it from development and uses that would destroy the scenic beauty and natural character of the area.	Applicable	
Presidio Trust Act	The Presidio Trust Act, Section 104(a) of Public Law 104-333 as amended; 16 U.S.C §460bb appendix	The Trust shall manage the leasing, maintenance, rehabilitation, repair, and improvement of property within the Presidio under its administrative jurisdiction using the authorities provided in this section, which shall be exercised in accordance with the purposes set forth in Section 1 of the act, entitled "An Act to establish the Golden Gate National Recreation Area in the State of California, and for other purposes," approved 27 October 1972 (Public Law 92-589; 86 Stat. 1299; 16 USC 460bb), and in accordance with the general objectives of the General Management Plan for the Presidio. Resolution 99-11 of the Presidio Trust Board sets forth the general objectives which are not explicit in the General Management Plan Amendment.	Applicable	
Vegetation Management Plan (VMP)	*Presidio of San Francisco Vegetation Management Plan and Environmental Assessment*, December 2001	The VMP guides the management of vegetative resources within the Presidio, including enhancing, restoring, and rehabilitating native and planted vegetation at the Presidio. The VMP establishes the vegetative schemes for the Presidio.	To be considered	
Presidio Trust Management Plan (PTMP)	*Presidio Trust, Presidio Trust Management Plan, Land Use Policies for Area B of the Presidio of San Francisco*, May 2002	The PTMP provides guidelines for the management and improvement of Area B of the Presidio. The PTMP emphasizes preservation and enhancement of the Presidio's cultural, natural, scenic, and recreational resources for public use.	To be considered	
Clean Water Act (CWA)	33 USC §1344; 33 CFR §323, 320-330; 40 CFR 230, 232	Section 404 of the CWA regulates the placement of dredged and fill material into waters of the U.S., including wetlands. The Act authorizes the issuance of permits for such discharges as long as the proposed activity complies with environmental requirements specified in Section 404(b)(1) of the CWA. The U.S. Army Corps of Engineers (USACE) has primary responsibility for the permit program and issues Section 404 permits. Section 404 of the CWA requires that states certify compliance of federal permits or licenses with state water quality requirements and other applicable state laws. Under Section 401, states have authority to review any federal permit or license that may result in a discharge to wetlands and other waters under state jurisdiction.	Applicable	A seasonal drainage swale, identified as Lower Landfill E, lies in the footprint of the BAPR. The swale was identified as having U.S. Fish and Wildlife Service (USFWS) wetland habitat (NPS and URS, 2003). Even if the wetlands were determined to be waters of the U.S., the procedural permit requirement is not applicable to on-site remedial action at the BAPR.
Federal wetlands regulations and state wetland policy	Executive Order 11990; 40 CFR § 6.302.(a), (d), (g); CA Fish & Game Commission's Wetlands Policy	Executive Order 11990 requires federal agencies conducting certain activities to avoid, to the extent practicable, adverse impacts associated with the destruction or loss of wetlands. The Cal. Dept. of Fish & Game Commission's wetlands policy instructs the Dept. of Fish & Game to recommend protection, preservation, restoration, enhancement and expansion of wetlands when the Dept. of Fish & Game acts in an advisory role.	Executive Order - Relevant and appropriate CA Wetlands Policy – To be considered	A seasonal drainage swale, identified as Lower Landfill E, lies in the footprint of the BAPR. The swale was identified as having U.S. Fish and Wildlife Service (USFWS) wetland habitat (NPS and URS, 2003).

TABLE 5
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
***DRAFT* REMOVAL ACTION WORK PLAN, BARNARD AVENUE PROTECTED RANGE**
Presidio of San Francisco, California

ARAR	Citation	Description	ARAR Determination [1]	Comments
State Location-Specific ARARs and TBCs				
Basin Plan, Wetlands Protection Management	Porter-Cologne Water Quality Control Act promulgated under California Water Code, § 13240-13241, Basin Plan, pp. 4-49 to 4-51	The Basin Plan reaffirms the goal of the California Wetlands Conservation Policy of ensuring no net loss of wetlands.	To be considered	A seasonal drainage swale, identified as Lower Landfill E, lies in the footprint of the BAPR. The swale was identified as having U.S. Fish and Wildlife Service (USFWS) wetland habitat (NPS and URS, 2003).
California Regulations for Discovery of Human Remains	Cal. Health & Safety Code §§ 7050.5	The Cal. Health & Safety Code establishes intentional disturbance, mutilation, or removal of interred human remains as a misdemeanor. This Code requires that further excavation or disturbance of land, upon discovery of human remains outside of a dedicated cemetery, cease until a county coroner makes a report. This Code requires a county coroner to contact the Native American Heritage Commission within 24 hours if the coroner determines that the remains are not subject to his or her authority and if the coroner recognizes the remains to be those of a Native American.	To be considered	
California Endangered Species Act (CESA)	Cal. Fish & Game Code §§ 2053–2054, 2081, 2080.1, 2081.1; 14 CCR §§ 670.2, 670.5, 783.1-783.6; Cal. Fish & Game Code § 2014	The California ESA provides authority similar to the Federal ESA for the protection of threatened and endangered species listed by the State. Four California endangered or threatened plant species have been identified at the Presidio: Raven's Manzanita, Presidio clarkia, Marin dwarf flax, and San Francisco Lessingia. Three California endangered or threatened bird species have been recorded as casual visitors to the Presidio and vicinity: bald eagle, marbled murrulet, and willow flycatcher.	To be considered	Threatened or endangered species are not known to occur in the vicinity of the BAPR.
California Native Plant Protection Act	Cal. Fish & Game Code § 1908; 14 CCR §§ 783.1–783.6	The California Native Plant Protection Act prohibits the taking of endangered or rare native plants, unless authorized by an incidental take permit. The Presidio has a number of endangered or rare plants specified under the California Native Plant Protection Act.	To be considered	Endangered or rare native plant species are not known to occur in the vicinity of the BAPR.
California Fish & Game Code regarding protection of birds, mammals, reptiles, or amphibia	Cal. Fish & Game Code §§ 3503, 3503.5, 3511, 3513; 14 CCR § 747	The California Fish & Game Code prohibits taking, possessing, or destroying certain birds, their nests, and their eggs; mammals; reptiles; or amphibia. Migratory and other birds have been observed at the Presidio. Remedial actions that include removal of vegetation that may provide nests for migratory birds may require additional review.	To be considered	

TABLE 5
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
***DRAFT* REMOVAL ACTION WORK PLAN, BARNARD AVENUE PROTECTED RANGE**
Presidio of San Francisco, California

ARAR	Citation	Description	ARAR Determination [1]	Comments
ACTION-SPECIFIC ARARs AND TBCs				
Federal Action-Specific ARARs and TBCs				
Resource Conservation and Recovery Act (RCRA)	40 CFR §§260-299; Subtitle C (hazardous waste requirements); State of California citation: Cal. Health & Safety Code, Title 22	RCRA is the primary federal law governing the disposal of hazardous and non-hazardous or municipal solid waste passed by Congress in 1976 and amended in 1984 by Hazardous and Solid Waste Amendments (HSWA). RCRA Subtitle C sets standards for the classification of hazardous waste, and requirements governing handling, management, transportation, treatment, and off-site disposal of these wastes. As specified in the Consent Agreement, the Trust addresses releases of (1) hazardous substances and hazardous waste at the Presidio under its hazardous substances and hazardous waste program overseen by the DTSC; and (2) non-hazardous petroleum hydrocarbons at the Presidio under its petroleum program overseen by the Water Board.	Relevant and appropriate	
Toxic Substances Control Act (TSCA)	15 USC §§ 2602, 2605(e) (regulation of polychlorinated biphenyls [PCBs]); 40 CFR 761.1-761.3 (definitions) & Subparts C (§§ 761.40-.45)(marking of PCBs and PCB items), D (§§ 761.50-.79) (storage and disposal of PCBs), N-R (§§ 761.260-.359) (sampling and analysis of PCB waste	TSCA regulates the use and disposal of various chemicals, including PCBs. Subpart D of 40 CFR Part 761 outlines disposal and cleanup procedures for wastes with a PCB concentration of at least 50 ppm [40 CFR §§ 761.60-.61] and prohibits the unpermitted discharge of PCBs to navigable waters or a treatment works at more than 3 parts per billion (ppb) concentration [id. § 761.50(a)(3)]. Certain PCBs in soil must be cleaned up and disposed of in accordance with Section 761.61. Certain liquid PCBs must be incinerated or otherwise disposed of in accordance with Section 761.60(a) or (e) [id. § 761.61(b)]. TSCA also contains specified requirements for labeling of containers and equipment with PCB-containing materials, and of transport vehicles carrying a certain amount of liquid PCBs (id. § 761.40).	Relevant and appropriate	PCBs are not chemicals of concern at the BAPR.
Clean Water Act (CWA)	33 USC §1342	Section 402 of the CWA regulates discharges of pollutants under the National Pollutant Discharge Elimination System (NPDES). The storm water discharges program is regulated by the State Water Board for certain municipal, industrial, and construction storm water discharges through NPDES permits. NPDES permits include requirements to prevent or reduce discharges of pollutants that cause or contribute to violations of water quality objectives.	Relevant and appropriate	The procedural permit requirement is not applicable to on-site remedial action at the BAPR.
Fish and Wildlife Coordination Act	16 USC §§ 661-663(c)	If stream realignment or modification is proposed or authorized by a Federal agency in an area not under its land management authority, then 16 USC § 662(a) requires the Federal agency to consult with U.S. Fish and Wildlife Service and the DOI to prevent loss or damage to wildlife as a result of the project. Under 16 USC § 662(h), projects carried out by Federal agencies with respect to Federal lands under their jurisdiction are exempt from and not applicable to these provisions.	To be considered	

TABLE 5
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
***DRAFT* REMOVAL ACTION WORK PLAN, BARNARD AVENUE PROTECTED RANGE**
Presidio of San Francisco, California

ARAR	Citation	Description	ARAR Determination [1]	Comments
State Action-Specific ARARs and TBCs				
Consent Agreement for the Remediation of Hazardous Substances at the Presidio of San Francisco (Consent Agreement)	Consent Agreement Between the California Department of Toxic Substances Control, the Presidio Trust, and the US Department of the Interior, National Park Service for the Remediation of Hazardous Substances at the Presidio of San Francisco (August 30, 1999)	The Consent Agreement establishes responsibilities and procedures between these parties for cleanup of releases of hazardous substances and hazardous waste at the Presidio under CERCLA and RCRA, specifically governing cleanup of nine Operable Units (OUs). The Trust addresses releases of hazardous substances and hazardous waste at the Presidio under its hazardous substances and hazardous waste program overseen by the DTSC. The definition of hazardous substances governed under CERCLA excludes petroleum hydrocarbons, as specified in the NCP at 40 CFR, Part 300.5. Accordingly, the Trust addresses releases of petroleum hydrocarbons at the Presidio under its petroleum program overseen by the Water Board.	To be considered	
Institutional controls on soil and groundwater	California Civil Code § 1471; Cal. Health & Safety Code § 25355.5(a)(1)(C); CCR tit. 22 § 67391.1(e)	Provides conditions under which land use restrictions will apply to successive owners of land. The substantive provision is the following general narrative standard: "to do or refrain from doing some act on his or her own land…where (c) each such act relates to the use of land and each such act is reasonably necessary to protect present or future human health or safety of the environment as a result of the presence of hazardous materials, as defined in § 25260 of the Cal. Health & Safety Code." This language provides authority for establishing a durable institutional control that will be implemented through incorporation of restrictive environmental covenants that run with the land in both the federal deed at the time of transfer of the property and in the Covenant to Restrict Use of Property with DTSC to be executed at the time of transfer. Whenever DTSC determines that it is not feasible to record a land use covenant for property owned by the federal government, such as transfers from one federal agency to another, DTSC and federal government shall use other mechanisms to ensure that future land use will be compatible with the levels of hazardous materials, hazardous wastes or constituents, or hazardous substances which remain on the property. Examples include: amendments to the federal government facility master plan, physical monuments, or agreements between the federal government facility and DTSC. The Presidio Trust's LUCMRR for Area B serves as the implementation and enforcement plan to meet the requirements of this Code. The LUCMRR describes the procedures used to implement LUCs at Area B sites at the Presidio.	Relevant and appropriate	The removal action work plan for the BAPR indicates that contaminants in soil will be removed to meet site-specific cleanup levels. LUCs are not expected but could be implemented if levels of contaminants remain in soil at the BAPR above cleanup levels.
Basin Plan - Chapter 4: Effluent Limitations	Porter-Cologne Water Quality Control Act promulgated under California Water Code § 13240-13241, Basin Plan, pages 4-8 to 4-11	Limitations to construction-related storm water discharges are described in this provision.	To be considered	
Discharge of Treated Groundwater Table 4-1: Discharge Prohibitions	Porter-Cologne Water Quality Control Act promulgated under California Water Code § 13240-13241, Basin Plan, pp. 4-17 to 4-18; Table 4-1	Table 4-1 more broadly describes discharge prohibitions (e.g., with respect to toxic substances, solid wastes, silt, sediments, oil, and petroleum by-products). Page 4-17 of the Basin Plan refers to SWRCB Resolution No. 88-160, Disposal of Extracted Groundwater from Cleanup Projects, which urges dischargers of groundwater extracted from site clean-up projects to reclaim their effluent. It states that when reclamation is not feasible, discharges must be piped to a municipal treatment plant or discharged under a National Pollutant Discharge Elimination System (NPDES) permit authorizing the discharge from these sites.	To be considered	

TABLE 5
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
***DRAFT* REMOVAL ACTION WORK PLAN, BARNARD AVENUE PROTECTED RANGE**
Presidio of San Francisco, California

ARAR	Citation	Description	ARAR Determination (1)	Comments
Surface Water Protection	Porter-Cologne Water Quality Control Act promulgated under California Water Code, § 13240-13241, Basin Plan pp. 4-28, 4-32, 4-40 to 4-41	Surface Water Protection and Management through nonpoint source control is regulated by the Water Board. Under the Construction General Permit 99-08-DWQ, the Water Board requires a Notice of Intent (NOI) to be filed prior to construction, a Storm Water Pollution Prevent Plan (SWPPP) to be prepared and implemented, and a Notice of Termination to be filed upon construction completion for construction activities involving disturbance of one acre or greater total land. Permit conditions address pollutant and waste discharges occurring during construction activities and the discharge of pollutants in runoff after construction. The Erosion and Sediment Control program establishes guidelines for the regulation of erosion and sedimentation for the protection of beneficial uses of water due to the impairment by sediment.	To be considered	
Hazardous Waste Requirements - Generation, Transport, and Disposal Regulations	State of California citation: Cal. Health & Safety Code §§ 25100–25249, 25250–25250.26, 25260–25929; 22 CCR §§ 66260.1–68500.35. Federal citation: 42 USC §§ 6901–6991i; 40 CFR Parts 260–282. §§ 25100-25166.5, 25179.1–.12 (land disposal restrictions [LDRs]), 25244–25244.24 (waste reduction and recycling); 22 CCR §§ 66260.10–66262.41, 66264.1–.172, 66265.16–199; 66268.10–.44, .105–113 (LDRs + treatment standards); 49 CFR Parts 172, 173, 178, 179 (transportation) [incorporated by reference]	Pursuant to 42 USC § 7926, the State of California is authorized to implement the federal RCRA Program. Federal statutes may apply to areas not covered by the state program, or where incorporated by reference.	Relevant and appropriate	
Medical Waste Handling Requirements	Cal. Health and Safety Code 117600-118360; SF Municipal Health Code §§ 1501-1514	Medical waste is required to undergo certain treatment requirements prior to disposal so that it can be characterized as a "solid" waste. Without such treatment, land disposal of medical waste is not permitted.	Relevant and appropriate	Medical waste is not expected to be encountered at the BAPR.
Solid (Nonhazardous) Waste Requirements	Cal. Pub. Res. Code §40000-40201, 43000-44820; 27 CCR §§ 20005-20278	These requirements govern disposal of nonhazardous solid waste and closure and post closure of solid waste management units.	To be considered	
Clean Closure Requirements	27 CCR § 20380(d)(2); 27 CCR § 21090(f); CCR § 21410	For clean closure, all waste, waste residues, contaminated containment systems components, contaminated subsoil, and all other contaminated materials are removed or decontaminated at closure pursuant to the specific requirements for landfills, etc. Clean closure renders the landfill no longer a threat to water quality.	Relevant and appropriate	

TABLE 5
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
***DRAFT* REMOVAL ACTION WORK PLAN, BARNARD AVENUE PROTECTED RANGE**
Presidio of San Francisco, California

ARAR	Citation	Description	ARAR Determination (1)	Comments
Closure, Post-Closure Maintenance and Land Use Restrictions	Cal. Health and Safety Code §§ 25100-25124 (definitions), 25208-25208.17 (special rules for surface impoundments), 25209-25209.7 (land treatment units); 25245-25249 (financial responsibility and closure and maintenance of facilities), 25297.15, 25299.10-25299.99.3 (closure of/corrective action regarding USTs); 22 CCR §§ 66264.110-66264.120, 66265.110-66265.120; 67217 (post-closure care)	Provisions of the California Health and Safety Code and implementing regulations govern the method and timing of closure of certain types of locations with material above hazardous waste levels (e.g., landfills), and the required post-closure care of those facilities, including meeting associated financial requirements (H & S Code 25208-25208.17, 25245-25249 financial responsibility and closure and maintenance of facilities); 22 CCR 66264.110-66264.148, 66264.228 (surface impoundments); 22CCR 66264.258 (waste piles); H & S Code 25209-25209.7; 22CCR 66264.280 (land treatment units); 66264.310 (landfills); 66264.351 (incinerators).	To be considered	
Federal Clean Air Act (CAA), certain Bay Area Air Quality Management District (BAAQMD) Regulations	BAAQMD Regulations (see citations below)	Implementation of federal Clean Air Act requirements has been delegated, in part, to the State of California. The BAAQMD is the local implementing agency. Where BAAQMD requirements have been incorporated into the State Implementation Plan (SIP) and approved by EPA, they are federally-enforceable. Where BAAQMD requirements have not been incorporated into the SIP and approved by EPA, they are not federally enforceable.	Relevant and appropriate	
	Air Resources Board Executive Order G-02-026, Resolution 0128, Modification to Section 93105 of Title 17 of the CCR, Asbestos Air-borne Toxic Control Measures for Construction, Grading, Quarrying, and Surface Mining Operations	The Model Rule addresses potential asbestos releases that may occur during construction, grading, quarrying, and surface mining on areas that contain naturally occurring asbestos. Excavation in serpentine rock may result in the emission of naturally occurring asbestos. Such activities in areas larger than 1 acre will require a dust mitigation plan.	To be considered	Naturally-occurring asbestos is not expected to be encountered at the BAPR.
	BAAQMD Regulation 7; Regulation 8, Rule 40; and Regulation 9, Rule 2	These requirements regulate the emission of odorous substances, organic compounds, and hydrogen sulfide.	Relevant and appropriate	
	BAAQMD Regulation 8, Rule 15	BAAQMD Regulation 8, Rule 15 prohibits the use of certain types of liquid and emulsified asphalts (those that would emit large amounts of organic compounds). This rule was approved into the SIP on 22 March 1995, as amended by BAAQMD on 1 June 1994.	Relevant and appropriate	
California prohibitions on polluting waters of the State	Cal. Fish & Game Code § 5650	Cal. Fish & Game Code § 5650(a) prohibits depositing enumerated substances, including “any substance or material deleterious to fish, plant life, or bird life” into the waters of the state.	To be considered	
Underground Storage Tank (UST) Regulations	California Code of Regulations, Title 23, Chapter 16, Article 11	UST regulations protect waters of the state from discharges of hazardous substances from USTs.	Relevant and appropriate	No USTs are known to be present at the BAPR.
Water Board Order No. R2-2003-080	Porter-Cologne Water Quality Control Act promulgated under California Water Code Section 13304	Order No. R2-2003-0080, Task 16, outlines requirements for Contingency Petroleum Sites.	To be considered	

TABLE 5
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
***DRAFT* REMOVAL ACTION WORK PLAN, BARNARD AVENUE PROTECTED RANGE**
Presidio of San Francisco, California

ARAR	Citation	Description	ARAR Determination [1]	Comments
San Francisco Bay Water Board UST Program	California Health and Safety Code, Division 20, Chapters 6.7 and 6.75	The San Francisco Bay Water Board UST Program gives local agencies the authority to oversee investigation and cleanup of UST leak sites.	Relevant and appropriate	No USTs are known to be present at the BAPR.
City and County of San Francisco UST Regulations	San Francisco Health Code, Article 21	These regulations describe procedures that the San Francisco Department of Public Health requires UST owners and operators to follow in removing USTs.	To be considered	No USTs are known to be present at the BAPR.
City of San Francisco Noise Regulations	City of San Francisco Code, Article 29 § 2907 and 2908	These regulations describe provisions to regulate noise during operation of construction equipment and when performing construction work at night. Nighttime construction (between 8 p.m. to 7 a.m.) to erect, construct, demolish, excavate for, alter, or repair any building or structure if the noise level created thereby is in excess of the ambient noise level by 5 dBA requires a permit by the Director of Public Works.	To be considered	
San Francisco Public Utilities Commission, Permit No. 05-0246 Industrial User Class II Wastewater Permit, dated February 7, 2005	San Francisco Municipal Code: Public Works Code, Article 4.1	Permit No. 05-0246 from the San Francisco Public Utilities Commission authorizes the Trust to discharge wastewater into the City and County of San Francisco sewerage system, provided that such wastewater discharges are performed in accordance with the conditions set forth in this permit. Discharge to the sewer of groundwater from dewatering must meet these requirements.	To be considered	
Department of Fish and Game's Lake and Streambed Alteration Program	Cal. Fish & Game Code §§ 1600-1607	These regulations require a state or local agency who proposes a project that will substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any stream or use materials from a streambed to notify the Dept. of Fish & Game before beginning the project. If Dept. of Fish & Game determines that the proposed project may substantially adversely affect existing fish or wildlife resources, the project proponent would need to obtain a Lake or Streambed Alteration Agreement from the Dept. of Fish & Game and the proposed project, unless it is otherwise exempt, would have to be reviewed in accordance with the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.).	To be considered	

[1] Locations for remote staging areas will be identified prior to remedial activities. Remote staging areas will have similar action- and chemical-specific ARARs and TBCs as the BAPR. Location-specific ARARs and TBCs may be more or less stringent, depending on the location of the staging area.

Table 6
Applicable Cleanup Levels for PCOCs in Soil and Sediment at BAPR
Draft Removal Action Work Plan, Barnard Avenue Protected Range
The Presidio of San Francisco, California

	Cleanup Levels Applicable to Area Mapped as Ecological Buffer Zone[1]		Cleanup Levels Applicable to Area Mapped as Ecological Special Status Zone[2]		Cleanup Levels Applicable to Tennessee Hollow Drainage Area Designated as Freshwater Ecological Protection Zone[3]		
	Soil Cleanup Level: Ecological Buffer Zone, Human Health-Residential, Colma Lithology (mg/kg)[4]	Protection of Groundwater (mg/kg)[5]	Soil Cleanup Level: Ecological Special Status Zone, Human Health-Residential, Colma Lithology (mg/kg)[6]	Protection of Groundwater (mg/kg)[5]	Soil Cleanup Level: Ecological Special Status Zone, Human Health-Residential, Colma Lithology (mg/kg)[6]	Sediment Ecological Special Status (mg/kg)[7]	Protection of Groundwater (mg/kg)[5]
METALS							
Antimony	5	--	5	--	5	3	--
Copper	120	--	49	--	49	114	--
Lead	300	--	160	--	160	82	--
Selenium	1.1	--	0.5	--	0.5	1.6	--
Zinc	79	--	79	--	79	230	--
PETROLEUM HYDROCARBONS							
TPH Diesel C12-C24	700	15,000	700	15,000	700	144	15,000
ORGANOCHLORINE PESTICIDES							
4,4'-DDE	0.61	--	0.098	--	0.098	0.016	--
4,4'-DDD	0.53	--	0.049	--	0.049	0.016	--
4,4'-DDT	0.53	--	0.0082	--	0.0082	0.032	--
alpha-Chlordane [8]	0.04	--	0.009	--	0.009	0.01	--
gamma-Chlordane [8]	0.04	--	0.009	--	0.009	0.01	--

Notes:

1. Ecological Buffer Zone cleanup levels apply to the east side of the site in the area mapped as an ecological buffer zone in the Cleanup Level Document (EKI, 2002).

2. Ecological Special Status Zone cleanup levels apply to the west side of the site (outside of the drainage area) in the area mapped as a special status species zone in the Cleanup Level Document (EKI, 2002).

3. Cleanup levels within the Tennessee Hollow drainage area, which is designated as a freshwater ecological protection zone (RWQCB, 2003) and mapped as a special status species zone in the Cleanup Level Document (EKI, 2002), are the more stringent of the levels between the Ecological Special Status and Freshwater Sediment criteria.

4. Soil cleanup levels are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-2: "Summary of Selection of Preliminary Remediation Goals and Proposed Cleanup Levels for Non-Petroleum Compounds in Soil". Listed criteria represent the applicable value of the following criteria: Proposed Buffer Zone PRGs, Human Health Residential PRGs, Colma fm. Background. Listed PRGs for metals are selected as applicable per EKI 2002 Table 7-2 footnote f. Background level for zinc based on revised value reported in the *Draft Development of Zinc Background Levels for Colma Formation and Mixed Beach Dune and Colma Formation Soils (AMEC, 2012).*

5. Soil and sediment cleanup levels for protection of groundwater are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-5 "Human Health and Ecological Cleanup Levels for Petroleum Hydrocarbons and Constituents in Soil and Sediments". Listed criteria represent cleanup level for soil or sediment to Maintain Drinking Water Standard in Groundwater, Greater than 5 Feet above Groundwater (for petroleum products only).

6. Soil cleanup levels are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-2: "Summary of Selection of Preliminary Remediation Goals and Proposed Cleanup Levels for Non-Petroleum Compounds in Soil" and Table 7-5 "Human Health and Ecological Cleanup Levels for Petroleum Hydrocarbons and Constituents in Soil and Sediments". Listed criteria represent the applicable value of the following criteria: Proposed Special Status PRGs, Human Health Residential PRGs, Colma fm. Background. Background level for zinc based on revised value reported in the Draft Development of Zinc Background Levels for Colma Formation and Mixed Beach Dune and Colma Formation Soils (AMEC, 2012).

7. Sediment PRGs are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-3: "Ecological Cleanup Levels for Non-Petroleum Compounds in Sediment at the Presidio of San Francisco (Freshwater)".

8. Chlordane cleanup level was used for alpha-Chlordane and gamma-Chlordane.

TABLE 7
COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES
Draft Removal Action Work Plan, Barnard Avenue Protected Range
Presidio of San Francisco, California

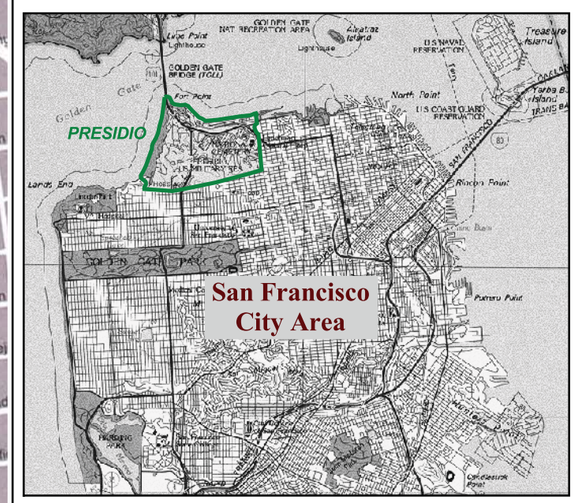
	Effectiveness		**Implementability**			**Cost**
Removal Action Alternative	*Protective of Human Health and Environment*	*Ability to achieve RAOs*	*Technical Feasibility*	*Availability*	*Administrative Feasibility*	
No Action	Alternative is not protective of the environment.	Site RAOs will not be achieved.	No technology to implement.	No technology to implement	No technology to implement.	$0
Containment	Alternative is protective of human health and the environment. However, to have long-term effectiveness, this alternative would need to be maintained and intrusive activities would need to be managed in an operation and maintenance plan.	Site RAOs will be achieved as long as on-going maintenance and restrictions are implemented.	This alternative is easy to implement.	This alternative is straightforward and well understood.	This alternative is straightforward; but requires long-term maintenance.	$451,900
Excavation and off-site disposal	Alternative is protective of human health and the environment in the long-term. Shallow soil exceeding ecological and sediment cleanup levels would be removed.	Alternative would achieve RAOs in a reasonable timeframe.	This alternative is easy to implement.	This alternative is straightforward and well understood.	This alternative is straightforward and well understood.	$449,400

FIGURES

LEGEND

Area A and B boundary

Notes:
Area A Stewardship by the National Park Service.
Area B Stewardship by the Presidio Trust.



Geosyntec

SITE LOCATION MAP
BARNARD AVENUE PROTECTED RANGE
REMOVAL ACTION WORKPLAN
PRESIDIO TRUST
SAN FRANCISCO, CA

THE PRESIDIO TRUST

DECEMBER 2012
FIGURE 1

SOURCE: Base map provided by Treadwell & Rollo, November 2004. *Draft Small Arms Firing Range Feasibility Study Report*, Figure 6.

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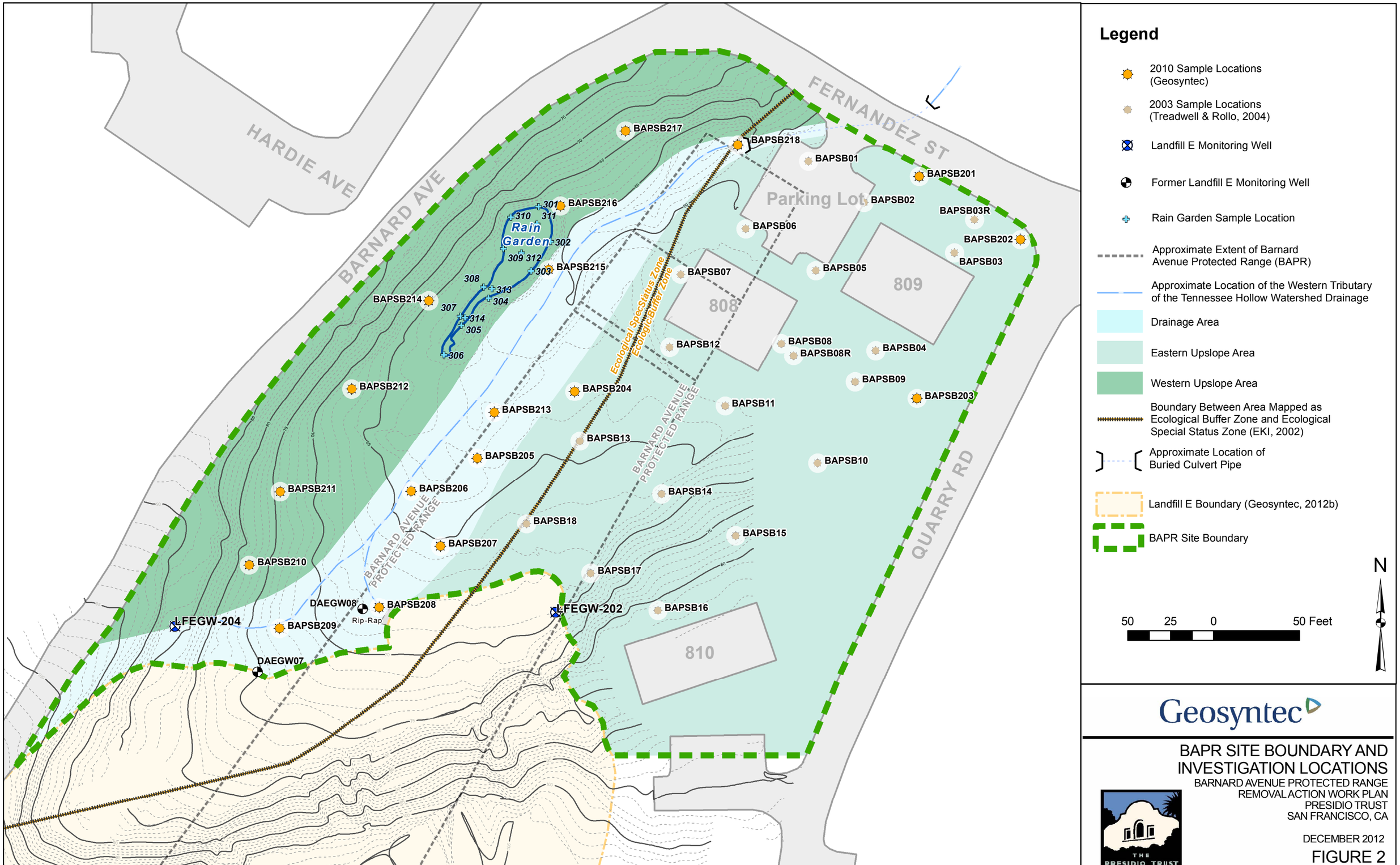

BAPR SITE BOUNDARY AND INVESTIGATION LOCATIONS

BARNARD AVENUE PROTECTED RANGE
REMOVAL ACTION WORK PLAN
PRESIDIO TRUST
SAN FRANCISCO, CA

DECEMBER 2012

FIGURE 2

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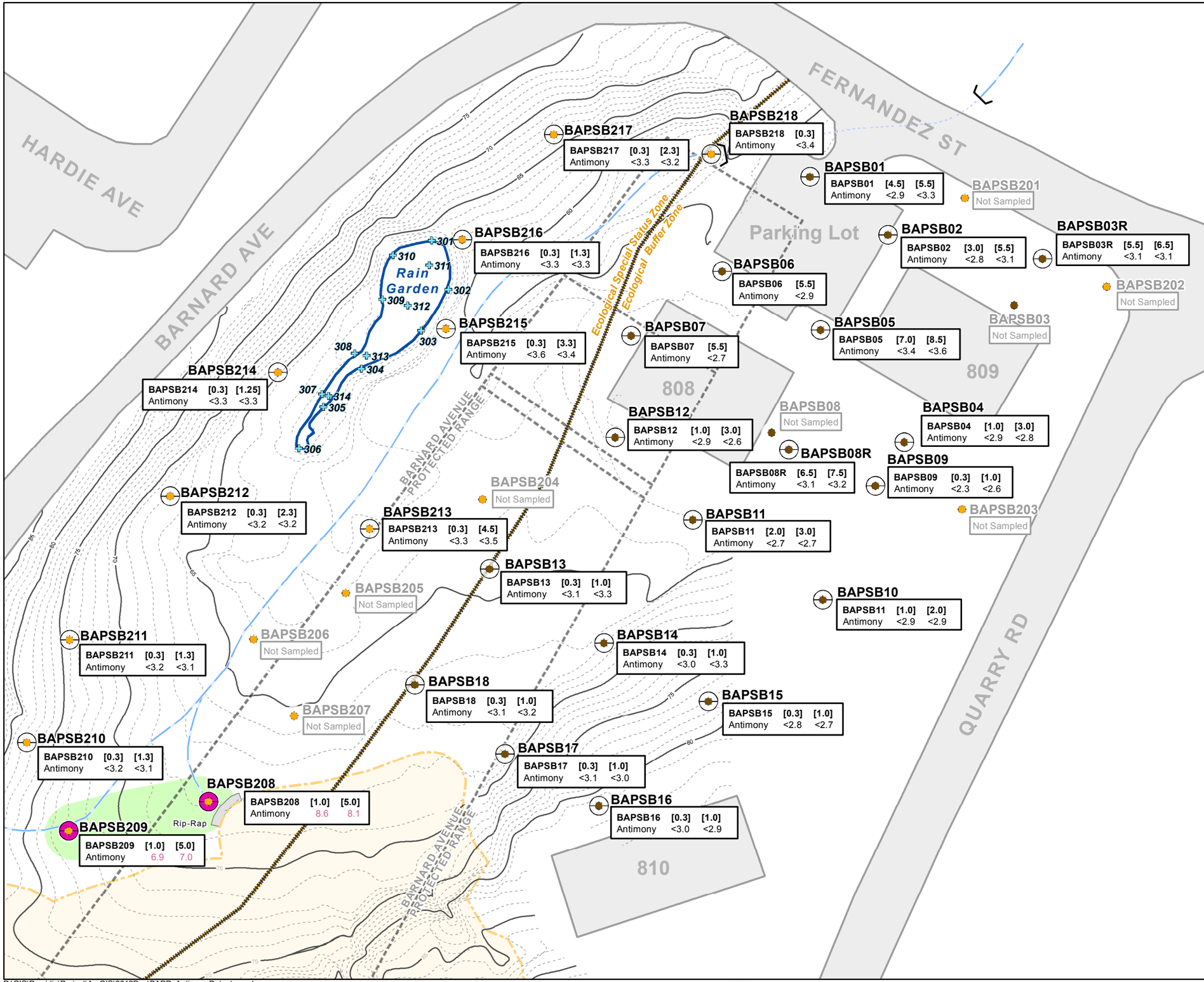

Legend

- 2010 Sample Locations (Geosyntec)
- 2003 Sample Locations (Treadwell & Rollo, 2004)
- Antimony Above Screening Level in Shallow Sample (<1 foot). See Table 1 for Screening Criteria
- Antimony Above Screening Level in Deep Sample (>1 foot). See Table 1 for Screening Criteria
- Rain Garden Sample Location
- Approximate Extent of Barnard Avenue Protected Range (BAPR)
- Approximate Location of the Western Tributary of the Tennessee Hollow Watershed Drainage
- Boundary Between Area Mapped as Ecological Buffer Zone and Ecological Special Status Zone (EKI, 2002)
- Approximate Location of Buried Culvert Pipe
- Landfill E Boundary (Geosyntec, 2012b)
- Approximate Extent of Antimony Exceeding Screening Levels witihin BAPR

N

[Depth in feet]

BAPSB217 [0.3] [2.3]
Antimony <3.3 <3.2

Results in mg/kg
Black values are at or below soil screening level
Red values are above soil screening level
See data Table 1 for duplicated analytical results, not depicted.

40 20 0 40 Feet

Geosyntec

DISTRIBUTION OF ANTIMONY IN SOIL

BARNARD AVENUE PROTECTED RANGE
REMOVAL ACTION WORK PLAN
PRESIDIO TRUST
SAN FRANCISCO, CA

THE PRESIDIO TRUST

DECEMBER 2012

FIGURE 3

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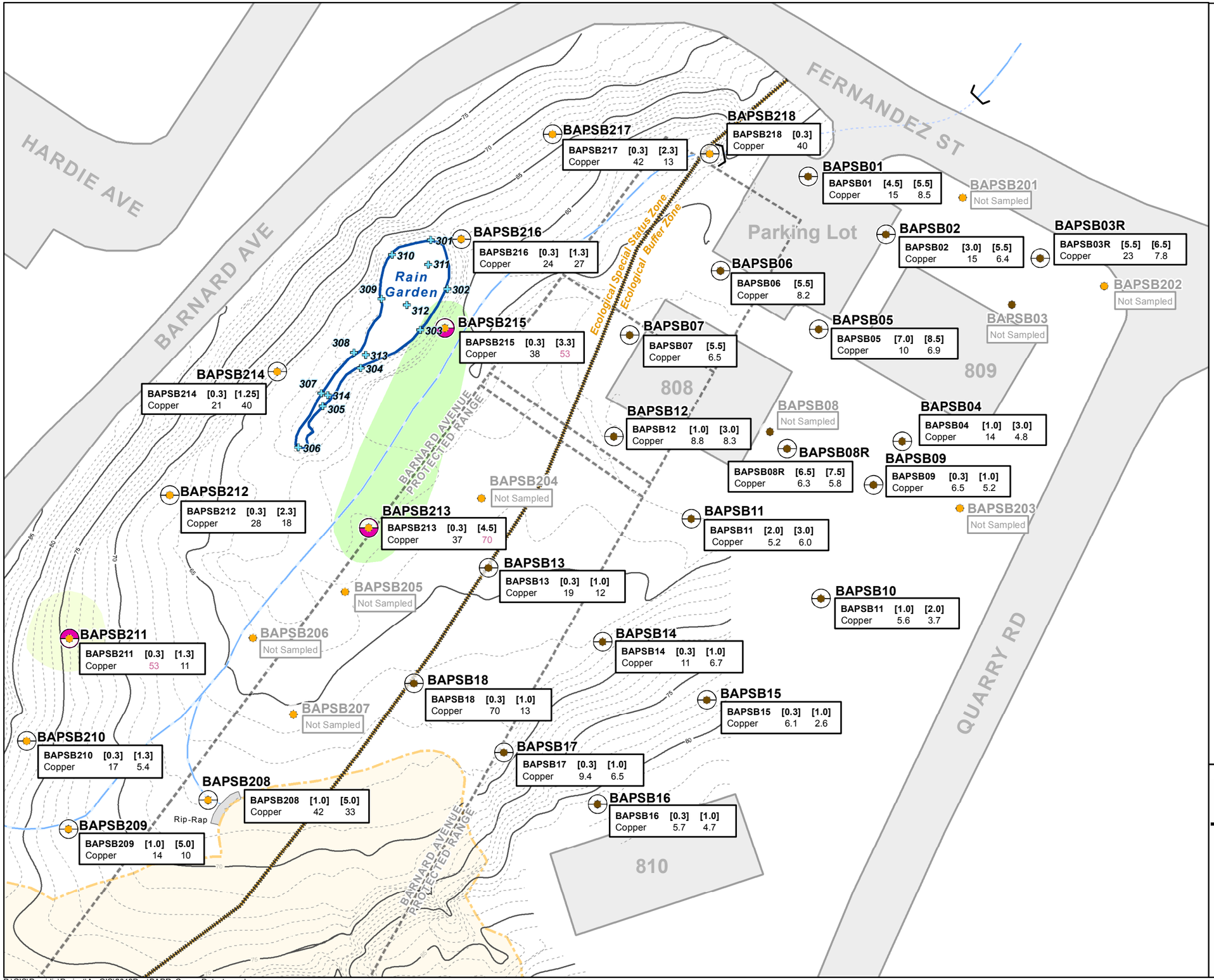

Legend

- 2010 Sample Locations (Geosyntec)
- 2003 Sample Locations (Treadwell & Rollo, 2004)
- Copper Above Screening Level in Shallow Sample (<1 foot). See Table 1 for Screening Criteria
- Copper Above Screening Level in Deep Sample (>1 foot). See Table 1 for Screening Criteria
- Rain Garden Sample Location
- Approximate Extent of Barnard Avenue Protected Range (BAPR)
- Approximate Location of the Western Tributary of the Tennessee Hollow Watershed Drainage
- Boundary Between Area Mapped as Ecological Buffer Zone and Ecological Special Status Zone (EKI, 2002)
- Approximate Location of Buried Culvert Pipe
- Landfill E Boundary (Geosyntec, 2012b)
- Approximate Extent of Copper Exceeding Screening Levels witihin BAPR in Shallow Sample (<1 foot)
- Approximate Extent of Copper Exceeding Screening Levels witihin BAPR in Deep Sample (>1 foot)

[Depth in feet]

BAPSB217 [0.3] [2.3]
Copper 42 13

Results in mg/kg
Black values are at or below soil screening level
Red values are above soil screening level
See data Table 1 for duplicated analytical results, not depicted.

N

40 20 0 40 Feet

Geosyntec

DISTRIBUTION OF COPPER IN SOIL

BARNARD AVENUE PROTECTED RANGE
REMOVAL ACTION WORK PLAN
PRESIDIO TRUST
SAN FRANCISCO, CA

THE PRESIDIO TRUST

DECEMBER 2012

FIGURE 4

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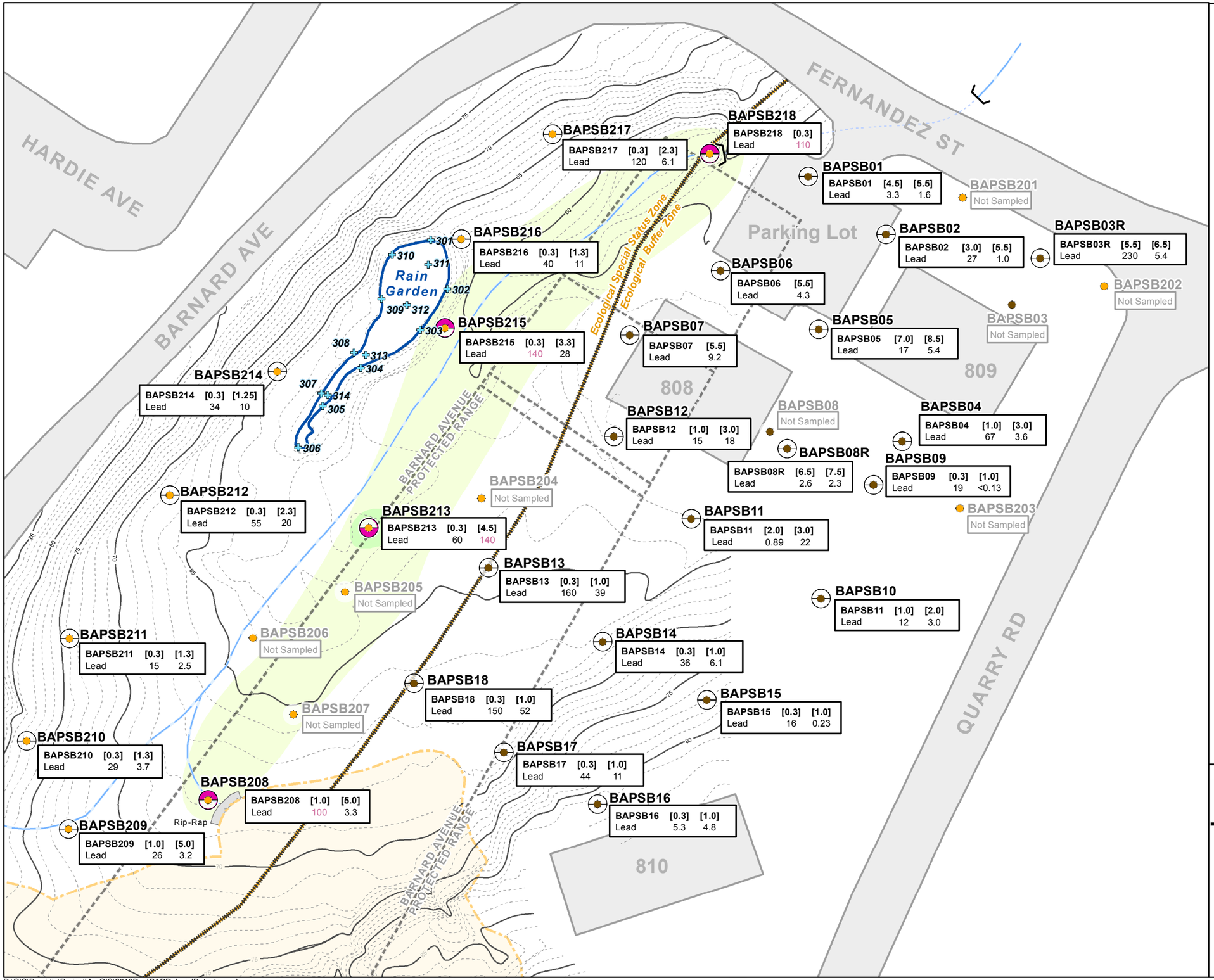

Legend

- 2010 Sample Locations (Geosyntec)
- 2003 Sample Locations (Treadwell & Rollo, 2004)
- Lead Above Screening Level in Shallow Sample (<1 foot). See Table 1 for Screening Criteria
- Lead Above Screening Level in Deep Sample (>1 foot). See Table 1 for Screening Criteria
- Rain Garden Sample Location
- Approximate Extent of Barnard Avenue Protected Range (BAPR)
- Approximate Location of the Western Tributary of the Tennessee Hollow Watershed Drainage
- Boundary Between Area Mapped as Ecological Buffer Zone and Ecological Special Status Zone (EKI, 2002)
- Approximate Location of Buried Culvert Pipe
- Landfill E Boundary (Geosyntec, 2012b)
- Approximate Extent of Lead Exceeding Screening Levels witihin BAPR in Shallow Sample (<1 foot)
- Approximate Extent of Lead Exceeding Screening Levels witihin BAPR in Deep Sample (>1 foot)

[Depth in feet]

BAPSB217	[0.3]	[2.3]
Lead	120	6.1

Results in mg/kg
Black values are at or below soil screening level
Red values are above soil screening level
See data Table 1 for duplicated analytical results, not depicted.

N

40 20 0 40 Feet

Geosyntec

DISTRIBUTION OF LEAD IN SOIL

BARNARD AVENUE PROTECTED RANGE
REMOVAL ACTION WORK PLAN
PRESIDIO TRUST
SAN FRANCISCO, CA

THE PRESIDIO TRUST

DECEMBER 2012

FIGURE 5

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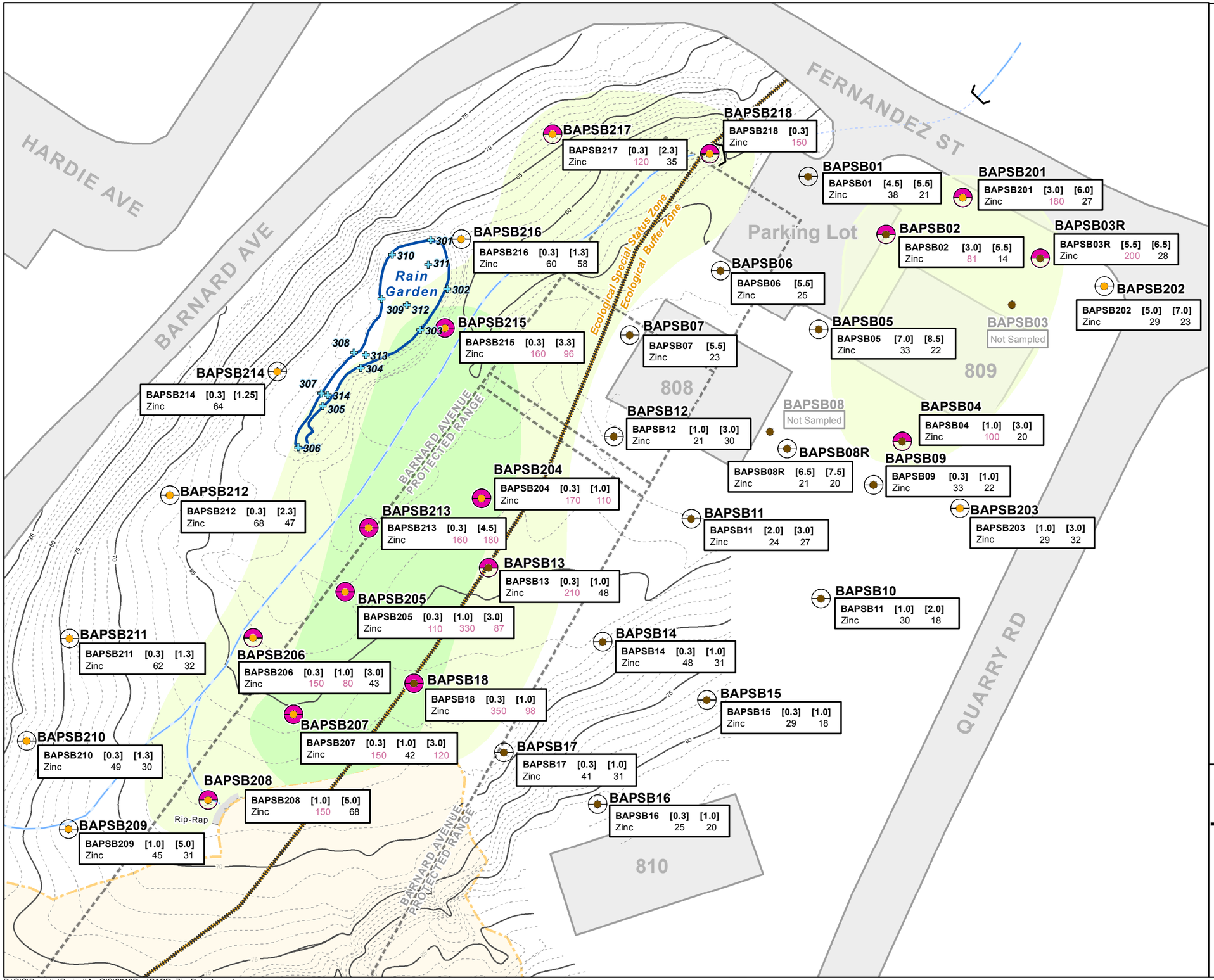


Legend

- 2010 Sample Locations (Geosyntec)
- 2003 Sample Locations (Treadwell & Rollo, 2004)
- Zinc Above Screening Level in Shallow Sample (<1 foot). See Table 1 for Screening Criteria
- Zinc Above Screening Level in Deep Sample (>1 foot). See Table 1 for Screening Criteria
- Rain Garden Sample Location
- Approximate Extent of Barnard Avenue Protected Range (BAPR)
- Approximate Location of the Western Tributary of the Tennessee Hollow Watershed Drainage
- Boundary Between Area Mapped as Ecological Buffer Zone and Ecological Special Status Zone (EKI, 2002)
- Approximate Location of Buried Culvert Pipe
- Landfill E Boundary (Geosyntec, 2012b)
- Approximate Extent of Zinc Exceeding Screening Levels witihin BAPR in Shallow Sample (<1 foot)
- Approximate Extent of Zinc Exceeding Screening Levels witihin BAPR in Deep Sample (>1 foot)

[Depth in feet]

BAPSB217 [0.3] [2.3]
Zinc 120 35

Results in mg/kg
Black values are at or below soil screening level
Red values are above soil screening level
See data Table 1 for duplicated analytical results, not depicted.

N

40 20 0 40 Feet

Geosyntec

DISTRIBUTION OF ZINC IN SOIL

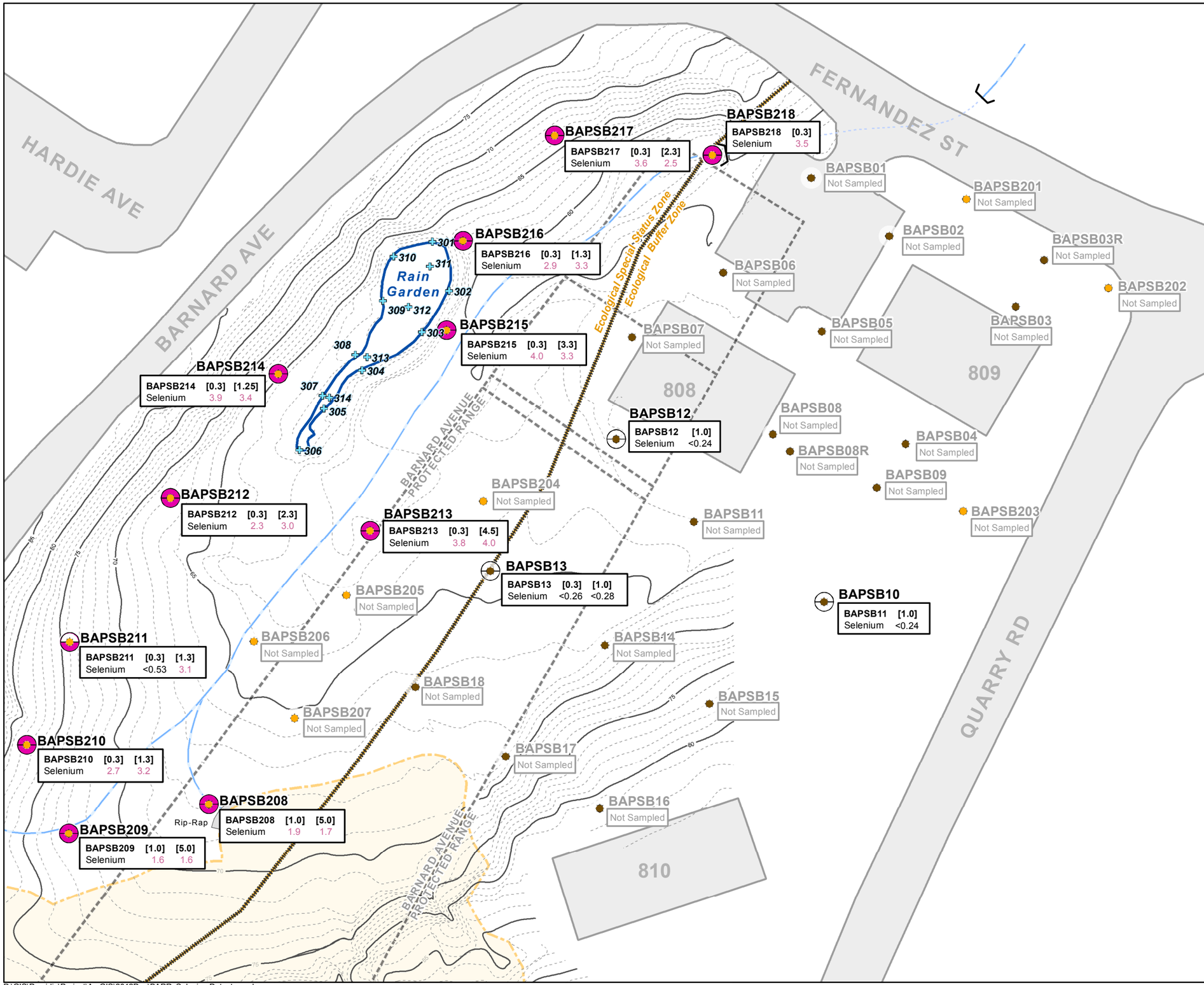
BARNARD AVENUE PROTECTED RANGE
REMOVAL ACTION WORK PLAN
PRESIDIO TRUST
SAN FRANCISCO, CA

THE PRESIDIO TRUST

DECEMBER 2012

FIGURE 6

P:\GIS\Presidio\Project\ArcGIS\2012Dec\BAPR_ZincDetects.mxd



Legend

- 2010 Sample Locations (Geosyntec)
- 2003 Sample Locations (Treadwell & Rollo, 2004)
- Selenium Above Screening Level in Shallow Sample (<1 foot)*. See Table 1 for Screening Criteria
- Selenium Above Screening Level in Deep Sample (>1 foot)*. See Table 1 for Screening Criteria
- Rain Garden Sample Location
- Approximate Extent of Barnard Avenue Protected Range (BAPR)
- Approximate Location of the Western Tributary of the Tennessee Hollow Watershed Drainage
- Boundary Between Area Mapped as Ecological Buffer Zone and Ecological Special Status Zone (EKI, 2002)
- Approximate Location of Buried Culvert Pipe
- Landfill E Boundary (Geosyntec, 2012b)

[Depth in feet]

BAPSB217 [0.3] [2.3]
Selenium 3.6 2.5

Results in mg/kg
Black values are at or below soil screening level
Red values are above soil screening level
See data Table 1 for duplicated analytical results, not depicted.

* The detected concentrations observed on the western side of the BAPR appear to be due to analytical interference.

40 20 0 40 Feet

N

Geosyntec

DISTRIBUTION OF SELENIUM IN SOIL

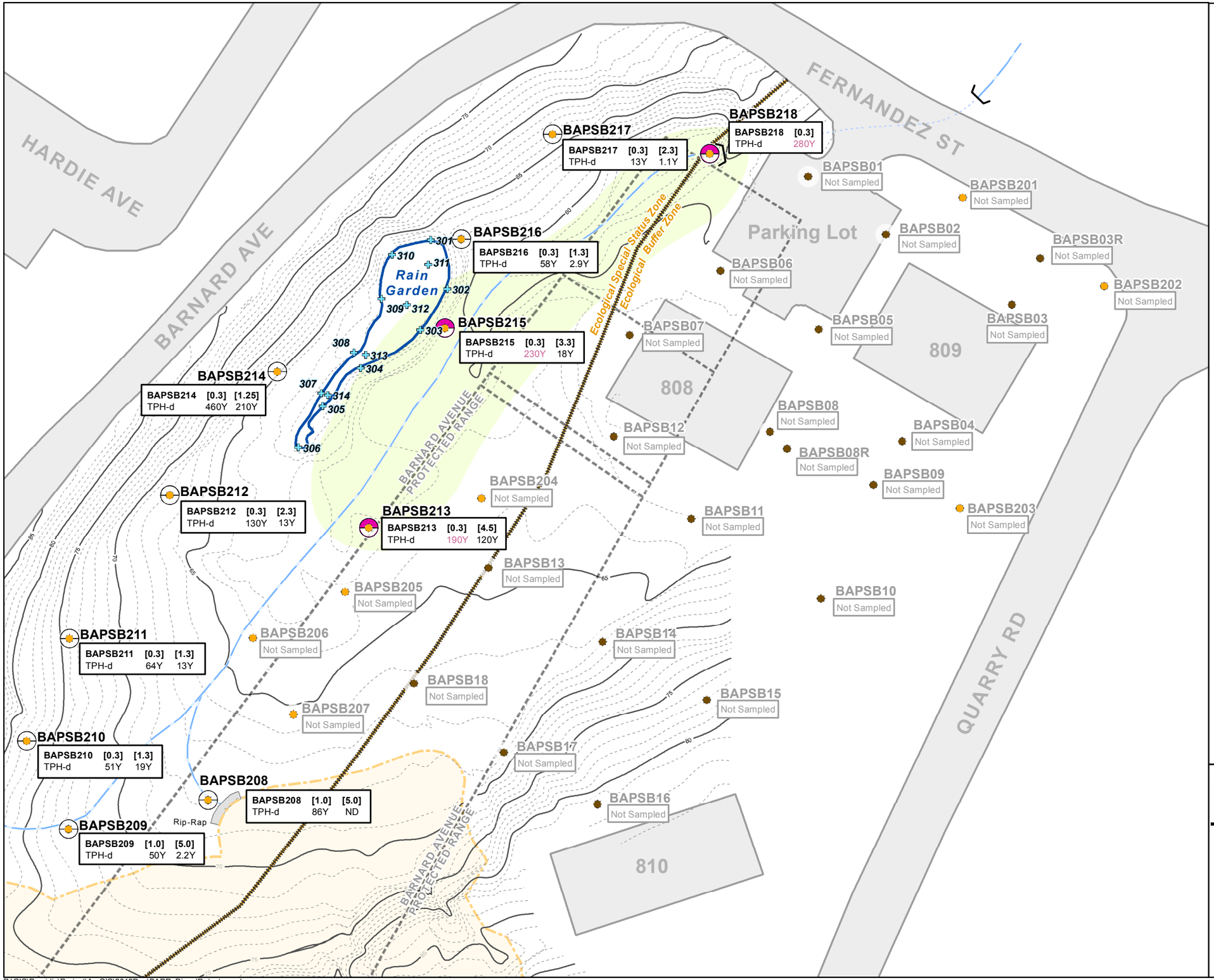
BARNARD AVENUE PROTECTED RANGE
REMOVAL ACTION WORK PLAN
PRESIDIO TRUST
SAN FRANCISCO, CA

THE PRESIDIO TRUST

DECEMBER 2012

FIGURE 7

P:\GIS\Presidio\Project\ArcGIS\2012Dec\BAPR_SeleniumDetects.mxd



Legend

- 2010 Sample Locations (Geosyntec)
- 2003 Sample Locations (Treadwell & Rollo, 2004)
- TPH-Diesel Above Screening Level in Shallow Sample (<1 foot). See Table 2 for Screening Criteria
- TPH-Diesel Above Screening Level in Deep Sample (>1 foot). See Table 2 for Screening Criteria
- Rain Garden Sample Location
- Approximate Extent of Barnard Avenue Protected Range (BAPR)
- Approximate Location of the Western Tributary of the Tennessee Hollow Watershed Drainage
- Boundary Between Area Mapped as Ecological Buffer Zone and Ecological Special Status Zone (EKI, 2002)
- Approximate Location of Buried Culvert Pipe
- Landfill E Boundary (Geosyntec, 2012b)
- Approximate Extent of TPH-d Exceeding Screening Levels witihin BAPR in Shallow Sample (<1 foot)

[Depth in feet]

BAPSB217 [0.3] [2.3]
TPH-d 13Y 1.1Y

Results in mg/kg
Black values are at or below soil screening level
Red values are above soil screening level
See data Table 2 for duplicated analytical results, not depicted.
TPH-d = Total Petroleum Hydrocarbons, Diesel Range
ND = Not Detected above laboratory reporting limits
Y = The sample exhibits chromatographic pattern which does not resemble the standard

N

40 20 0 40 Feet

Geosyntec

DISTRIBUTION OF TPH-DIESEL IN SOIL

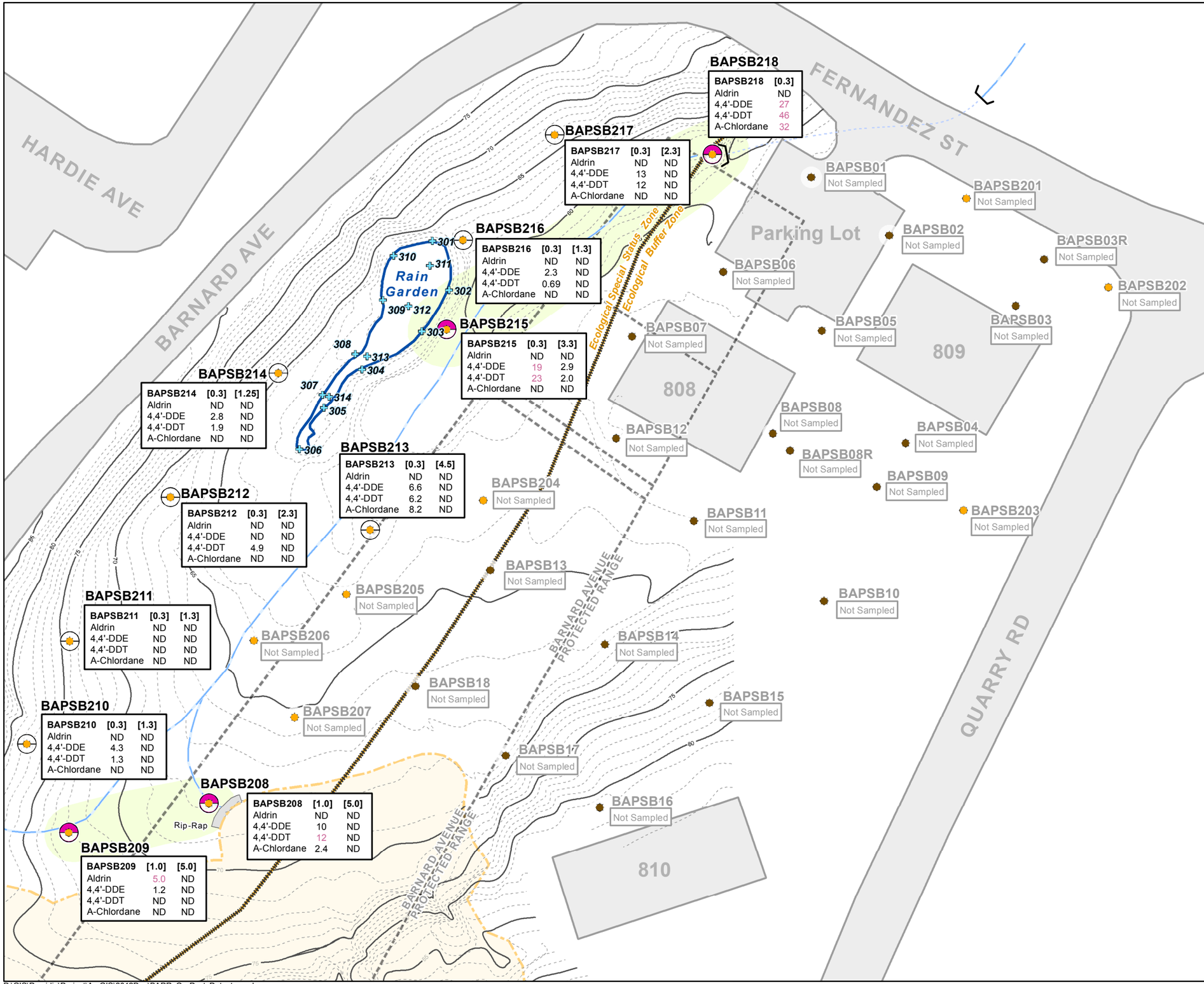
BARNARD AVENUE PROTECTED RANGE
REMOVAL ACTION WORK PLAN
PRESIDIO TRUST
SAN FRANCISCO, CA

THE PRESIDIO TRUST

DECEMBER 2012

FIGURE 8

P:\GIS\Presidio\Project\ArcGIS\2012Dec\BAPR_DieselDetects.mxd



Legend

- 2010 Sample Locations (Geosyntec)
- 2003 Sample Locations (Treadwell & Rollo, 2004)
- Organochlorine Pesticides Above Screening Level in Shallow Sample (<1 foot) See Table 2 for Screening Criteria
- Organochlorine Pesticides Above Screening Level in Deep Sample (>1 foot) See Table 2 for Screening Criteria
- Rain Garden Sample Location
- Approximate Extent of Barnard Avenue Protected Range (BAPR)
- Approximate Location of the Western Tributary of the Tennessee Hollow Watershed Drainage
- Boundary Between Area Mapped as Ecological Buffer Zone and Ecological Special Status Zone (EKI, 2002)
- Approximate Location of Buried Culvert Pipe
- Landfill E Boundary (Geosyntec, 2012b)
- Approximate Extent of Organochlorine Pesticides Exceeding Screening Levels witihin BAPR in Shallow Sample (<1 foot)

[Depth in feet]

BAPSB217	[0.3]	[2.3]
Aldrin	ND	ND
4,4'-DDE	13	ND
4,4'-DDT	12	ND
A-Chlordane	ND	ND

Results in µg/kg
Black values are at or below soil screening level
Red values are above soil screening level
See data Table 2 for duplicated analytical results, not depicted.
A-Chlordane = Alpha-Chlordane
ND = Not detected above laboratory reporting limits

N

40 20 0 40 Feet

Geosyntec

DISTRIBUTION OF ORGANOCHLORINE PESTICIDES IN SOIL

BARNARD AVENUE PROTECTED RANGE
REMOVAL ACTION WORK PLAN
PRESIDIO TRUST
SAN FRANCISCO, CA

DECEMBER 2012

FIGURE 9

THE PRESIDIO TRUST

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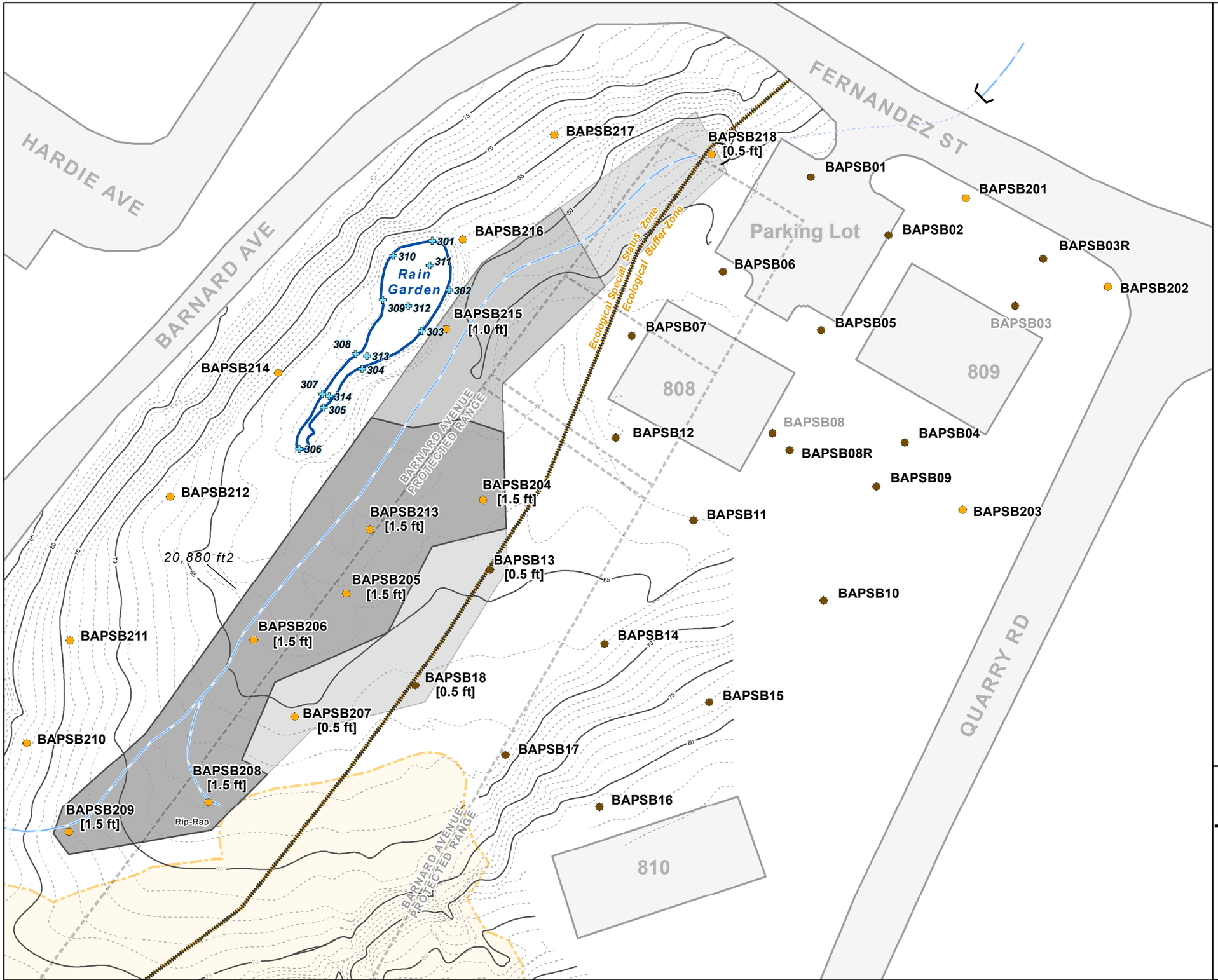

Legend

- Proposed Excavation Depth - 0.5 ft
- Proposed Excavation Depth - 1.0 ft
- Proposed Excavation Depth - 1.5 ft
- [1.5] Approximate Depth of Excavation
- 2010 Sample Locations (Geosyntec)
- 2003 Sample Locations (Treadwell & Rollo, 2004)
- Rain Garden Sample Location
- Approximate Extent of Barnard Avenue Protected Range (BAPR)
- Approximate Location of the Western Tributary of the Tennessee Hollow Watershed Drainage
- Approximate Location of Buried Culvert Pipe
- Landfill E Boundary (Geosyntec, 2012b)

N

40 20 0 40 Feet

Geosyntec

REMEDIAL ACTION AREA
BARNARD AVENUE PROTECTED RANGE
REMOVAL ACTION WORK PLAN
PRESIDIO TRUST
SAN FRANCISCO, CA

THE PRESIDIO TRUST

DECEMBER 2012

FIGURE 10

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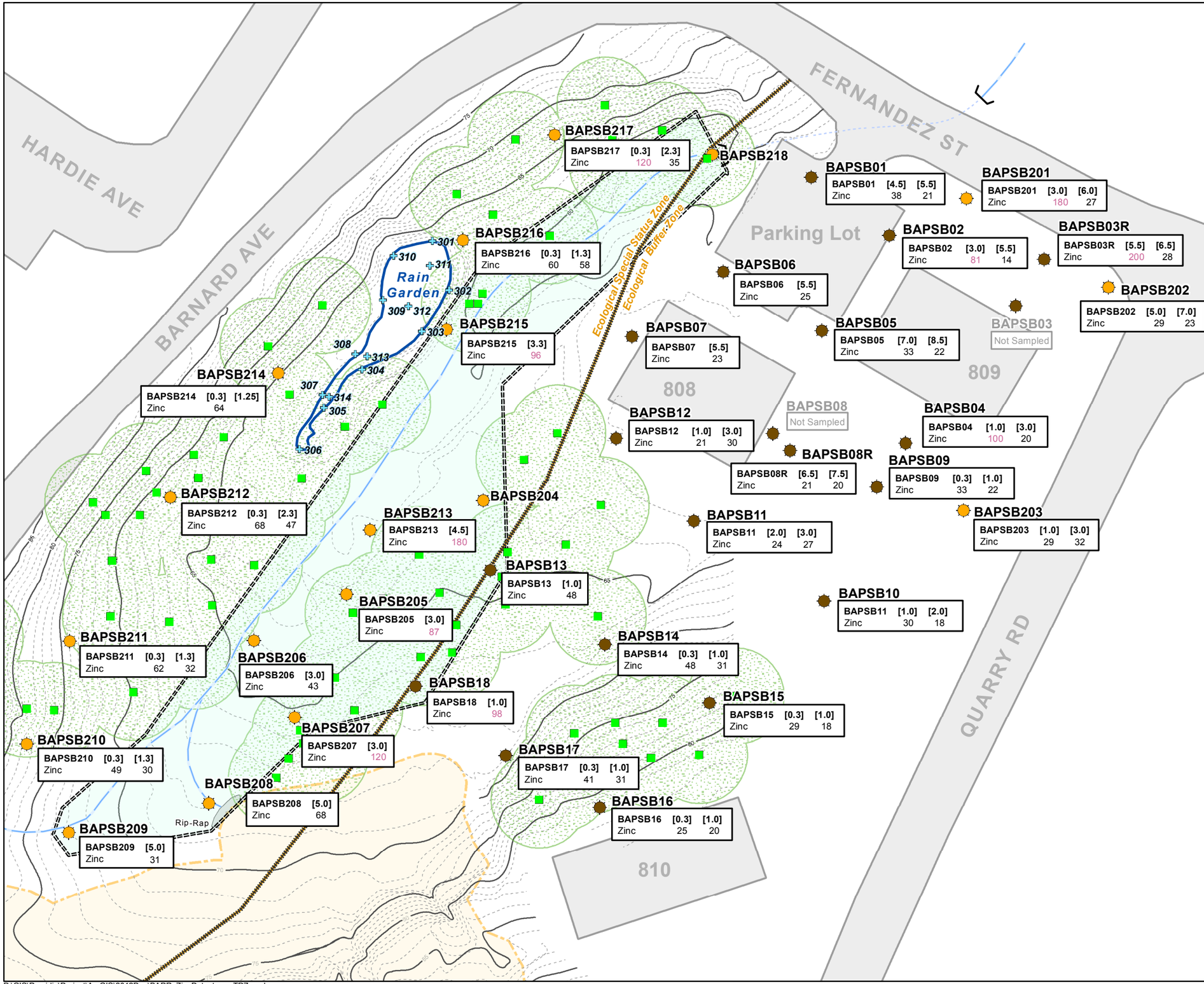

Legend

- Trees to Remain
- Tree Protection Zone
- 2010 Sample Locations (Geosyntec)
- 2003 Sample Locations (Treadwell & Rollo, 2004)
- Rain Garden Sample Location
- Approximate Location of the Western Tributary of the Tennessee Hollow Watershed Drainage
- Boundary Between Area Mapped as Ecological Buffer Zone and Ecological Special Status Zone (EKI, 2002)
- Approximate Location of Buried Culvert Pipe
- Excavation Extent
- Landfill E Boundary (Geosyntec, 2012b)

[Depth in feet]

BAPSB217 [0.3] [2.3]
Zinc 120 35

Results in mg/kg
Shown values are zinc concentrations expected after remediation, based on pre-remediation data.
Black values are at or below soil screening level
Red values are above soil screening level

N

40 20 0 40 Feet

Geosyntec

TREE PROTECTION ZONES AND POST-REMEDIATION CONCENTRATIONS OF ZINC

BARNARD AVENUE PROTECTED RANGE
REMOVAL ACTION WORK PLAN
PRESIDIO TRUST
SAN FRANCISCO, CA

THE PRESIDIO TRUST

DECEMBER 2012

FIGURE 11

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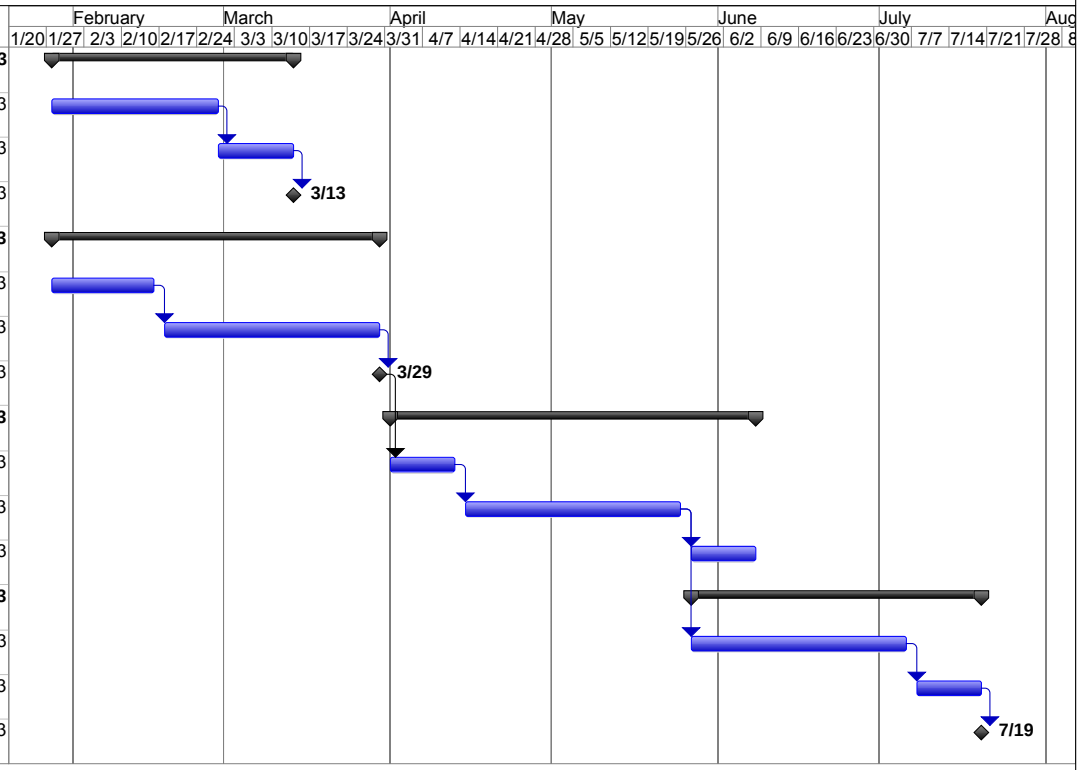
Figure 12
Removal Action Implementation Schedule
BAPR Removal Action
Presidio of San Francisco

ID	Task Name	Duration	Start	Finish
1	**Removal Action Work Plan (RAW)**	**33 days**	**Mon 1/28/13**	**Wed 3/13/13**
2	Draft RAW Public Review	23 days	Mon 1/28/13	Wed 2/27/13
3	Final RAW	10 days	Thu 2/28/13	Wed 3/13/13
4	RAW Approval	0 days	Wed 3/13/13	Wed 3/13/13
5	**Contractor Procurement**	**45 days**	**Mon 1/28/13**	**Fri 3/29/13**
6	Construction specifications	15 days	Mon 1/28/13	Fri 2/15/13
7	Contractor Selection	30 days	Mon 2/18/13	Fri 3/29/13
8	Contractor Award	0 days	Fri 3/29/13	Fri 3/29/13
9	**Removal Action**	**50 days**	**Mon 4/1/13**	**Fri 6/7/13**
10	Mobilization	10 days	Mon 4/1/13	Fri 4/12/13
11	Remediation	30 days	Mon 4/15/13	Fri 5/24/13
12	Demobilization	10 days	Mon 5/27/13	Fri 6/7/13
13	**Post Remediation**	**40 days**	**Mon 5/27/13**	**Fri 7/19/13**
14	Closeout Report	30 days	Mon 5/27/13	Fri 7/5/13
15	DTSC review	10 days	Mon 7/8/13	Fri 7/19/13
16	Closure Certification	0 days	Fri 7/19/13	Fri 7/19/13



Project: BAPR Completion Schedule
Date: Wed 1/23/13

Task	External Tasks	Manual Task	Finish-only
Split	External Milestone	Duration-only	Progress
Milestone	Inactive Task	Manual Summary Rollup	Deadline
Summary	Inactive Milestone	Manual Summary	
Project Summary	Inactive Summary	Start-only	

APPENDIX A

Administrative Record

Appendix A
Administrative Record List
Draft Removal Action Work Plan, Barnard Avenue Protected Range
Presidio of San Francisco, California

Date	Author	Recipient	Title of Document
January-2013	Geosyntec Consultants	Trust	Draft Removal Action Work Plan, Barnard Avenue Protected Range, Presidio of San Francisco, California
January-2013	AMEC	Trust	Development of Zinc Background Levels for Colma Formation and Mixed Beach Dune and Colma Formation Soils, Presidio of San Francisco, California
December-2012	Presidio Archaeology Lab	Trust	Archaeological Management Assessment, Barnard Avenue Protected Range (BAPR) Remediation, Prepared by Kari Jones
April-2012	Curtis & Tompkins	Trust	Email from John Goyette, Senior Program Manager, Curtis & Tompkins to Genevieve Coyle, Presidio Trust
February-2012	Geosyntec Consultants	Trust	Remedial Investigation Summary Report, Barnard Avenue Protected Range (BAPR), Presidio of San Francisco, California
February-2012	Geosyntec Consultants	Trust	Construction Completion Report, Landfill E
September-2011	Trust	DTSC	Soil Management Plan for Building 42 Rain Garden, Barnard Avenue Firing Range
June-2011	Geosyntec Consultants	Trust	Final Feasibility Study/Remedial Action Plan, Landfill E, Presidio of San Francisco, California
August-2010	Geosyntec Consultants	Trust	Second Addendum to Draft Field Sampling Plan, Landfill E and Barnard Avenue Protected Range, Presidio of San Francisco, California
June-2010	Geosyntec Consultants	Trust	Addendum to Draft Field Sampling Plan, Landfill E and Barnard Avenue Protected Range, Presidio of San Francisco, California
March-2010	Geosyntec Consultants	Trust	Draft Field Sampling Plan, Additional Site Characterization, Landfill E and Barnard Avenue Protected Range, Presidio of San Francisco, California
August-2007	Trust	Public	Tennessee Hollow Upper Watershed Revitalization Project Environmental Assessment
November-2004	Treadwell & Rollo, Inc.	Trust	Draft Small Arms Firing Ranges Feasibility Study Report
August-2004	EKI	Trust	Petroleum Contingency Plan, Presidio of San Francisco, California
February-2004	Treadwell & Rollo, Inc.	Trust	Draft Small Arms Firing Ranges Remedial Investigation Report
April-2003	NPS and URS Corporation	Trust	Presidio Wetland Resources
October-2002	Erler & Kalinowski, Inc. (EKI)	Trust	Development of Presidio-wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water
May-2002	Trust	Public	Presidio Trust Management Plan, Land Use Policies for Area B of the Presidio of San Francisco, California
October-2001	DTSC	Public	Information Advisory, Clean Imported Fill Material
June-2001	Trust	Public	Community Relations Plan
May-2001	Trust and NPS	Trust	Vegetation Management Plan and Environmental Assessment for the Presidio of San Francisco
April-2001	Tetra Tech EM Inc.	Trust	Presidio-wide Quality Assurance Project Plan Sampling and Analysis Plan, Presidio of San Francisco, Revision 1.0
August-1999	DTSC	Trust	Consent Agreement between the California Department of Toxics Substances Control (DTSC), the U.S. Department of the Interior, National Park Service, and the Presidio Trust
May-1999	Department of the Army (Army), Trust, and National Park Service (NPS)	Trust	Memorandum of Agreement Regarding Environmental Remediation at the Presidio of San Francisco
July-1997	Montgomery Watson	U.S. Army Corps of Engineers Sacramento District	Final Site Investigation Report for the Small Arms Firing Ranges. Presidio of San Francisco, California

Appendix A
Administrative Record List
Draft Removal Action Work Plan, Barnard Avenue Protected Range
Presidio of San Francisco, California

Date	Author	Recipient	Title of Document
November-1995	Earth Tech	Trust	Base Realignment and Closure (BRAC) Cleanup Plan, Presidio of San Francisco, San Francisco, California
May-1991	U.S. Army Corps of Engineers (USACE)	Trust	Base Closure Final Environmental Impact Statement for Presidio of San Francisco
November-1989	U.S. Army Toxic and Hazardous Materials Agency (USATHAMA)	Trust	Enhanced Preliminary Assessment Report: Presidio of San Francisco Military Reservation, San Francisco, California

APPENDIX B

Calculation of 95 Percent Upper Confidence Limit on the Arithmetic Mean

Appendix B: Calculation of 95 Percent Upper Confidence Limit on the Arithmetic Mean Concentrations of Chemicals of Potential Concern

This appendix presents the methods used to calculate the 95 percent upper confidence limit on the arithmetic mean (95 percent UCL) concentrations of potential chemicals of concern (PCOCs) in Barnard Avenue Protected Range (BAPR) soil in support of the Risk Evaluation and Selection of Chemicals of Concern in Soil (Section 4.3, main text). The 95 percent UCLs were calculated using ProUCL Version 4.1.00, which is the current version of the ProUCL statistical software available from the United States Environmental Protection Agency (USEPA). The ProUCL software is available for download from: http://www.epa.gov/osp/hstl/tsc/software.htm.

1. INTRODUCTION

PCOCs in BAPR soil were identified in the Remedial Investigation Summary Report (RI Summary; Geosyntec, 2012) and this Draft Remedial Action Work Plan (RAW) (see Section 4.1 of the RAW). The PCOCs identified for the BAPR are antimony, copper, lead, zinc, selenium, 4-4'DDE, 4'4-DDT, chlordane, and TPH-d. These PCOCs had maximum concentrations greater than preliminary remediation goals (PRGs) protective of human health and the environment presented in the *Development of Presidio-wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water* (Presidio Cleanup Levels Document) (EKI, 2002). The PRGs applicable to the BAPR are based on criteria protective of human health, ecological receptors (buffer zone and special status), groundwater, and freshwater sediment, and are not associated with background.

While the use of the maximum detected concentration is appropriate for screening purposes, it is likely an overestimate of the concentration to which exposure would occur over time. Per USEPA guidance (1992), the 95 percent UCL of the arithmetic mean should be used to evaluate potential exposures to chemicals in environmental media. Therefore, the 95 percent UCL concentrations were calculated for the PCOCs at the BAPR.

2. DATA USE IN CALCULATIONS

The analytical data that were used to calculate the 95 percent UCLs were obtained from Tables 1 through 4 of this RAW for those samples[1] collected within the area mapped as an Ecological Special Status Zone and those samples collected within the drainage (Figure 2). In the first case (case A), all sample locations within the Ecological Special Status Zone and drainage area including the Building 42 rain garden sample locations were used in the calculations. In the second case (case B), all sample locations were used excluding the samples collected from the Building 42 rain garden. The 95 percent UCLs were calculated for these two cases to establish the effect that clustered rain garden data would have on the 95 percent UCLs.

Prior to calculating the 95 percent UCLs, the following criteria were used to determine the representative concentration for duplicate samples:

[1] Includes sample locations BAPSB204 through BAPSB218 and BAPSB301 through BAPSB314.

- If both samples were detected values, the two values were averaged, and the result was considered a detected value in the calculations.
- If one sample was a detected value and the other sample was a non-detect, the detected value was used in the calculations.
- If both samples were non-detects, the lower detection limit was used as a non-detect in the calculations.

3. BASELINE CONDITION 95 PERCENT UCLs

To calculate the baseline condition 95 percent UCLs, all soil data collected between 0 and 3 feet below soil surface (bss), which represents the exposure interval for ecological receptors, were included in the data set. The data used in the baseline condition 95 percent UCL calculations, including the representative concentrations for duplicate samples, are presented in Tables B-1A (with rain garden data) and B-1B (without rain garden data).

The 95 percent UCLs were calculated in accordance with the ProUCL User Guide (USEPA 2010). The 95 percent UCLs recommended by the ProUCL software were used as the 95 percent UCLs for the PCOCs. When multiple 95 percent UCLs were recommended, the value calculated using the non-bootstrap method was selected, as the bootstrap method can be unreliable for data sets with a few number of detects. The summary statistics, including the 95 percent UCL concentrations, are presented in Table B-2A (with rain garden data) and B-2B (without rain garden data).

As shown in Table B-2A, the 95 percent UCL concentrations for the following PCOCs in soil exceed their respective special status cleanup levels: selenium, zinc, and 4,4-DDT. Selenium is the only PCOC with a 95 percent UCL concentration exceeding its respective freshwater sediment cleanup level. If the rain garden data are not used in the evaluation (Table B-2B), then the 95 percent UCL concentrations for antimony, selenium, and zinc exceed their respective special status cleanup levels, and the 95 percent UCL concentrations for antimony, selenium, and TPH-d exceed their respective freshwater sediment cleanup levels.

The ProUCL output files are included as attachments.

4. POST-REMEDIATION 95 PERCENT UCLs

Post-remediation 95 percent UCLs were also calculated assuming removal of the remedial action area defined in Section 4.4 of the main text and illustrated in Figure 10. To calculate the post-remediation 95 percent UCLs, all soil data collected between the anticipated removal depth (0.5 to 1.5 feet bgs) and 3 feet below the anticipated removal depth[2] were included in the data set, as these data would represent the upper 3 feet of soil following removal (i.e., the exposure interval

[2] Samples BAPSB208[5] and BAPSB209[5] were collected at a depth of 5 feet bgs, which is deeper than the 3 foot exposure interval; therefore, this data was not included in the post-remediation 95 percent UCL calculations.

for ecological receptors following the removal action). The data used in the post-remediation 95 percent UCL calculations, including the representative concentrations for duplicate samples, are presented in Table B-3A (with rain garden data) and B-3B (without rain garden data).

The 95 percent UCLs were calculated in accordance with the ProUCL User Guide (USEPA, 2010). The 95 percent UCLs recommended by the ProUCL software were used as the 95 percent UCLs for the PCOCs. When multiple 95 percent UCLs were recommended, the value calculated using the non-bootstrap method was selected, as the bootstrap method can be unreliable for data sets with a few number of detects. The summary statistics, including the 95 percent UCL concentrations, are presented in Table B-4A (with rain garden data) and B-4B (without rain garden data).

As shown in Table B-4A, selenium, zinc, and 4,4'-DDT have 95 percent UCL concentrations exceeding the special status cleanup levels, and the 95 percent UCL concentration for selenium exceeds the freshwater sediment cleanup level. If the rain garden data are not used in the evaluation (Table B-4B), then the 95 percent UCL concentrations for selenium and zinc exceed their respective special status cleanup levels, and the 95 percent UCL concentration for selenium exceeds its respective freshwater sediment cleanup levels. All other PCOCs have 95 percent UCLs below cleanup levels or background concentrations.

The ProUCL output files are included as attachments.

5. REFERENCES

USEPA. 1992. Supplemental Guidance to RAGS: Calculating the Concentration Term. Office of Solid Waste and Emergency Response. Publication 9285.7-081. May 1992.

USEPA. 2010. ProUCL Version 4.1 User Guide (Draft). Office of Research and Development. EPA/600/R-07/041. May 2010.

Table B-1A: Data Used in 95 Percent Upper Confidence Limit Calculations for Baseline Conditions[a]
Draft Removal Action Work Plan
Barnard Avenue Protected Range
Presidio of San Francisco, California

Source[b]	Sample Number[c]	Cu[d] mg/kg[e]	Pb[f] mg/kg	Sb[g] mg/kg	Se[h] mg/kg	Zn[i] mg/kg	alpha-Chlordane µg/kg[j]	gamma-Chlordane µg/kg	4,4'-DDE[k] µg/kg	4,4'-DDT[l] µg/kg	TPHd[m] mg/kg
Geosyntec, 2010	BAPSB204[0.3]	-	-	-	-	170	-	-	-	-	-
	BAPSB204[1]	-	-	-	-	110	-	-	-	-	-
	BAPSB205 [0.3]	-	-	-	-	110	-	-	-	-	-
	BAPSB205 [1]	-	-	-	-	330	-	-	-	-	-
	BAPSB205 [3]	-	-	-	-	87	-	-	-	-	-
	BAPSB206[0.3]	-	-	-	-	150	-	-	-	-	-
	BAPSB206[1]	-	-	-	-	77 [n]	-	-	-	-	-
	BAPSB206[3]	-	-	-	-	43	-	-	-	-	-
	BAPSB207 [0.3]	-	-	-	-	150	-	-	-	-	-
	BAPSB207 [1]	-	-	-	-	42	-	-	-	-	-
	BAPSB207 [3]	-	-	-	-	120	-	-	-	-	-
	BAPSB208[1]	42	100	8.6	1.9	150	2.4	1.9	10	12	86 Y
	BAPSB209[1]	14	26	6.9	1.6	45	<1.9	2.9	1.2 C J	<3.6	50 Y
	BAPSB210[0.3]	17	29	<3.2	2.7	49	<1.8	<1.8	4.3 C	1.3 J	51 Y
	BAPSB210[1.3]	5.4	3.7	<3.1	3.2	30	<1.7	<1.7	<3.4	<3.4	19 Y
	BAPSB211[0.3]	53	15	<3.2	<0.53	62	<1.8	<1.8	<3.5	<3.5	64 Y
	BAPSB211[1.3]	11	2.5	<3.1	3.1	32	<1.7	<1.7	<3.4	<3.4	13 Y
	BAPSB212[0.3]	28	55	<3.2	2.3	68	<8.9	<8.9	<17	4.9 J	130 Y
	BAPSB212[2.3]	18	20	<3.2	3	47	<1.8	<1.8	<3.5	<3.5	13 Y
	BAPSB213[0.3]	37	60	<3.3	3.8	160	8.2 C	<1.9	6.6	6.2 C	190 Y
	BAPSB214[0.3]	21	34	<3.3	3.9	64	<1.8	<1.8	2.8 J	1.9 C J	460 Y
	BAPSB214[1.25]	40	10	<3.3	3.4	54	<1.8	<1.8	<3.6	<3.6	210 Y
	BAPSB215[0.3]	38	140	<3.6	4	160	<10	<10	19 C J	23	230 Y
	BAPSB216[0.3]	24	40	<3.3	2.9	60	<1.9	<1.9	2.3 C J	0.69 J	58Y
	BAPSB216[1.3]	27	11	<3.3	3.3	58	<1.8	<1.8	<3.6	<3.6	2.9 Y
	BAPSB217[0.3]	42	120	<3.3	3.6	120	<9.3	<9.3	13 J	12 J	13 Y
	BAPSB217[2.3] [n]	13	6.1	<3.2	2.5	35	<1.8	<1.8	<3.5	<3.5	1.1 Y
	BAPSB218[0.3]	40	110	<3.4	3.5	150	32	19	27	46	280
Geosyntec, 2012	BAPSB301[0.5] [n]	18.5	37.5	<0.47	<0.47	52.5	<5.1	<5.1	<9.9	<9.9	32 Y
	BAPSB302[1]	17	26	0.81	<0.47	44	3.9 C	<1.7	<3.3	<3.3	4.4 Y
	BAPSB303[1]	28	140	<0.46	<0.46	96	36	25	13	28 C	25 Y
	BAPSB304[1]	24	110	0.84	<0.46	83	9.7 C	13 C	11 C	30 C	42 Y
	BAPSB305[1]	23	80	1	<0.48	85	<5.1	5.6 C	<9.9	12 C	94 Y
	BAPSB306[1]	30	160	<0.47	<0.47	110	<8.4	<8.4	<16	20 C	77 Y
	BAPSB307[0.5] [n]	22	81	0.68	<0.47	77	<5.1	8.25	<9.8	13.5	140 Y
	BAPSB308[0.5]	21	91	0.95	<0.47	83.5 [n]	5.8 C	8.6	<9.8	15 C	74 Y
	BAPSB309[0.5]	31	120	1.1	<0.48	110	<5.1	6.3 C	10 C	17 C	110 Y
	BAPSB310[0.5]	12	4.9	<0.47	<0.47	26	<5.1	<5.1	<9.9	<9.9	1 Y
	BAPSB311[2]	23	76	<0.46	<0.46	76	6.1	8.2 C	<9.7	19 C	20 Y
	BAPSB312[2]	24	100	0.9	<0.46	81	6.7 C	9.4 C	<9.9	18 C	49 Y
	BAPSB313[2]	16	27	0.83	<0.5	48	<5	<5	<9.7	<9.7	3.3 Y
	BAPSB314[2]	19	30	0.64	<0.49	58	<5.2	<5.2	<10	<10	25 Y

Notes:

All metals measured on a dry basis

< = No detection above the stated laboratory detection limit.

"-"= Not available or not analyzed

QA/QC samples including source decontamination water and rinsate were analyzed for metals, and all analytes were not detected above the reporting limit. Results are depicted in the laboratory analytical reports, included as Appendix A.

J- Data validation qualifier, "The analyte was positively identified; the associated numerical values is biased low due to a low surrogate recovery and should be considered an approximate concentration of the analyte in the sample."

C = Presence confirmed, but RPD between columns exceeds 40%.

Y= Sample exhibits chromatographic pattern which does not resemble standard.

(a) Data are from Tables 1,2, 3, and 4 of this RAW. Samples collected from 0 to 3 feet below surface are included in the baseline conditions data set.

(b) Source of data as referenced in the RIS Report (Geosyntec, 2012a).

(c) The sample number. The square bracket indicates sample depth.

(d) Cu = copper

(e) mg/kg = milligrams per kilogram

(f) Pb = lead

(g) Sb=Antimony

Table B-1A: Data Used in 95 Percent Upper Confidence Limit Calculations for Baseline Conditions[a]
Draft Removal Action Work Plan
Barnard Avenue Protected Range
Presidio of San Francisco, California

Source[b]	Sample Number[c]	Cu[d] mg/kg[e]	Pb[f] mg/kg	Sb[g] mg/kg	Se[h] mg/kg	Zn[i] mg/kg	alpha-Chlordane µg/kg[j]	gamma-Chlordane µg/kg	4,4'-DDE[k] µg/kg	4,4'-DDT[l] µg/kg	TPHd[m] mg/kg

(h) Se = selenium
(i) Zn = zinc
(j) µg/kg=micrograms/kilogram
(k) DDE=Dichlorodiphenyldichloroethylene
(l) DDD = dichlorodiphenyldichloroethane
(m) TPHd= Total petroleum hydrocarbon Diesel
(n) AVG = Average of duplicate samples: if both values detect than it is an average of the results, if it there is one detect and one non-detect it is the value of the detect, and if they are both non-detects then it is the lower of the two non-detects.

Table B-1B: Data Used in 95 Percent Upper Confidence Limit Calculations for Baseline Conditions[a]
Draft Removal Action Work Plan
Barnard Avenue Protected Range
Presidio of San Francisco, California

Source[b]	Sample Number[c]	Cu[d] mg/kg[e]	Pb[f] mg/kg	Sb[g] mg/kg	Se[h] mg/kg	Zn[i] mg/kg	alpha-Chlordane µg/kg[j]	gamma-Chlordane µg/kg	4,4'-DDE[k] µg/kg	4,4'-DDT[l] µg/kg	TPHd[m] mg/kg
Geosyntec, 2010	BAPSB204[0.3]	-	-	-	-	170	-	-	-	-	-
	BAPSB204[1]	-	-	-	-	110	-	-	-	-	-
	BAPSB205 [0.3]	-	-	-	-	110	-	-	-	-	-
	BAPSB205 [1]	-	-	-	-	330	-	-	-	-	-
	BAPSB205 [3]	-	-	-	-	87	-	-	-	-	-
	BAPSB206[0.3]	-	-	-	-	150	-	-	-	-	-
	BAPSB206[1]	-	-	-	-	77 [n]	-	-	-	-	-
	BAPSB206[3]	-	-	-	-	43	-	-	-	-	-
	BAPSB207 [0.3]	-	-	-	-	150	-	-	-	-	-
	BAPSB207 [1]	-	-	-	-	42	-	-	-	-	-
	BAPSB207 [3]	-	-	-	-	120	-	-	-	-	-
	BAPSB208[1]	42	100	8.6	1.9	150	2.4	1.9	10	12	86 Y
	BAPSB209[1]	14	26	6.9	1.6	45	<1.9	2.9	1.2 C J	<3.6	50 Y
	BAPSB210[0.3]	17	29	<3.2	2.7	49	<1.8	<1.8	4.3 C	1.3 J	51 Y
	BAPSB210[1.3]	5.4	3.7	<3.1	3.2	30	<1.7	<1.7	<3.4	<3.4	19 Y
	BAPSB211[0.3]	53	15	<3.2	<0.53	62	<1.8	<1.8	<3.5	<3.5	64 Y
	BAPSB211[1.3]	11	2.5	<3.1	3.1	32	<1.7	<1.7	<3.4	<3.4	13 Y
	BAPSB212[0.3]	28	55	<3.2	2.3	68	<8.9	<8.9	<17	4.9 J	130 Y
	BAPSB212[2.3]	18	20	<3.2	3	47	<1.8	<1.8	<3.5	<3.5	13 Y
	BAPSB213[0.3]	37	60	<3.3	3.8	160	8.2 C	<1.9	6.6	6.2 C	190 Y
	BAPSB214[0.3]	21	34	<3.3	3.9	64	<1.8	<1.8	2.8 J	1.9 C J	460 Y
	BAPSB214[1.25]	40	10	<3.3	3.4	54	<1.8	<1.8	<3.6	<3.6	210 Y
	BAPSB215[0.3]	38	140	<3.6	4	160	<10	<10	19 C J	23	230 Y
	BAPSB216[0.3]	24	40	<3.3	2.9	60	<1.9	<1.9	2.3 C J	0.69 J	58Y
	BAPSB216[1.3]	27	11	<3.3	3.3	58	<1.8	<1.8	<3.6	<3.6	2.9 Y
	BAPSB217[0.3]	42	120	<3.3	3.6	120	<9.3	<9.3	13 J	12 J	13 Y
	BAPSB217[2.3] [n]	13	6.1	<3.2	2.5	35	<1.8	<1.8	<3.5	<3.5	1.1 Y
	BAPSB218[0.3]	40	110	<3.4	3.5	150	32	19	27	46	280

Notes:

All metals measured on a dry basis

< = No detection above the stated laboratory detection limit.

"-"= Not available or not analyzed

QA/QC samples including source decontamination water and rinsate were analyzed for metals, and all analytes were not detected above the reporting limit. Results are depicted in the laboratory analytical reports, included as Appendix A.

J- Data validation qualifier, "The analyte was positively identified; the associated numerical values is biased low due to a low surrogate recovery and should be considered an approximate concentration of the analyte in the sample."

C = Presence confirmed, but RPD between columns exceeds 40%.

Y= Sample exhibits chromatographic pattern which does not resemble standard.

(a) Data are from Tables 1 and 2 of this RAW. Samples collected from 0 to 3 feet below surface are included in the baseline conditions data set.

(b) Source of data as referenced in the RIS Report (Geosyntec, 2012a).

(c) The sample number. The square bracket indicates sample depth.

(d) Cu = copper

(e) mg/kg = milligrams per kilogram

(f) Pb = lead

(g) Sb=Antimony

(h) Se = selenium

(i) Zn = zinc

(j) µg/kg=micrograms/kilogram

(k) DDE=Dichlorodiphenyldichloroethylene

(l) DDD = dichlorodiphenyldichloroethane

(m) TPHd= Total petroleum hydrocarbon Diesel

(n) AVG = Average of duplicate samples: if both values detect than it is an average of the results, if it there is one detect and one non-detect it is the value of the detect, and if they are both non-detects then it is the lower of the two non-detects.

Table B-2A: Statistical Evaluation of Baseline Soil and Sediment Samples (0 to 3 feet below surface) from Presidio [a]
Draft Removal Action Work Plan
Barnard Avenue Protected Range
Presidio of San Francisco, California

				Summary Statistics[b]		Detected Values[b]		Goodness-of-Fit Test	Upper Confidence Limit (UCL)		Cleanup Level	
Analyte	Unit	No. of Samples	Detection Rate	Arithmetic Mean[c]	Standard Deviation	Minimum Detected	Maximum Detected	Distribution	Method of UCL Calculation[d]	Assessed 95% UCL[e]	Ecological Screening Level[f]	Sediment Screening Level[g]
Antimony	mg/kg	31	35%	2.1	2.8	0.6	8.6	Normal	95% KM (t) UCL	1.8	5	3
Copper	mg/kg	31	100%	25.1	11.0	5.4	53.0	Normal	95% Student's-t UCL	28.5	49	114
Lead	mg/kg	31	100%	60.2	47.6	2.5	160.0	Gamma	95% Approximate Gamma UCL	81.8	160	82
Selenium	mg/kg	31	52%	3.0	0.7	1.6	4.0	Normal	95% KM (t) UCL	2.6	0.5	1.6
Zinc	mg/kg	42	100%	89.6	55.9	26.0	330.0	Gamma	95% Approximate Gamma UCL	104.0	79	230
alpha-Chlordane	µg/kg	31	26%	9.9	10.8	2.4	36.0	Normal	95% KM (t) UCL	6.5	9	10
gamma-Chlordane	µg/kg	31	32%	8.9	6.5	1.9	25.0	Normal	95% KM (t) UCL	6.0	9	10
4,4'-DDE	µg/kg	31	39%	10.0	7.5	1.2	27.0	Normal	95% KM (t) UCL	7.4	98	16
4,4'-DDT	µg/kg	31	58%	15.6	11.5	0.7	46.0	Normal	95% KM (t) UCL	13.1	8.2	32
Diesel	mg/kg	31	100%	82.8	101.2	1.0	460.0	Gamma	95% Approximate Gamma UCL	123.8	700	144

Notes:
mg/kg - milligrams per kilogram
µg/kg - micrograms per kilogram
95% UCL - 95 percent upper confidence limit
a) Values calculated using ProUCL Version 4.1.00 (http://www.epa.gov/osp/hstl/tsc/software.htm)
b) Summary statistics and detected values were determined following data reduction
c) Arithmetic mean is calculated only for detects
d) Method is the statistic recommended by ProUCL based on the dataset for the given chemical
e) Nondetects are included in the 95% UCL in accordance with the ProUCL methods
f) Soil cleanup levels are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-2: "Summary of Selection of Preliminary Remediation Goals and Proposed Cleanup Levels for Non-Petroleum Compounds in Soil". Listed criteria for non-metals represent the applicable value of the following criteria: Proposed Special Status PRGs, Human Health Residential PRGs, Colma fm. Background. Listed PRGs for metals are selected as applicable per EKI 2002 Table 7-2 footnote f.
g) Sediment cleanup levels are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-3: "Ecological Cleanup Levels for Non-Petroleum Compounds in Sediment at the Presidio of San Francisco (Freshwater)".
j) Highlighted cells are 95% UCLs that exceed the cleanup level

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Table B-2B: Statistical Evaluation of Baseline Soil and Sediment Samples (0 to 3 feet below surface) from Presidio [a]
Draft Removal Action Work Plan
Barnard Avenue Protected Range
Presidio of San Francisco, California

				Summary Statistics[b]		Detected Values[b]		Goodness-of-Fit Test	Upper Confidence Limit (UCL)		Cleanup Level	
Analyte	Unit	No. of Samples	Detection Rate	Arithmetic Mean[c]	Standard Deviation	Minimum Detected	Maximum Detected	Distribution	Method of UCL Calculation[d]	Assessed 95% UCL[e]	Ecological Screening Level[f]	Sediment Screening Level[g]
Antimony	mg/kg	17	12%	7.8	1.2	6.9	8.6	Normal	95% KM (t) UCL	7.2	5	3
Copper	mg/kg	17	100%	27.7	13.7	5.4	53.0	Normal	95% Student's-t UCL	33.5	49	114
Lead	mg/kg	17	100%	46.0	44.7	2.5	140.0	Gamma	95% Approximate Gamma UCL	74.9	160	82
Selenium	mg/kg	17	94%	3.0	0.7	1.6	4.0	Normal	95% KM (t) UCL	3.3	0.5	1.6
Zinc	mg/kg	28	100%	97.6	65.1	30.0	330.0	Gamma	95% Approximate Gamma UCL	120.0	79	230
alpha-Chlordane	µg/kg	17	12%	5.3	4.1	2.4	8.2	Normal	95% KM (t) UCL	3.9	9	10
gamma-Chlordane	µg/kg	17	12%	2.4	0.7	1.9	2.9	Normal	95% KM (t) UCL	2.2	9	10
4,4'-DDE	µg/kg	17	53%	9.6	8.7	1.2	27.0	Normal	95% KM (t) UCL	9.4	98	16
4,4'-DDT	µg/kg	17	53%	12.0	14.6	0.7	46.0	Normal	95% KM (t) UCL	13.2	8.2	32
Diesel	mg/kg	17	100%	110.1	126.2	1.1	460.0	Gamma	95% Approximate Gamma UCL	200.6	700	144

Notes:
mg/kg - milligrams per kilogram
µg/kg - micrograms per kilogram
95% UCL - 95 percent upper confidence limit
a) Values calculated using ProUCL Version 4.1.00 (http://www.epa.gov/osp/hstl/tsc/software.htm)
b) Summary statistics and detected values were determined following data reduction
c) Arithmetic mean is calculated only for detects
d) Method is the statistic recommended by ProUCL based on the dataset for the given chemical
e) Nondetects are included in the 95% UCL in accordance with the ProUCL methods
f) Soil cleanup levels are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-2: "Summary of Selection of Preliminary Remediation Goals and Proposed Cleanup Levels for Non-Petroleum Compounds in Soil". Listed criteria for non-metals represent the applicable value of the following criteria: Proposed Special Status PRGs, Human Health Residential PRGs, Colma fm. Background. Listed PRGs for metals are selected as applicable per EKI 2002 Table 7-2 footnote f.
g) Sediment cleanup levels are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-3: "Ecological Cleanup Levels for Non-Petroleum Compounds in Sediment at the Presidio of San Francisco (Freshwater)".
j) Highlighted cells are 95% UCLs that exceed the cleanup level

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Table B-3A: Data Used in Post-Remediation 95 Percent Upper Confidence Limit Calculations[a]
Draft Removal Action Work Plan
Barnard Avenue Protected Range
Presidio of San Francisco, California

Source[b]	Sample Number[c]	Cu[d] mg/kg[e]	Pb[f] mg/kg	Sb[g] mg/kg	Se[h] mg/kg	Zn[i] mg/kg	alpha-Chlordane µg/kg[j]	gamma-Chlordane µg/kg	4,4'-DDE[k] µg/kg	4,4'-DDT[l] µg/kg	TPHd[m] mg/kg
Geosyntec, 2010	BAPSB205 [3]	-	-	-	-	87	-	-	-	-	-
	BAPSB206[3]	-	-	-	-	43	-	-	-	-	-
	BAPSB207 [3]	-	-	-	-	120	-	-	-	-	-
	BAPSB210[0.3]	17	29	<3.2	2.7	49	<1.8	<1.8	1.3 J	4.3 C	51 Y
	BAPSB210[1.3]	5.4	3.7	<3.1	3.2	30	<1.7	<1.7	<3.4	<3.4	19 Y
	BAPSB211[0.3]	53	15	<3.2	<0.53	62	<1.8	<1.8	<3.5	<3.5	64 Y
	BAPSB211[1.3]	11	2.5	<3.1	3.1	32	<1.7	<1.7	<3.4	<3.4	13 Y
	BAPSB212[0.3]	28	55	<3.2	2.3	68	<8.9	<8.9	4.9 J	<17	130 Y
	BAPSB212[2.3]	18	20	<3.2	3	47	<1.8	<1.8	<3.5	<3.5	13 Y
	BAPSB213[4.5]	70	140	<3.5	4	180	<2.0	<2.0	2.9 C J	<3.8	120 Y
	BAPSB214[0.3]	21	34	<3.3	3.9	64	<1.8	<1.8	1.9 C J	2.8 J	460 Y
	BAPSB214[1.25]	40	10	<3.3	3.4	54	<1.8	<1.8	<3.6	<3.6	210 Y
	BAPSB215[3.3]	53	28	<3.4	3.3	96	<1.9	<1.9	2.0 J	<3.8	18 Y
	BAPSB216[0.3]	24	40	<3.3	2.9	60	<1.9	<1.9	0.69 J	2.3 C J	58Y
	BAPSB216[1.3]	27	11	<3.3	3.3	58	<1.8	<1.8	<3.6	<3.6	2.9 Y
	BAPSB217[0.3]	42	120	<3.3	3.6	120	<9.3	<9.3	12 J	13 J	13 Y
	BAPSB217[2.3] [n]	13	6.1	<3.2	2.5	35	<1.8	<1.8	<3.5	<3.5	1.1 Y
Geosyntec, 2012	BAPSB301[0.5] [n]	18.5	37.5	<0.47	<0.47	52.5	<5.1	<5.1	<9.9	<9.9	32 Y
	BAPSB302[1]	17	26	0.81	<0.47	44	3.9 C	<1.7	<3.3	<3.3	4.4 Y
	BAPSB303[1]	28	140	<0.46	<0.46	96	36	25	28 C	13	25 Y
	BAPSB304[1]	24	110	0.84	<0.46	83	9.7 C	13 C	30 C	11 C	42 Y
	BAPSB305[1]	23	80	1	<0.48	85	<5.1	5.6 C	12 C	<9.9	94 Y
	BAPSB306[1]	30	160	<0.47	<0.47	110	<8.4	<8.4	20 C	<16	77 Y
	BAPSB307[0.5] [n]	22	81	0.68	<0.47	77	<5.1	8.25	13.5	<9.8	140 Y
	BAPSB308[0.5]	21	91	0.95	<0.47	83.5 [n]	5.8 C	8.6	15 C	<9.8	74 Y
	BAPSB309[0.5]	31	120	1.1	<0.48	110	<5.1	6.3 C	17 C	10 C	110 Y
	BAPSB310[0.5]	12	4.9	<0.47	<0.47	26	<5.1	<5.1	<9.9	<9.9	1 Y
	BAPSB311[2]	23	76	<0.46	<0.46	76	6.1	8.2 C	19 C	<9.7	20 Y
	BAPSB312[2]	24	100	0.9	<0.46	81	6.7 C	9.4 C	18 C	<9.9	49 Y
	BAPSB313[2]	16	27	0.83	<0.5	48	<5	<5	<9.7	<9.7	3.3 Y
	BAPSB314[2]	19	30	0.64	<0.49	58	<5.2	<5.2	<10	<10	25 Y

Notes:

All metals measured on a dry basis

< = No detection above the stated laboratory detection limit.

"-"= Not available or not analyzed

QA/QC samples including source decontamination water and rinsate were analyzed for metals, and all analytes were not detected above the reporting limit. Results are depicted in the laboratory analytical reports, included as Appendix A.

J- Data validation qualifier, "The analyte was positively identified; the associated numerical values is biased low due to a low surrogate recovery and should be considered an approximate concentration of the analyte in the sample."

C = Presence confirmed, but RPD between columns exceeds 40%.

Y= Sample exhibits chromatographic pattern which does not resemble standard.

(a) Data are from Tables 1,2, 3, and 4 of this RAW. Samples collected from 0 to 3 feet below surface are included in the baseline conditions data set.

(b) Source of data as referenced in the RIS Report (Geosyntec, 2012a).

(c) The sample number. The square bracket indicates sample depth.

(d) Cu = copper

(e) mg/kg = milligrams per kilogram

(f) Pb = lead

(g) Sb=Antimony

(h) Se = selenium

(i) Zn = zinc

(j) DDE=Dichlorodiphenyldichloroethylene

(k) µg/kg=micrograms/kilogram

(l) DDD = dichlorodiphenyldichloroethane

(m) TPHd= Total petroleum hydrocarbon Diesel

(n) AVG = Average of duplicate samples: if both values detect than it is an average of the results, if it there is one detect and one non-detect it is the value of the detect, and if they are both non-detects then it is the lower of the two non-detects.

Table B-3B: Data Used in Post-Remediation 95 Percent Upper Confidence Limit Calculations[a]
Draft Removal Action Work Plan
Barnard Avenue Protected Range
Presidio of San Francisco, California

Source[b]	Sample Number[c]	Cu[d] mg/kg[e]	Pb[f] mg/kg	Sb[g] mg/kg	Se[h] mg/kg	Zn[i] mg/kg	alpha-Chlordane µg/kg[j]	gamma-Chlordane µg/kg	4,4'-DDE[k] µg/kg	4,4'-DDT[l] µg/kg	TPHd[m] mg/kg
Geosyntec, 2010	BAPSB205 [3]	-	-	-	-	87	-	-	-	-	-
	BAPSB206[3]	-	-	-	-	43	-	-	-	-	-
	BAPSB207 [3]	-	-	-	-	120	-	-	-	-	-
	BAPSB210[0.3]	17	29	<3.2	2.7	49	<1.8	<1.8	1.3 J	4.3 C	51 Y
	BAPSB210[1.3]	5.4	3.7	<3.1	3.2	30	<1.7	<1.7	<3.4	<3.4	19 Y
	BAPSB211[0.3]	53	15	<3.2	<0.53	62	<1.8	<1.8	<3.5	<3.5	64 Y
	BAPSB211[1.3]	11	2.5	<3.1	3.1	32	<1.7	<1.7	<3.4	<3.4	13 Y
	BAPSB212[0.3]	28	55	<3.2	2.3	68	<8.9	<8.9	4.9 J	<17	130 Y
	BAPSB212[2.3]	18	20	<3.2	3	47	<1.8	<1.8	<3.5	<3.5	13 Y
	BAPSB213[4.5]	70	140	<3.5	4	180	<2.0	<2.0	2.9 C J	<3.8	120 Y
	BAPSB214[0.3]	21	34	<3.3	3.9	64	<1.8	<1.8	1.9 C J	2.8 J	460 Y
	BAPSB214[1.25]	40	10	<3.3	3.4	54	<1.8	<1.8	<3.6	<3.6	210 Y
	BAPSB215[3.3]	53	28	<3.4	3.3	96	<1.9	<1.9	2.0 J	<3.8	18 Y
	BAPSB216[0.3]	24	40	<3.3	2.9	60	<1.9	<1.9	0.69 J	2.3 C J	58Y
	BAPSB216[1.3]	27	11	<3.3	3.3	58	<1.8	<1.8	<3.6	<3.6	2.9 Y
	BAPSB217[0.3]	42	120	<3.3	3.6	120	<9.3	<9.3	12 J	13 J	13 Y
	BAPSB217[2.3] [n]	13	6.1	<3.2	2.5	35	<1.8	<1.8	<3.5	<3.5	1.1 Y

Notes:

All metals measured on a dry basis

< = No detection above the stated laboratory detection limit.

"-"= Not available or not analyzed

QA/QC samples including source decontamination water and rinsate were analyzed for metals, and all analytes were not detected above the reporting limit. Results are depicted in the laboratory analytical reports, included as Appendix A.

J- Data validation qualifier, "The analyte was positively identified; the associated numerical values is biased low due to a low surrogate recovery and should be considered an approximate concentration of the analyte in the sample."

C = Presence confirmed, but RPD between columns exceeds 40%.

Y= Sample exhibits chromatographic pattern which does not resemble standard.

(a) Data are from Tables 1 and 2 of this RAW. Samples collected from 0 to 3 feet below surface are included in the baseline conditions data set.

(b) Source of data as referenced in the RIS Report (Geosyntec, 2012a).

(c) The sample number. The square bracket indicates sample depth.

(d) Cu = copper

(e) mg/kg = milligrams per kilogram

(f) Pb = lead

(g) Sb=Antimony

(h) Se = selenium

(i) Zn = zinc

(j) DDE=Dichlorodiphenyldichloroethylene

(k) µg/kg=micrograms/kilogram

(l) DDD = dichlorodiphenyldichloroethane

(m) TPHd= Total petroleum hydrocarbon Diesel

(n) AVG = Average of duplicate samples: if both values detect than it is an average of the results, if it there is one detect and one non-detect it is the value of the detect, and if they are both non-detects then it is the lower of the two non-detects.

Table B-4A: Statistical Evaluation of Post-Remediation Soil and Sediment Samples (0 to 3 feet below post-remediation surface) from Presidio[a]
Draft Removal Action Work Plan
Barnard Avenue Protected Range
Presidio of San Francisco, California

				Summary Statistics[b]		Detected Values[b]		Goodness-of-Fit Test	Upper Confidence Limit (UCL)		Cleanup Level	
Analyte	Unit	No. of Samples	Detection Rate	Arithmetic Mean[c]	Standard Deviation	Minimum Detected	Maximum Detected	Distribution	Method of UCL Calculation[d]	Assessed 95% UCL[e]	Ecological Screening Level[f]	Sediment Screening Level[g]
Antimony	mg/kg	28	32%	0.9	0.1	0.6	1.1	Normal	95% KM (t) UCL	0.9	5	3
Copper	mg/kg	28	100%	26.1	14.2	5.4	70.0	Gamma	95% Approximate Gamma UCL	31.0	49	114
Lead	mg/kg	28	100%	57.1	48.5	2.5	160.0	Gamma	95% Approximate Gamma UCL	79.9	160	82
Selenium	mg/kg	28	46%	3.2	0.5	2.3	4.0	Normal	95% KM (t) UCL	2.9	0.5	1.6
Zinc	mg/kg	31	100%	72.1	33.0	26.0	180.0	Gamma	95% Approximate Gamma UCL	82.9	79	230
alpha-Chlordane	µg/kg	28	21%	11.4	12.2	3.9	36.0	Normal	95% KM (t) UCL	7.7	9	10
gamma-Chlordane	µg/kg	28	29%	10.5	6.2	5.6	25.0	Normal	95% KM (t) UCL	8.4	9	10
4,4'-DDE	µg/kg	30	23%	8.1	4.8	2.3	13.0	Normal	95% KM (t) UCL	5.1	98	16
4,4'-DDT	µg/kg	30	53%	12.4	9.5	0.7	30.0	Normal	95% KM (t) UCL	10.2	8	32
Diesel	mg/kg	30	100%	62.6	90.9	1.0	460.0	Gamma	95% Approximate Gamma UCL	96.2	700	144

Notes:
mg/kg - milligrams per kilogram
µg/kg - micrograms per kilogram
95% UCL - 95 percent upper confidence limit
a) Values calculated using ProUCL Version 4.1.00 (http://www.epa.gov/osp/hstl/tsc/software.htm)
b) Summary statistics and detected values were determined following data reduction
c) Arithmetic mean is calculated only for detects
d) Method is the statistic recommended by ProUCL based on the dataset for the given chemical
e) Nondetects are included in the 95% UCL in accordance with the ProUCL methods
f) Soil cleanup levels are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-2: "Summary of Selection of Preliminary Remediation Goals and Proposed Cleanup Levels for Non-Petroleum Compounds in Soil". Listed criteria for non-metals represent the applic value of the following criteria: Proposed Special Status PRGs, Human Health Residential PRGs, Colma fm. Background. Listed PRGs for metals are selected as applicable per EKI 2002 Table 7-2 footnote f.
g) Sediment cleanup levels are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-3: "Ecological Cleanup Levels for Non-Petroleum Compounds in Sediment at the Presidio of San Francisco (Freshwater)".
j) Highlighted cells are 95% UCLs that exceed the cleanup level

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Table B-4B: Statistical Evaluation of Post-Remediation Soil and Sediment Samples (0 to 3 feet below post-remediation surface) from Presidio[a]
Draft Removal Action Work Plan
Barnard Avenue Protected Range
Presidio of San Francisco, California

				Summary Statistics[b]		Detected Values[b]		Goodness-of-Fit Test	Upper Confidence Limit (UCL)		Cleanup Level	
Analyte	Unit	No. of Samples	Detection Rate	Arithmetic Mean[c]	Standard Deviation	Minimum Detected	Maximum Detected	Distribution	Method of UCL Calculation[d]	Assessed 95% UCL[e]	Ecological Screening Level[f]	Sediment Screening Level[g]
Antimony	mg/kg	14	0%	-	-	-	-	-	-	-	5	3
Copper	mg/kg	14	100%	30.2	18.8	5.4	70	Normal	95% Student's-t UCL	39	49	114
Lead	mg/kg	14	100%	37	42.4	2.50	140	Gamma	95% Approximate Gamma UCL	65	160	82
Selenium	mg/kg	14	93%	3.17	0.5	2.30	4	Normal	95% KM (t) UCL	3.36	0.5	1.6
Zinc	mg/kg	17	100%	70.9	39.2	30	180	Gamma	95% Approximate Gamma UCL	89	79	230
alpha-Chlordane	µg/kg	14	0%	-	-	-	-	-	-	-	9	10
gamma-Chlordane	µg/kg	14	0%	-	-	-	-	-	-	-	9	10
4,4'-DDE	µg/kg	14	29%	5.6	5.0	2.3	13.0	Normal	95% KM (t) UCL	5.10	98	16
4,4'-DDT	µg/kg	14	50%	3.7	3.9	0.7	12.0	Normal	95% KM (t) UCL	4.20	8.2	32
Diesel	mg/kg	14	100%	83.8	124.0	1	460	Gamma	95% Approximate Gamma UCL	174	700	144

Notes:
mg/kg - milligrams per kilogram
µg/kg - micrograms per kilogram
95% UCL - 95 percent upper confidence limit
a) Values calculated using ProUCL Version 4.1.00 (http://www.epa.gov/osp/hstl/tsc/software.htm)
b) Summary statistics and detected values were determined following data reduction
c) Arithmetic mean is calculated only for detects
d) Method is the statistic recommended by ProUCL based on the dataset for the given chemical
e) Nondetects are included in the 95% UCL in accordance with the ProUCL methods
f) Soil cleanup levels are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-2: "Summary of Selection of Preliminary Remediation Goals and Proposed Cleanup Levels for Non-Petroleum Compounds in Soil". Listed criteria for non-metals represent the applic value of the following criteria: Proposed Special Status PRGs, Human Health Residential PRGs, Colma fm. Background. Listed PRGs for metals are selected as applicable per EKI 2002 Table 7-2 footnote f.
g) Sediment cleanup levels are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-3: "Ecological Cleanup Levels for Non-Petroleum Compounds in Sediment at the Presidio of San Francisco (Freshwater)".
j) Highlighted cells are 95% UCLs that exceed the cleanup level

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	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects								
2			User Selected Options									
3			From File	Before Excavation-A.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	Antimony											
10												
11						General Statistics						
12						Number of Valid Data	31			Number of Detected Data		11
13						Number of Distinct Detected Data	11			Number of Non-Detect Data		20
14										Percent Non-Detects		64.52%
15												
16						Raw Statistics				Log-transformed Statistics		
17						Minimum Detected	0.64			Minimum Detected		-0.446
18						Maximum Detected	8.6			Maximum Detected		2.152
19						Mean of Detected	2.114			Mean of Detected		0.238
20						SD of Detected	2.816			SD of Detected		0.907
21						Minimum Non-Detect	0.46			Minimum Non-Detect		-0.777
22						Maximum Non-Detect	3.6			Maximum Non-Detect		1.281
23												
24				Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect		29
25				For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected		2
26				Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage		93.55%
27												
28						UCL Statistics						
29						Normal Distribution Test with Detected Values Only				Lognormal Distribution Test with Detected Values Only		
30						Shapiro Wilk Test Statistic	0.552			Shapiro Wilk Test Statistic		0.659
31						5% Shapiro Wilk Critical Value	0.85			5% Shapiro Wilk Critical Value		0.85
32						Data not Normal at 5% Significance Level				Data not Lognormal at 5% Significance Level		
33												
34						Assuming Normal Distribution				Assuming Lognormal Distribution		
35						DL/2 Substitution Method				DL/2 Substitution Method		
36						Mean	1.578			Mean		0.0866
37						SD	1.747			SD		0.873
38						95% DL/2 (t) UCL	2.11			95% H-Stat (DL/2) UCL		2.294
39												
40						Maximum Likelihood Estimate(MLE) Method	N/A			Log ROS Method		
41						MLE method failed to converge properly				Mean in Log Scale		-0.457
42										SD in Log Scale		0.939
43										Mean in Original Scale		1.108
44										SD in Original Scale		1.824
45										95% t UCL		1.664
46										95% Percentile Bootstrap UCL		1.656
47										95% BCA Bootstrap UCL		1.882
48										95% H-UCL		1.473
49												
50						Gamma Distribution Test with Detected Values Only				Data Distribution Test with Detected Values Only		

	A	B	C	D	E	F	G	H	I	J	K	L
51					k star (bias corrected)	0.873	Data do not follow a Discernable Distribution (0.05)					
52					Theta Star	2.421						
53					nu star	19.2						
54												
55					A-D Test Statistic	2.194	Nonparametric Statistics					
56					5% A-D Critical Value	0.749					Kaplan-Meier (KM) Method	
57					K-S Test Statistic	0.749					Mean	1.232
58					5% K-S Critical Value	0.262					SD	1.732
59	Data not Gamma Distributed at 5% Significance Level										SE of Mean	0.327
60											95% KM (t) UCL	1.788
61	Assuming Gamma Distribution										95% KM (z) UCL	1.77
62				Gamma ROS Statistics using Extrapolated Data							95% KM (jackknife) UCL	1.759
63					Minimum	0.000001					95% KM (bootstrap t) UCL	5.257
64					Maximum	8.6					95% KM (BCA) UCL	1.912
65					Mean	1.107					95% KM (Percentile Bootstrap) UCL	1.762
66					Median	0.64					95% KM (Chebyshev) UCL	2.659
67					SD	1.967					97.5% KM (Chebyshev) UCL	3.277
68					k star	0.137					99% KM (Chebyshev) UCL	4.49
69					Theta star	8.102						
70					Nu star	8.472	Potential UCLs to Use					
71					AppChi2	3.011					95% KM (t) UCL	1.788
72				95% Gamma Approximate UCL (Use when n >= 40)		3.115					95% KM (% Bootstrap) UCL	1.762
73				95% Adjusted Gamma UCL (Use when n < 40)		3.311						
74	Note: DL/2 is not a recommended method.											
75												
76	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
77	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
78	For additional insight, the user may want to consult a statistician.											
79												
80												
81	Copper											
82												
83	General Statistics											
84				Number of Valid Observations		31					Number of Distinct Observations	23
85												
86	Raw Statistics						Log-transformed Statistics					
87					Minimum	5.4					Minimum of Log Data	1.686
88					Maximum	53					Maximum of Log Data	3.97
89					Mean	25.13					Mean of log Data	3.123
90					Geometric Mean	22.72					SD of log Data	0.479
91					Median	23						
92					SD	10.97						
93					Std. Error of Mean	1.97						
94					Coefficient of Variation	0.437						
95					Skewness	0.626						
96												
97	Relevant UCL Statistics											
98	Normal Distribution Test						Lognormal Distribution Test					
99					Shapiro Wilk Test Statistic	0.958					Shapiro Wilk Test Statistic	0.962
100					Shapiro Wilk Critical Value	0.929					Shapiro Wilk Critical Value	0.929

	A–E	F	G–K	L
101	**Data appear Normal at 5% Significance Level**		**Data appear Lognormal at 5% Significance Level**	
102				
103	**Assuming Normal Distribution**		**Assuming Lognormal Distribution**	
104	95% Student's-t UCL	28.47	95% H-UCL	30.13
105	**95% UCLs (Adjusted for Skewness)**		95% Chebyshev (MVUE) UCL	35.29
106	95% Adjusted-CLT UCL (Chen-1995)	28.6	97.5% Chebyshev (MVUE) UCL	39.58
107	95% Modified-t UCL (Johnson-1978)	28.51	99% Chebyshev (MVUE) UCL	48.01
108				
109	**Gamma Distribution Test**		**Data Distribution**	
110	k star (bias corrected)	4.649	**Data appear Normal at 5% Significance Level**	
111	Theta Star	5.404		
112	MLE of Mean	25.13		
113	MLE of Standard Deviation	11.65		
114	nu star	288.2		
115	Approximate Chi Square Value (.05)	249.9	**Nonparametric Statistics**	
116	Adjusted Level of Significance	0.0413	95% CLT UCL	28.37
117	Adjusted Chi Square Value	247.9	95% Jackknife UCL	28.47
118			95% Standard Bootstrap UCL	28.29
119	Anderson-Darling Test Statistic	0.223	95% Bootstrap-t UCL	28.68
120	Anderson-Darling 5% Critical Value	0.747	95% Hall's Bootstrap UCL	28.49
121	Kolmogorov-Smirnov Test Statistic	0.0948	95% Percentile Bootstrap UCL	28.47
122	Kolmogorov-Smirnov 5% Critical Value	0.158	95% BCA Bootstrap UCL	28.77
123	**Data appear Gamma Distributed at 5% Significance Level**		95% Chebyshev(Mean, Sd) UCL	33.71
124			97.5% Chebyshev(Mean, Sd) UCL	37.43
125	**Assuming Gamma Distribution**		99% Chebyshev(Mean, Sd) UCL	44.73
126	95% Approximate Gamma UCL (Use when n >= 40)	28.98		
127	95% Adjusted Gamma UCL (Use when n < 40)	29.21		
128				
129	**Potential UCL to Use**		Use 95% Student's-t UCL	28.47
130				
131	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**			
132	**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**			
133	**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**			
134				
135				
136	**Lead**			
137				
138	**General Statistics**			
139	Number of Valid Observations	31	Number of Distinct Observations	26
140				
141	**Raw Statistics**		**Log-transformed Statistics**	
142	Minimum	2.5	Minimum of Log Data	0.916
143	Maximum	160	Maximum of Log Data	5.075
144	Mean	60.18	Mean of log Data	3.623
145	Geometric Mean	37.45	SD of log Data	1.161
146	Median	40		
147	SD	47.63		
148	Std. Error of Mean	8.555		
149	Coefficient of Variation	0.791		
150	Skewness	0.511		

	A	B	C	D	E	F	G	H	I	J	K	L
151												
152						Relevant UCL Statistics						
153				Normal Distribution Test						Lognormal Distribution Test		
154					Shapiro Wilk Test Statistic	0.906					Shapiro Wilk Test Statistic	0.911
155					Shapiro Wilk Critical Value	0.929					Shapiro Wilk Critical Value	0.929
156				Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level		
157												
158				Assuming Normal Distribution						Assuming Lognormal Distribution		
159					95% Student's-t UCL	74.7					95% H-UCL	128.1
160				95% UCLs (Adjusted for Skewness)							95% Chebyshev (MVUE) UCL	147.9
161					95% Adjusted-CLT UCL (Chen-1995)	75.09					97.5% Chebyshev (MVUE) UCL	181.1
162					95% Modified-t UCL (Johnson-1978)	74.84					99% Chebyshev (MVUE) UCL	246.4
163												
164				Gamma Distribution Test						Data Distribution		
165					k star (bias corrected)	1.099				Data appear Gamma Distributed at 5% Significance Level		
166					Theta Star	54.76						
167					MLE of Mean	60.18						
168					MLE of Standard Deviation	57.41						
169					nu star	68.14						
170					Approximate Chi Square Value (.05)	50.14				Nonparametric Statistics		
171					Adjusted Level of Significance	0.0413					95% CLT UCL	74.26
172					Adjusted Chi Square Value	49.28					95% Jackknife UCL	74.7
173											95% Standard Bootstrap UCL	74.32
174					Anderson-Darling Test Statistic	0.526					95% Bootstrap-t UCL	76.11
175					Anderson-Darling 5% Critical Value	0.771					95% Hall's Bootstrap UCL	74.98
176					Kolmogorov-Smirnov Test Statistic	0.134					95% Percentile Bootstrap UCL	74.03
177					Kolmogorov-Smirnov 5% Critical Value	0.162					95% BCA Bootstrap UCL	74.58
178				Data appear Gamma Distributed at 5% Significance Level							95% Chebyshev(Mean, Sd) UCL	97.48
179											97.5% Chebyshev(Mean, Sd) UCL	113.6
180				Assuming Gamma Distribution							99% Chebyshev(Mean, Sd) UCL	145.3
181					95% Approximate Gamma UCL (Use when n >= 40)	81.79						
182					95% Adjusted Gamma UCL (Use when n < 40)	83.21						
183												
184				Potential UCL to Use							Use 95% Approximate Gamma UCL	81.79
185												
186				Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.								
187				These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)								
188				and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.								
189												
190												
191	Selenium											
192												
193				General Statistics								
194					Number of Valid Data	31					Number of Detected Data	16
195					Number of Distinct Detected Data	16					Number of Non-Detect Data	15
196											Percent Non-Detects	48.39%
197												
198				Raw Statistics						Log-transformed Statistics		
199					Minimum Detected	1.6					Minimum Detected	0.47
200					Maximum Detected	4					Maximum Detected	1.386

	A–E	F	G–K	L
201	Mean of Detected	3.044	Mean of Detected	1.084
202	SD of Detected	0.699	SD of Detected	0.26
203	Minimum Non-Detect	0.46	Minimum Non-Detect	-0.777
204	Maximum Non-Detect	0.53	Maximum Non-Detect	-0.635
205				
206	Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	15
207	For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	16
208	Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	48.39%
209				
210	**UCL Statistics**			
211	**Normal Distribution Test with Detected Values Only**		**Lognormal Distribution Test with Detected Values Only**	
212	Shapiro Wilk Test Statistic	0.956	Shapiro Wilk Test Statistic	0.906
213	5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887
214	**Data appear Normal at 5% Significance Level**		**Data appear Lognormal at 5% Significance Level**	
215				
216	**Assuming Normal Distribution**		**Assuming Lognormal Distribution**	
217	DL/2 Substitution Method		DL/2 Substitution Method	
218	Mean	1.686	Mean	-0.135
219	SD	1.509	SD	1.294
220	95% DL/2 (t) UCL	2.146	95% H-Stat (DL/2) UCL	3.902
221				
222	Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
223	Mean	3.044	Mean in Log Scale	0.78
224	SD	0.677	SD in Log Scale	0.383
225	95% MLE (t) UCL	3.25	Mean in Original Scale	2.342
226	95% MLE (Tiku) UCL	3.331	SD in Original Scale	0.901
227			95% t UCL	2.617
228			95% Percentile Bootstrap UCL	2.619
229			95% BCA Bootstrap UCL	2.62
230			95% H UCL	2.67
231				
232	**Gamma Distribution Test with Detected Values Only**		**Data Distribution Test with Detected Values Only**	
233	k star (bias corrected)	14.2	**Data appear Normal at 5% Significance Level**	
234	Theta Star	0.214		
235	nu star	454.3		
236				
237	A-D Test Statistic	0.43	**Nonparametric Statistics**	
238	5% A-D Critical Value	0.737	Kaplan-Meier (KM) Method	
239	K-S Test Statistic	0.737	Mean	2.345
240	5% K-S Critical Value	0.215	SD	0.87
241	**Data appear Gamma Distributed at 5% Significance Level**		SE of Mean	0.161
242			95% KM (t) UCL	2.619
243	**Assuming Gamma Distribution**		95% KM (z) UCL	2.611
244	Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2.593
245	Minimum	0.000001	95% KM (bootstrap t) UCL	2.613
246	Maximum	4	95% KM (BCA) UCL	2.942
247	Mean	1.685	95% KM (Percentile Bootstrap) UCL	2.826
248	Median	1.6	95% KM (Chebyshev) UCL	3.049
249	SD	1.535	97.5% KM (Chebyshev) UCL	3.353
250	k star	0.183	99% KM (Chebyshev) UCL	3.951

	A	B	C	D	E	F	G	H	I	J	K	L
251					Theta star	9.184						
252					Nu star	11.37			Potential UCLs to Use			
253					AppChi2	4.818					95% KM (t) UCL	2.619
254				95% Gamma Approximate UCL (Use when n >= 40)		3.978					95% KM (Percentile Bootstrap) UCL	2.826
255				95% Adjusted Gamma UCL (Use when n < 40)		4.183						
256	Note: DL/2 is not a recommended method.											
257												
258	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
259	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
260	For additional insight, the user may want to consult a statistician.											
261												
262												
263	Zinc											
264												
265	General Statistics											
266					Number of Valid Observations	42					Number of Distinct Observations	33
267												
268	Raw Statistics						Log-transformed Statistics					
269					Minimum	26					Minimum of Log Data	3.258
270					Maximum	330					Maximum of Log Data	5.799
271					Mean	89.61					Mean of log Data	4.34
272					Geometric Mean	76.73					SD of log Data	0.555
273					Median	77.25						
274					SD	55.87						
275					Std. Error of Mean	8.621						
276					Coefficient of Variation	0.624						
277					Skewness	2.116						
278												
279	Relevant UCL Statistics											
280	Normal Distribution Test						Lognormal Distribution Test					
281					Shapiro Wilk Test Statistic	0.791					Shapiro Wilk Test Statistic	0.932
282					Shapiro Wilk Critical Value	0.942					Shapiro Wilk Critical Value	0.942
283	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level					
284												
285	Assuming Normal Distribution						Assuming Lognormal Distribution					
286					95% Student's-t UCL	104.1					95% H-UCL	105.9
287	95% UCLs (Adjusted for Skewness)										95% Chebyshev (MVUE) UCL	124.3
288					95% Adjusted-CLT UCL (Chen-1995)	106.8					97.5% Chebyshev (MVUE) UCL	139.6
289					95% Modified-t UCL (Johnson-1978)	104.6					99% Chebyshev (MVUE) UCL	169.5
290												
291	Gamma Distribution Test						Data Distribution					
292					k star (bias corrected)	3.156	Data appear Gamma Distributed at 5% Significance Level					
293					Theta Star	28.39						
294					MLE of Mean	89.61						
295					MLE of Standard Deviation	50.44						
296					nu star	265.1						
297					Approximate Chi Square Value (.05)	228.4	Nonparametric Statistics					
298					Adjusted Level of Significance	0.0443					95% CLT UCL	103.8
299					Adjusted Chi Square Value	227.2					95% Jackknife UCL	104.1
300											95% Standard Bootstrap UCL	103.9

	A–E	F	G–K	L
301	Anderson-Darling Test Statistic	0.474	95% Bootstrap-t UCL	108.3
302	Anderson-Darling 5% Critical Value	0.754	95% Hall's Bootstrap UCL	114.1
303	Kolmogorov-Smirnov Test Statistic	0.0916	95% Percentile Bootstrap UCL	104.4
304	Kolmogorov-Smirnov 5% Critical Value	0.137	95% BCA Bootstrap UCL	107.4
305	**Data appear Gamma Distributed at 5% Significance Level**		95% Chebyshev(Mean, Sd) UCL	127.2
306			97.5% Chebyshev(Mean, Sd) UCL	143.4
307	**Assuming Gamma Distribution**		99% Chebyshev(Mean, Sd) UCL	175.4
308	95% Approximate Gamma UCL (Use when n >= 40)	104		
309	95% Adjusted Gamma UCL (Use when n < 40)	104.6		
310				
311	**Potential UCL to Use**		Use 95% Approximate Gamma UCL	104
312				
313	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**			
314	**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**			
315	**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**			
316				
317				
318	**alpha-Chlordane**			
319				
320	**General Statistics**			
321	Number of Valid Data	31	Number of Detected Data	8
322	Number of Distinct Detected Data	8	Number of Non-Detect Data	23
323			Percent Non-Detects	74.19%
324				
325	**Raw Statistics**		**Log-transformed Statistics**	
326	Minimum Detected	2.4	Minimum Detected	0.875
327	Maximum Detected	36	Maximum Detected	3.584
328	Mean of Detected	9.85	Mean of Detected	1.958
329	SD of Detected	10.81	SD of Detected	0.789
330	Minimum Non-Detect	1.7	Minimum Non-Detect	0.531
331	Maximum Non-Detect	32	Maximum Non-Detect	3.466
332				
333	Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	30
334	For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
335	Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	96.77%
336				
337	**Warning: There are only 8 Detected Values in this data**			
338	**Note: It should be noted that even though bootstrap may be performed on this data set**			
339	**the resulting calculations may not be reliable enough to draw conclusions**			
340				
341	**It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.**			
342				
343				
344	**UCL Statistics**			
345	**Normal Distribution Test with Detected Values Only**		**Lognormal Distribution Test with Detected Values Only**	
346	Shapiro Wilk Test Statistic	0.626	Shapiro Wilk Test Statistic	0.912
347	5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
348	**Data not Normal at 5% Significance Level**		**Data appear Lognormal at 5% Significance Level**	
349				
350	**Assuming Normal Distribution**		**Assuming Lognormal Distribution**	

	A	B	C	D	E	F	G	H	I	J	K	L
351					DL/2 Substitution Method						DL/2 Substitution Method	
352					Mean	4.544					Mean	0.964
353					SD	6.705					SD	0.99
354					95% DL/2 (t) UCL	6.587					95% H-Stat (DL/2) UCL	6.619
355												
356					Maximum Likelihood Estimate(MLE) Method	N/A					Log ROS Method	
357					**MLE method failed to converge properly**						Mean in Log Scale	0.381
358											SD in Log Scale	1.151
359											Mean in Original Scale	3.277
360											SD in Original Scale	6.556
361											95% t UCL	5.276
362											95% Percentile Bootstrap UCL	5.414
363											95% BCA Bootstrap UCL	6.683
364											95% H-UCL	4.907
365												
366					**Gamma Distribution Test with Detected Values Only**						**Data Distribution Test with Detected Values Only**	
367					k star (bias corrected)	1.124					**Data appear Gamma Distributed at 5% Significance Level**	
368					Theta Star	8.764						
369					nu star	17.98						
370												
371					A-D Test Statistic	0.712					**Nonparametric Statistics**	
372					5% A-D Critical Value	0.727					Kaplan-Meier (KM) Method	
373					K-S Test Statistic	0.727					Mean	4.495
374					5% K-S Critical Value	0.298					SD	6.084
375					**Data appear Gamma Distributed at 5% Significance Level**						SE of Mean	1.179
376											95% KM (t) UCL	6.496
377					**Assuming Gamma Distribution**						95% KM (z) UCL	6.434
378					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	6.138
379					Minimum	0.000001					95% KM (bootstrap t) UCL	8.932
380					Maximum	36					95% KM (BCA) UCL	8.989
381					Mean	2.542					95% KM (Percentile Bootstrap) UCL	7.97
382					Median	0.000001					95% KM (Chebyshev) UCL	9.635
383					SD	6.816					97.5% KM (Chebyshev) UCL	11.86
384					k star	0.0922					99% KM (Chebyshev) UCL	16.23
385					Theta star	27.56						
386					Nu star	5.719					**Potential UCLs to Use**	
387					AppChi2	1.498					95% KM (t) UCL	6.496
388					95% Gamma Approximate UCL (Use when n >= 40)	9.705						
389					95% Adjusted Gamma UCL (Use when n < 40)	10.52						
390	**Note: DL/2 is not a recommended method.**											
391												
392	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
393	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**											
394	**For additional insight, the user may want to consult a statistician.**											
395												
396												
397	**gamma-Chlordane**											
398												
399					**General Statistics**							
400					Number of Valid Data	31					Number of Detected Data	10

	A–E	F	G–K	L
401	Number of Distinct Detected Data	10	Number of Non-Detect Data	21
402			Percent Non-Detects	67.74%
403				
404	**Raw Statistics**		**Log-transformed Statistics**	
405	Minimum Detected	1.9	Minimum Detected	0.642
406	Maximum Detected	25	Maximum Detected	3.219
407	Mean of Detected	8.915	Mean of Detected	1.966
408	SD of Detected	6.497	SD of Detected	0.724
409	Minimum Non-Detect	1.7	Minimum Non-Detect	0.531
410	Maximum Non-Detect	19	Maximum Non-Detect	2.944
411				
412	Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	30
413	For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
414	Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	96.77%
415				
416	**UCL Statistics**			
417	**Normal Distribution Test with Detected Values Only**		**Lognormal Distribution Test with Detected Values Only**	
418	Shapiro Wilk Test Statistic	0.823	Shapiro Wilk Test Statistic	0.954
419	5% Shapiro Wilk Critical Value	0.842	5% Shapiro Wilk Critical Value	0.842
420	**Data not Normal at 5% Significance Level**		**Data appear Lognormal at 5% Significance Level**	
421				
422	**Assuming Normal Distribution**		**Assuming Lognormal Distribution**	
423	DL/2 Substitution Method		DL/2 Substitution Method	
424	Mean	4.448	Mean	0.981
425	SD	5.07	SD	1.025
426	95% DL/2 (t) UCL	5.994	95% H-Stat (DL/2) UCL	7.137
427				
428	Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
429	**MLE method failed to converge properly**		Mean in Log Scale	0.788
430			SD in Log Scale	0.997
431			Mean in Original Scale	3.81
432			SD in Original Scale	5.068
433			95% t UCL	5.355
434			95% Percentile Bootstrap UCL	5.418
435			95% BCA Bootstrap UCL	5.767
436			95% H-UCL	5.617
437				
438	**Gamma Distribution Test with Detected Values Only**		**Data Distribution Test with Detected Values Only**	
439	k star (bias corrected)	1.753	**Data appear Gamma Distributed at 5% Significance Level**	
440	Theta Star	5.086		
441	nu star	35.06		
442				
443	A-D Test Statistic	0.33	**Nonparametric Statistics**	
444	5% A-D Critical Value	0.734	Kaplan-Meier (KM) Method	
445	K-S Test Statistic	0.734	Mean	4.39
446	5% K-S Critical Value	0.269	SD	4.82
447	**Data appear Gamma Distributed at 5% Significance Level**		SE of Mean	0.936
448			95% KM (t) UCL	5.978
449	**Assuming Gamma Distribution**		95% KM (z) UCL	5.929
450	Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	5.718

	A	B	C	D	E	F	G	H	I	J	K	L
451					Minimum	0.000001				95% KM (bootstrap t) UCL		6.492
452					Maximum	25				95% KM (BCA) UCL		8.486
453					Mean	2.876				95% KM (Percentile Bootstrap) UCL		7.489
454					Median	0.000001				95% KM (Chebyshev) UCL		8.468
455					SD	5.533				97.5% KM (Chebyshev) UCL		10.23
456					k star	0.098				99% KM (Chebyshev) UCL		13.7
457					Theta star	29.34						
458					Nu star	6.078				**Potential UCLs to Use**		
459					AppChi2	1.68				95% KM (t) UCL		5.978
460				95% Gamma Approximate UCL (Use when n >= 40)		10.41						
461				95% Adjusted Gamma UCL (Use when n < 40)		11.24						
462	**Note: DL/2 is not a recommended method.**											
463												
464	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
465	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**											
466	**For additional insight, the user may want to consult a statistician.**											
467												
468												
469	**4,4'-DDE**											
470												
471	**General Statistics**											
472					Number of Valid Data	31				Number of Detected Data		12
473					Number of Distinct Detected Data	10				Number of Non-Detect Data		19
474										Percent Non-Detects		61.29%
475												
476	**Raw Statistics**						**Log-transformed Statistics**					
477					Minimum Detected	1.2				Minimum Detected		0.182
478					Maximum Detected	27				Maximum Detected		3.296
479					Mean of Detected	10.02				Mean of Detected		1.98
480					SD of Detected	7.517				SD of Detected		0.927
481					Minimum Non-Detect	3.3				Minimum Non-Detect		1.194
482					Maximum Non-Detect	17				Maximum Non-Detect		2.833
483												
484	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		29
485	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		2
486	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		93.55%
487												
488	**UCL Statistics**											
489	**Normal Distribution Test with Detected Values Only**						**Lognormal Distribution Test with Detected Values Only**					
490					Shapiro Wilk Test Statistic	0.916				Shapiro Wilk Test Statistic		0.945
491					5% Shapiro Wilk Critical Value	0.859				5% Shapiro Wilk Critical Value		0.859
492	**Data appear Normal at 5% Significance Level**						**Data appear Lognormal at 5% Significance Level**					
493												
494	**Assuming Normal Distribution**						**Assuming Lognormal Distribution**					
495					DL/2 Substitution Method					DL/2 Substitution Method		
496					Mean	6.287				Mean		1.508
497					SD	5.712				SD		0.822
498					95% DL/2 (t) UCL	8.028				95% H-Stat (DL/2) UCL		8.837
499												
500					Maximum Likelihood Estimate(MLE) Method	N/A				Log ROS Method		

	A	B	C	D	E	F	G	H	I	J	K	L
501	MLE method failed to converge properly										Mean in Log Scale	1.283
502											SD in Log Scale	0.852
503											Mean in Original Scale	5.404
504											SD in Original Scale	5.927
505											95% t UCL	7.211
506											95% Percentile Bootstrap UCL	7.176
507											95% BCA Bootstrap UCL	7.482
508											95% H-UCL	7.366
509												
510	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only					
511					k star (bias corrected)	1.324	Data appear Normal at 5% Significance Level					
512					Theta Star	7.567						
513					nu star	31.77						
514												
515					A-D Test Statistic	0.248	Nonparametric Statistics					
516					5% A-D Critical Value	0.744					Kaplan-Meier (KM) Method	
517					K-S Test Statistic	0.744					Mean	5.452
518					5% K-S Critical Value	0.249					SD	5.919
519	Data appear Gamma Distributed at 5% Significance Level										SE of Mean	1.165
520											95% KM (t) UCL	7.429
521	Assuming Gamma Distribution										95% KM (z) UCL	7.368
522					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	7.429
523					Minimum	0.000001					95% KM (bootstrap t) UCL	7.875
524					Maximum	27					95% KM (BCA) UCL	7.955
525					Mean	5.544					95% KM (Percentile Bootstrap) UCL	7.678
526					Median	4.3					95% KM (Chebyshev) UCL	10.53
527					SD	6.141					97.5% KM (Chebyshev) UCL	12.72
528					k star	0.23					99% KM (Chebyshev) UCL	17.04
529					Theta star	24.15						
530					Nu star	14.23	Potential UCLs to Use					
531					AppChi2	6.73					95% KM (t) UCL	7.429
532					95% Gamma Approximate UCL (Use when n >= 40)	11.72					95% KM (Percentile Bootstrap) UCL	7.678
533					95% Adjusted Gamma UCL (Use when n < 40)	12.24						
534	Note: DL/2 is not a recommended method.											
535												
536	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
537	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
538	For additional insight, the user may want to consult a statistician.											
539												
540												
541	4,4'-DDT											
542												
543	General Statistics											
544					Number of Valid Data	31					Number of Detected Data	18
545					Number of Distinct Detected Data	16					Number of Non-Detect Data	13
546											Percent Non-Detects	41.94%
547												
548	Raw Statistics						Log-transformed Statistics					
549					Minimum Detected	0.69					Minimum Detected	-0.371
550					Maximum Detected	46					Maximum Detected	3.829

	A–E	F	G–K	L
551	Mean of Detected	15.58	Mean of Detected	2.337
552	SD of Detected	11.48	SD of Detected	1.136
553	Minimum Non-Detect	3.3	Minimum Non-Detect	1.194
554	Maximum Non-Detect	10	Maximum Non-Detect	2.303
555				
556	Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	18
557	For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	13
558	Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	58.06%
559				
560	**UCL Statistics**			
561	**Normal Distribution Test with Detected Values Only**		**Lognormal Distribution Test with Detected Values Only**	
562	Shapiro Wilk Test Statistic	0.929	Shapiro Wilk Test Statistic	0.869
563	5% Shapiro Wilk Critical Value	0.897	5% Shapiro Wilk Critical Value	0.897
564	**Data appear Normal at 5% Significance Level**		**Data not Lognormal at 5% Significance Level**	
565				
566	**Assuming Normal Distribution**		**Assuming Lognormal Distribution**	
567	DL/2 Substitution Method		DL/2 Substitution Method	
568	Mean	10.19	Mean	1.725
569	SD	10.83	SD	1.17
570	95% DL/2 (t) UCL	13.49	95% H-Stat (DL/2) UCL	19.52
571				
572	Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
573	Mean	6.557	Mean in Log Scale	1.616
574	SD	15.19	SD in Log Scale	1.245
575	95% MLE (t) UCL	11.19	Mean in Original Scale	9.888
576	95% MLE (Tiku) UCL	12.91	SD in Original Scale	11.01
577			95% t UCL	13.25
578			95% Percentile Bootstrap UCL	13.29
579			95% BCA Bootstrap UCL	13.73
580			95% H UCL	20.31
581				
582	**Gamma Distribution Test with Detected Values Only**		**Data Distribution Test with Detected Values Only**	
583	k star (bias corrected)	1.175	**Data appear Normal at 5% Significance Level**	
584	Theta Star	13.26		
585	nu star	42.31		
586				
587	A-D Test Statistic	0.53	**Nonparametric Statistics**	
588	5% A-D Critical Value	0.759	Kaplan-Meier (KM) Method	
589	K-S Test Statistic	0.759	Mean	9.67
590	5% K-S Critical Value	0.208	SD	11
591	**Data follow Appr. Gamma Distribution at 5% Significance Level**		SE of Mean	2.041
592			95% KM (t) UCL	13.13
593	**Assuming Gamma Distribution**		95% KM (z) UCL	13.03
594	Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	13.1
595	Minimum	0.000001	95% KM (bootstrap t) UCL	13.82
596	Maximum	46	95% KM (BCA) UCL	13.39
597	Mean	9.436	95% KM (Percentile Bootstrap) UCL	13.23
598	Median	3.909	95% KM (Chebyshev) UCL	18.57
599	SD	11.39	97.5% KM (Chebyshev) UCL	22.42
600	k star	0.166	99% KM (Chebyshev) UCL	29.98

	A	B	C	D	E	F	G	H	I	J	K	L
601					Theta star	56.89						
602					Nu star	10.28	Potential UCLs to Use					
603					AppChi2	4.12					95% KM (t) UCL	13.13
604				95% Gamma Approximate UCL (Use when n >= 40)		23.55					95% KM (Percentile Bootstrap) UCL	13.23
605				95% Adjusted Gamma UCL (Use when n < 40)		24.85						
606	Note: DL/2 is not a recommended method.											
607												
608	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
609	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
610	For additional insight, the user may want to consult a statistician.											
611												
612												
613	TPHd											
614												
615	General Statistics											
616					Number of Valid Observations	31					Number of Distinct Observations	28
617												
618	Raw Statistics						Log-transformed Statistics					
619					Minimum	1					Minimum of Log Data	0
620					Maximum	460					Maximum of Log Data	6.131
621					Mean	82.83					Mean of log Data	3.581
622					Geometric Mean	35.92					SD of log Data	1.571
623					Median	50						
624					SD	101.2						
625					Std. Error of Mean	18.17						
626					Coefficient of Variation	1.221						
627					Skewness	2.178						
628												
629	Relevant UCL Statistics											
630	Normal Distribution Test						Lognormal Distribution Test					
631					Shapiro Wilk Test Statistic	0.759					Shapiro Wilk Test Statistic	0.943
632					Shapiro Wilk Critical Value	0.929					Shapiro Wilk Critical Value	0.929
633	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
634												
635	Assuming Normal Distribution						Assuming Lognormal Distribution					
636					95% Student's-t UCL	113.7					95% H-UCL	307.1
637	95% UCLs (Adjusted for Skewness)										95% Chebyshev (MVUE) UCL	293.4
638					95% Adjusted-CLT UCL (Chen-1995)	120.3					97.5% Chebyshev (MVUE) UCL	371
639					95% Modified-t UCL (Johnson-1978)	114.8					99% Chebyshev (MVUE) UCL	523.6
640												
641	Gamma Distribution Test						Data Distribution					
642					k star (bias corrected)	0.672	Data appear Gamma Distributed at 5% Significance Level					
643					Theta Star	123.2						
644					MLE of Mean	82.83						
645					MLE of Standard Deviation	101						
646					nu star	41.68						
647					Approximate Chi Square Value (.05)	27.88	Nonparametric Statistics					
648					Adjusted Level of Significance	0.0413					95% CLT UCL	112.7
649					Adjusted Chi Square Value	27.25					95% Jackknife UCL	113.7
650											95% Standard Bootstrap UCL	111.8

	A	B	C	D	E	F	G	H	I	J	K	L
651					Anderson-Darling Test Statistic	0.138					95% Bootstrap-t UCL	129.6
652					Anderson-Darling 5% Critical Value	0.79					95% Hall's Bootstrap UCL	133.8
653					Kolmogorov-Smirnov Test Statistic	0.0585					95% Percentile Bootstrap UCL	113.5
654					Kolmogorov-Smirnov 5% Critical Value	0.164					95% BCA Bootstrap UCL	126.4
655					**Data appear Gamma Distributed at 5% Significance Level**						95% Chebyshev(Mean, Sd) UCL	162
656											97.5% Chebyshev(Mean, Sd) UCL	196.3
657					**Assuming Gamma Distribution**						99% Chebyshev(Mean, Sd) UCL	263.6
658					95% Approximate Gamma UCL (Use when n >= 40)	123.8						
659					95% Adjusted Gamma UCL (Use when n < 40)	126.7						
660												
661					**Potential UCL to Use**						Use 95% Approximate Gamma UCL	123.8
662												
663	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
664	**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**											
665	**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**											
666												

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects								
2			User Selected Options									
3			From File	Before Excavation-B.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	Antimony											
10												
11						General Statistics						
12						Number of Valid Data	17			Number of Detected Data		2
13						Number of Distinct Detected Data	2			Number of Non-Detect Data		15
14										Percent Non-Detects		88.24%
15												
16						Raw Statistics				Log-transformed Statistics		
17						Minimum Detected	6.9			Minimum Detected		1.932
18						Maximum Detected	8.6			Maximum Detected		2.152
19						Mean of Detected	7.75			Mean of Detected		2.042
20						SD of Detected	1.202			SD of Detected		0.156
21						Minimum Non-Detect	3.1			Minimum Non-Detect		1.131
22						Maximum Non-Detect	3.6			Maximum Non-Detect		1.281
23												
24				Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect		15
25				For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected		2
26				Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage		88.24%
27												
28						Warning: Data set has only 2 Distinct Detected Values.						
29						This may not be adequate enough to compute meaningful and reliable test statistics and estimates.						
30						The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).						
31												
32						Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.						
33												
34						The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.						
35						Those methods will return a 'N/A' value on your output display!						
36												
37						It is necessary to have 4 or more Distinct Values for bootstrap methods.						
38						However, results obtained using 4 to 9 distinct values may not be reliable.						
39						It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.						
40												
41												
42						UCL Statistics						
43						Normal Distribution Test with Detected Values Only				Lognormal Distribution Test with Detected Values Only		
44						Shapiro Wilk Test Statistic	N/A			Shapiro Wilk Test Statistic		N/A
45						5% Shapiro Wilk Critical Value	N/A			5% Shapiro Wilk Critical Value		N/A
46						Data not Normal at 5% Significance Level				Data not Lognormal at 5% Significance Level		
47												
48						Assuming Normal Distribution				Assuming Lognormal Distribution		
49						DL/2 Substitution Method				DL/2 Substitution Method		
50						Mean	2.353			Mean		0.673

	A	B	C	D	E	F	G	H	I	J	K	L
51					SD	2.054					SD	0.518
52					95% DL/2 (t) UCL	3.223					95% H-Stat (DL/2) UCL	2.923
53												
54					Maximum Likelihood Estimate(MLE) Method	N/A					Log ROS Method	
55					**MLE method failed to converge properly**						Mean in Log Scale	N/A
56											SD in Log Scale	N/A
57											Mean in Original Scale	N/A
58											SD in Original Scale	N/A
59											95% t UCL	N/A
60											95% Percentile Bootstrap UCL	N/A
61											95% BCA Bootstrap UCL	N/A
62											95% H-UCL	N/A
63												
64					**Gamma Distribution Test with Detected Values Only**						**Data Distribution Test with Detected Values Only**	
65					k star (bias corrected)	N/A					**Data do not follow a Discernable Distribution (0.05)**	
66					Theta Star	N/A						
67					nu star	N/A						
68												
69					A-D Test Statistic	N/A					**Nonparametric Statistics**	
70					5% A-D Critical Value	N/A					Kaplan-Meier (KM) Method	
71					K-S Test Statistic	N/A					Mean	7
72					5% K-S Critical Value	N/A					SD	0.4
73					**Data not Gamma Distributed at 5% Significance Level**						SE of Mean	0.137
74											95% KM (t) UCL	7.24
75					**Assuming Gamma Distribution**						95% KM (z) UCL	7.226
76					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	8.136
77					Minimum	N/A					95% KM (bootstrap t) UCL	N/A
78					Maximum	N/A					95% KM (BCA) UCL	8.6
79					Mean	N/A					95% KM (Percentile Bootstrap) UCL	8.6
80					Median	N/A					95% KM (Chebyshev) UCL	7.598
81					SD	N/A					97.5% KM (Chebyshev) UCL	7.857
82					k star	N/A					99% KM (Chebyshev) UCL	8.365
83					Theta star	N/A						
84					Nu star	N/A					**Potential UCLs to Use**	
85					AppChi2	N/A					95% KM (t) UCL	7.24
86					95% Gamma Approximate UCL (Use when n >= 40)	N/A					95% KM (% Bootstrap) UCL	8.6
87					95% Adjusted Gamma UCL (Use when n < 40)	N/A						
88	**Note: DL/2 is not a recommended method.**											
89												
90	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
91	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**											
92	**For additional insight, the user may want to consult a statistician.**											
93												
94												
95	**Copper**											
96												
97					**General Statistics**							
98					Number of Valid Observations	17					Number of Distinct Observations	15
99												
100					**Raw Statistics**						**Log-transformed Statistics**	

	A	B	C	D	E	F	G	H	I	J	K	L
101					Minimum	5.4				Minimum of Log Data		1.686
102					Maximum	53				Maximum of Log Data		3.97
103					Mean	27.67				Mean of log Data		3.173
104					Geometric Mean	23.87				SD of log Data		0.609
105					Median	27						
106					SD	13.67						
107					Std. Error of Mean	3.317						
108					Coefficient of Variation	0.494						
109					Skewness	0.109						
110												
111					**Relevant UCL Statistics**							
112					**Normal Distribution Test**					**Lognormal Distribution Test**		
113					Shapiro Wilk Test Statistic	0.952				Shapiro Wilk Test Statistic		0.923
114					Shapiro Wilk Critical Value	0.892				Shapiro Wilk Critical Value		0.892
115					**Data appear Normal at 5% Significance Level**					**Data appear Lognormal at 5% Significance Level**		
116												
117					**Assuming Normal Distribution**					**Assuming Lognormal Distribution**		
118					95% Student's-t UCL	33.46				95% H-UCL		39.86
119					**95% UCLs (Adjusted for Skewness)**					95% Chebyshev (MVUE) UCL		47.49
120					95% Adjusted-CLT UCL (Chen-1995)	33.22				97.5% Chebyshev (MVUE) UCL		55.77
121					95% Modified-t UCL (Johnson-1978)	33.48				99% Chebyshev (MVUE) UCL		72.02
122												
123					**Gamma Distribution Test**					**Data Distribution**		
124					k star (bias corrected)	2.956				**Data appear Normal at 5% Significance Level**		
125					Theta Star	9.361						
126					MLE of Mean	27.67						
127					MLE of Standard Deviation	16.09						
128					nu star	100.5						
129					Approximate Chi Square Value (.05)	78.38				**Nonparametric Statistics**		
130					Adjusted Level of Significance	0.0346				95% CLT UCL		33.13
131					Adjusted Chi Square Value	76.33				95% Jackknife UCL		33.46
132										95% Standard Bootstrap UCL		32.93
133					Anderson-Darling Test Statistic	0.4				95% Bootstrap-t UCL		33.55
134					Anderson-Darling 5% Critical Value	0.744				95% Hall's Bootstrap UCL		33.09
135					Kolmogorov-Smirnov Test Statistic	0.185				95% Percentile Bootstrap UCL		32.82
136					Kolmogorov-Smirnov 5% Critical Value	0.21				95% BCA Bootstrap UCL		33
137					**Data appear Gamma Distributed at 5% Significance Level**					95% Chebyshev(Mean, Sd) UCL		42.13
138										97.5% Chebyshev(Mean, Sd) UCL		48.38
139					**Assuming Gamma Distribution**					99% Chebyshev(Mean, Sd) UCL		60.67
140					95% Approximate Gamma UCL (Use when n >= 40)	35.48						
141					95% Adjusted Gamma UCL (Use when n < 40)	36.43						
142												
143					**Potential UCL to Use**					Use 95% Student's-t UCL		33.46
144												
145					**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**							
146					**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**							
147					**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**							
148												
149												
150	**Lead**											

	A	B	C	D	E	F	G	H	I	J	K	L
151												
152						General Statistics						
153					Number of Valid Observations	17					Number of Distinct Observations	17
154												
155				Raw Statistics						Log-transformed Statistics		
156					Minimum	2.5					Minimum of Log Data	0.916
157					Maximum	140					Maximum of Log Data	4.942
158					Mean	46.02					Mean of log Data	3.26
159					Geometric Mean	26.04					SD of log Data	1.225
160					Median	29						
161					SD	44.65						
162					Std. Error of Mean	10.83						
163					Coefficient of Variation	0.97						
164					Skewness	1.022						
165												
166						Relevant UCL Statistics						
167				Normal Distribution Test						Lognormal Distribution Test		
168					Shapiro Wilk Test Statistic	0.846					Shapiro Wilk Test Statistic	0.957
169					Shapiro Wilk Critical Value	0.892					Shapiro Wilk Critical Value	0.892
170				Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level		
171												
172				Assuming Normal Distribution						Assuming Lognormal Distribution		
173					95% Student's-t UCL	64.93					95% H-UCL	139.1
174				95% UCLs (Adjusted for Skewness)							95% Chebyshev (MVUE) UCL	127.1
175					95% Adjusted-CLT UCL (Chen-1995)	66.7					97.5% Chebyshev (MVUE) UCL	159.8
176					95% Modified-t UCL (Johnson-1978)	65.37					99% Chebyshev (MVUE) UCL	224.2
177												
178				Gamma Distribution Test						Data Distribution		
179					k star (bias corrected)	0.873				Data appear Gamma Distributed at 5% Significance Level		
180					Theta Star	52.72						
181					MLE of Mean	46.02						
182					MLE of Standard Deviation	49.25						
183					nu star	29.68						
184					Approximate Chi Square Value (.05)	18.24				Nonparametric Statistics		
185					Adjusted Level of Significance	0.0346					95% CLT UCL	63.83
186					Adjusted Chi Square Value	17.3					95% Jackknife UCL	64.93
187											95% Standard Bootstrap UCL	63.13
188					Anderson-Darling Test Statistic	0.238					95% Bootstrap-t UCL	69.86
189					Anderson-Darling 5% Critical Value	0.766					95% Hall's Bootstrap UCL	64.93
190					Kolmogorov-Smirnov Test Statistic	0.122					95% Percentile Bootstrap UCL	64.24
191					Kolmogorov-Smirnov 5% Critical Value	0.215					95% BCA Bootstrap UCL	68
192				Data appear Gamma Distributed at 5% Significance Level							95% Chebyshev(Mean, Sd) UCL	93.22
193											97.5% Chebyshev(Mean, Sd) UCL	113.6
194				Assuming Gamma Distribution							99% Chebyshev(Mean, Sd) UCL	153.8
195					95% Approximate Gamma UCL (Use when n >= 40)	74.87						
196					95% Adjusted Gamma UCL (Use when n < 40)	78.93						
197												
198				Potential UCL to Use							Use 95% Approximate Gamma UCL	74.87
199												
200				Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.								

These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Selenium

General Statistics

Number of Valid Data	17	Number of Detected Data	16
Number of Distinct Detected Data	16	Number of Non-Detect Data	1
		Percent Non-Detects	5.88%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.6	Minimum Detected	0.47
Maximum Detected	4	Maximum Detected	1.386
Mean of Detected	3.044	Mean of Detected	1.084
SD of Detected	0.699	SD of Detected	0.26
Minimum Non-Detect	0.53	Minimum Non-Detect	-0.635
Maximum Non-Detect	0.53	Maximum Non-Detect	-0.635

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.956	Shapiro Wilk Test Statistic	0.906
5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.88	Mean	0.942
SD	0.955	SD	0.637
95% DL/2 (t) UCL	3.285	95% H-Stat (DL/2) UCL	4.448
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	2.878	Mean in Log Scale	1.048
SD	0.935	SD in Log Scale	0.291
95% MLE (t) UCL	3.274	Mean in Original Scale	2.96
95% MLE (Tiku) UCL	3.285	SD in Original Scale	0.761
		95% t UCL	3.282
		95% Percentile Bootstrap UCL	3.243
		95% BCA Bootstrap UCL	3.229
		95% H UCL	3.407

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	14.2	Data appear Normal at 5% Significance Level	
Theta Star	0.214		
nu star	454.3		
A-D Test Statistic	0.43	**Nonparametric Statistics**	
5% A-D Critical Value	0.737	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.737	Mean	2.959

	A	B	C	D	E	F	G	H	I	J	K	L
251					5% K-S Critical Value	0.215					SD	0.74
252					**Data appear Gamma Distributed at 5% Significance Level**						SE of Mean	0.185
253											95% KM (t) UCL	3.282
254					**Assuming Gamma Distribution**						95% KM (z) UCL	3.264
255					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	3.279
256					Minimum	0.609					95% KM (bootstrap t) UCL	3.253
257					Maximum	4					95% KM (BCA) UCL	3.282
258					Mean	2.901					95% KM (Percentile Bootstrap) UCL	3.259
259					Median	3.1					95% KM (Chebyshev) UCL	3.766
260					SD	0.899					97.5% KM (Chebyshev) UCL	4.116
261					k star	5.76					99% KM (Chebyshev) UCL	4.802
262					Theta star	0.504						
263					Nu star	195.8					**Potential UCLs to Use**	
264					AppChi2	164.5					95% KM (t) UCL	3.282
265					95% Gamma Approximate UCL (Use when n >= 40)	3.454					95% KM (Percentile Bootstrap) UCL	3.259
266					95% Adjusted Gamma UCL (Use when n < 40)	3.518						
267	**Note: DL/2 is not a recommended method.**											
268												
269					**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**							
270					**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**							
271					**For additional insight, the user may want to consult a statistician.**							
272												
273												
274	**Zinc**											
275												
276					**General Statistics**							
277					Number of Valid Observations	28					Number of Distinct Observations	22
278												
279					**Raw Statistics**						**Log-transformed Statistics**	
280					Minimum	30					Minimum of Log Data	3.401
281					Maximum	330					Maximum of Log Data	5.799
282					Mean	97.63					Mean of log Data	4.394
283					Geometric Mean	80.98					SD of log Data	0.617
284					Median	72.75						
285					SD	65.14						
286					Std. Error of Mean	12.31						
287					Coefficient of Variation	0.667						
288					Skewness	1.751						
289												
290					**Relevant UCL Statistics**							
291					**Normal Distribution Test**						**Lognormal Distribution Test**	
292					Shapiro Wilk Test Statistic	0.824					Shapiro Wilk Test Statistic	0.95
293					Shapiro Wilk Critical Value	0.924					Shapiro Wilk Critical Value	0.924
294					**Data not Normal at 5% Significance Level**						**Data appear Lognormal at 5% Significance Level**	
295												
296					**Assuming Normal Distribution**						**Assuming Lognormal Distribution**	
297					95% Student's-t UCL	118.6					95% H-UCL	124.8
298					**95% UCLs (Adjusted for Skewness)**						95% Chebyshev (MVUE) UCL	149.7
299					95% Adjusted-CLT UCL (Chen-1995)	122.2					97.5% Chebyshev (MVUE) UCL	172.4
300					95% Modified-t UCL (Johnson-1978)	119.3					99% Chebyshev (MVUE) UCL	217

	A	B	C	D	E	F	G	H	I	J	K	L
301												
302				**Gamma Distribution Test**					**Data Distribution**			
303					k star (bias corrected)	2.552			**Data appear Gamma Distributed at 5% Significance Level**			
304					Theta Star	38.26						
305					MLE of Mean	97.63						
306					MLE of Standard Deviation	61.12						
307					nu star	142.9						
308					Approximate Chi Square Value (.05)	116.3			**Nonparametric Statistics**			
309					Adjusted Level of Significance	0.0404					95% CLT UCL	117.9
310					Adjusted Chi Square Value	114.8					95% Jackknife UCL	118.6
311											95% Standard Bootstrap UCL	117.3
312					Anderson-Darling Test Statistic	0.688					95% Bootstrap-t UCL	124.9
313					Anderson-Darling 5% Critical Value	0.754					95% Hall's Bootstrap UCL	130.8
314					Kolmogorov-Smirnov Test Statistic	0.144					95% Percentile Bootstrap UCL	118.7
315					Kolmogorov-Smirnov 5% Critical Value	0.167					95% BCA Bootstrap UCL	122
316				**Data appear Gamma Distributed at 5% Significance Level**							95% Chebyshev(Mean, Sd) UCL	151.3
317											97.5% Chebyshev(Mean, Sd) UCL	174.5
318				**Assuming Gamma Distribution**							99% Chebyshev(Mean, Sd) UCL	220.1
319					95% Approximate Gamma UCL (Use when n >= 40)	120						
320					95% Adjusted Gamma UCL (Use when n < 40)	121.5						
321												
322				**Potential UCL to Use**							Use 95% Approximate Gamma UCL	120
323												
324												
325												
326												
327												
328												
329	**alpha-Chlordane**											
330												
331						**General Statistics**						
332					Number of Valid Data	17					Number of Detected Data	2
333					Number of Distinct Detected Data	2					Number of Non-Detect Data	15
334											Percent Non-Detects	88.24%
335												
336				**Raw Statistics**					**Log-transformed Statistics**			
337					Minimum Detected	2.4					Minimum Detected	0.875
338					Maximum Detected	8.2					Maximum Detected	2.104
339					Mean of Detected	5.3					Mean of Detected	1.49
340					SD of Detected	4.101					SD of Detected	0.869
341					Minimum Non-Detect	1.7					Minimum Non-Detect	0.531
342					Maximum Non-Detect	32					Maximum Non-Detect	3.466
343												
344	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	17
345	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	0
346	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	100.00%
347												
348												
349												
350												

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

	A	B	C	D	E	F	G	H	I	J	K	L
351												
352	Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.											
353												
354	The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.											
355	Those methods will return a 'N/A' value on your output display!											
356												
357	It is necessary to have 4 or more Distinct Values for bootstrap methods.											
358	However, results obtained using 4 to 9 distinct values may not be reliable.											
359	It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.											
360												
361												
362	UCL Statistics											
363	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only					
364					Shapiro Wilk Test Statistic	N/A				Shapiro Wilk Test Statistic		N/A
365					5% Shapiro Wilk Critical Value	N/A				5% Shapiro Wilk Critical Value		N/A
366	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level					
367												
368	Assuming Normal Distribution						Assuming Lognormal Distribution					
369					DL/2 Substitution Method					DL/2 Substitution Method		
370					Mean	2.976				Mean		0.543
371					SD	3.982				SD		0.974
372					95% DL/2 (t) UCL	4.663				95% H-Stat (DL/2) UCL		5.254
373												
374					Maximum Likelihood Estimate(MLE) Method	N/A				Log ROS Method		
375	MLE method failed to converge properly									Mean in Log Scale		N/A
376										SD in Log Scale		N/A
377										Mean in Original Scale		N/A
378										SD in Original Scale		N/A
379										95% t UCL		N/A
380										95% Percentile Bootstrap UCL		N/A
381										95% BCA Bootstrap UCL		N/A
382										95% H-UCL		N/A
383												
384	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only					
385					k star (bias corrected)	N/A	Data do not follow a Discernable Distribution (0.05)					
386					Theta Star	N/A						
387					nu star	N/A						
388												
389					A-D Test Statistic	N/A	Nonparametric Statistics					
390					5% A-D Critical Value	N/A				Kaplan-Meier (KM) Method		
391					K-S Test Statistic	N/A				Mean		2.846
392					5% K-S Critical Value	N/A				SD		1.546
393	Data not Gamma Distributed at 5% Significance Level									SE of Mean		0.606
394										95% KM (t) UCL		3.905
395	Assuming Gamma Distribution									95% KM (z) UCL		3.843
396					Gamma ROS Statistics using Extrapolated Data					95% KM (jackknife) UCL		6.678
397					Minimum	N/A				95% KM (bootstrap t) UCL		N/A
398					Maximum	N/A				95% KM (BCA) UCL		8.2
399					Mean	N/A				95% KM (Percentile Bootstrap) UCL		8.2
400					Median	N/A				95% KM (Chebyshev) UCL		5.489

	A	B	C	D	E	F	G	H	I	J	K	L
401					SD	N/A				97.5% KM (Chebyshev) UCL		6.632
402					k star	N/A				99% KM (Chebyshev) UCL		8.878
403					Theta star	N/A						
404					Nu star	N/A				**Potential UCLs to Use**		
405					AppChi2	N/A				95% KM (t) UCL		3.905
406				95% Gamma Approximate UCL (Use when n >= 40)		N/A				95% KM (% Bootstrap) UCL		8.2
407				95% Adjusted Gamma UCL (Use when n < 40)		N/A						
408	**Note: DL/2 is not a recommended method.**											
409												
410	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
411	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**											
412	**For additional insight, the user may want to consult a statistician.**											
413												
414												
415	**gamma-Chlordane**											
416												
417					**General Statistics**							
418					Number of Valid Data	17				Number of Detected Data		2
419					Number of Distinct Detected Data	2				Number of Non-Detect Data		15
420										Percent Non-Detects		88.24%
421												
422					**Raw Statistics**					**Log-transformed Statistics**		
423					Minimum Detected	1.9				Minimum Detected		0.642
424					Maximum Detected	2.9				Maximum Detected		1.065
425					Mean of Detected	2.4				Mean of Detected		0.853
426					SD of Detected	0.707				SD of Detected		0.299
427					Minimum Non-Detect	1.7				Minimum Non-Detect		0.531
428					Maximum Non-Detect	19				Maximum Non-Detect		2.944
429												
430	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		17
431	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		0
432	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		100.00%
433												
434	**Warning: Data set has only 2 Distinct Detected Values.**											
435	**This may not be adequate enough to compute meaningful and reliable test statistics and estimates.**											
436	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
437												
438	**Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.**											
439												
440	**The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.**											
441	**Those methods will return a 'N/A' value on your output display!**											
442												
443	**It is necessary to have 4 or more Distinct Values for bootstrap methods.**											
444	**However, results obtained using 4 to 9 distinct values may not be reliable.**											
445	**It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.**											
446												
447												
448					**UCL Statistics**							
449					**Normal Distribution Test with Detected Values Only**					**Lognormal Distribution Test with Detected Values Only**		
450					Shapiro Wilk Test Statistic	N/A				Shapiro Wilk Test Statistic		N/A

	A	B	C	D	E	F	G	H	I	J	K	L
451					5% Shapiro Wilk Critical Value	N/A				5% Shapiro Wilk Critical Value		N/A
452					**Data not Normal at 5% Significance Level**					**Data not Lognormal at 5% Significance Level**		
453												
454					**Assuming Normal Distribution**					**Assuming Lognormal Distribution**		
455					DL/2 Substitution Method					DL/2 Substitution Method		
456					Mean	2.253				Mean		0.437
457					SD	2.389				SD		0.817
458					95% DL/2 (t) UCL	3.265				95% H-Stat (DL/2) UCL		3.515
459												
460					Maximum Likelihood Estimate(MLE) Method	N/A				Log ROS Method		
461					**MLE method failed to converge properly**					Mean in Log Scale		N/A
462										SD in Log Scale		N/A
463										Mean in Original Scale		N/A
464										SD in Original Scale		N/A
465										95% t UCL		N/A
466										95% Percentile Bootstrap UCL		N/A
467										95% BCA Bootstrap UCL		N/A
468										95% H-UCL		N/A
469												
470					**Gamma Distribution Test with Detected Values Only**					**Data Distribution Test with Detected Values Only**		
471					k star (bias corrected)	N/A				**Data do not follow a Discernable Distribution (0.05)**		
472					Theta Star	N/A						
473					nu star	N/A						
474												
475					A-D Test Statistic	N/A				**Nonparametric Statistics**		
476					5% A-D Critical Value	N/A				Kaplan-Meier (KM) Method		
477					K-S Test Statistic	N/A				Mean		1.977
478					5% K-S Critical Value	N/A				SD		0.266
479					**Data not Gamma Distributed at 5% Significance Level**					SE of Mean		0.105
480										95% KM (t) UCL		2.159
481					**Assuming Gamma Distribution**					95% KM (z) UCL		2.149
482					Gamma ROS Statistics using Extrapolated Data					95% KM (jackknife) UCL		2.638
483					Minimum	N/A				95% KM (bootstrap t) UCL		N/A
484					Maximum	N/A				95% KM (BCA) UCL		2.9
485					Mean	N/A				95% KM (Percentile Bootstrap) UCL		2.9
486					Median	N/A				95% KM (Chebyshev) UCL		2.433
487					SD	N/A				97.5% KM (Chebyshev) UCL		2.63
488					k star	N/A				99% KM (Chebyshev) UCL		3.017
489					Theta star	N/A						
490					Nu star	N/A				**Potential UCLs to Use**		
491					AppChi2	N/A				95% KM (t) UCL		2.159
492					95% Gamma Approximate UCL (Use when n >= 40)	N/A				95% KM (% Bootstrap) UCL		2.9
493					95% Adjusted Gamma UCL (Use when n < 40)	N/A						
494	**Note: DL/2 is not a recommended method.**											
495												
496					**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**							
497					**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**							
498					**For additional insight, the user may want to consult a statistician.**							
499												
500												

	A	B	C	D	E	F	G	H	I	J	K	L
501	4,4'-DDE											
502												
503					General Statistics							
504					Number of Valid Data	17				Number of Detected Data		9
505					Number of Distinct Detected Data	9				Number of Non-Detect Data		8
506										Percent Non-Detects		47.06%
507												
508					Raw Statistics					Log-transformed Statistics		
509					Minimum Detected	1.2				Minimum Detected		0.182
510					Maximum Detected	27				Maximum Detected		3.296
511					Mean of Detected	9.578				Mean of Detected		1.833
512					SD of Detected	8.732				SD of Detected		1.04
513					Minimum Non-Detect	3.4				Minimum Non-Detect		1.224
514					Maximum Non-Detect	17				Maximum Non-Detect		2.833
515												
516	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		15
517	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		2
518	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		88.24%
519												
520					Warning: There are only 9 Detected Values in this data							
521					Note: It should be noted that even though bootstrap may be performed on this data set							
522					the resulting calculations may not be reliable enough to draw conclusions							
523												
524					It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.							
525												
526												
527					UCL Statistics							
528					Normal Distribution Test with Detected Values Only					Lognormal Distribution Test with Detected Values Only		
529					Shapiro Wilk Test Statistic	0.88				Shapiro Wilk Test Statistic		0.974
530					5% Shapiro Wilk Critical Value	0.829				5% Shapiro Wilk Critical Value		0.829
531					Data appear Normal at 5% Significance Level					Data appear Lognormal at 5% Significance Level		
532												
533					Assuming Normal Distribution					Assuming Lognormal Distribution		
534					DL/2 Substitution Method					DL/2 Substitution Method		
535					Mean	6.291				Mean		1.327
536					SD	7.316				SD		0.992
537					95% DL/2 (t) UCL	9.389				95% H-Stat (DL/2) UCL		11.91
538												
539					Maximum Likelihood Estimate(MLE) Method	N/A				Log ROS Method		
540					MLE method failed to converge properly					Mean in Log Scale		1.311
541										SD in Log Scale		0.971
542										Mean in Original Scale		6.114
543										SD in Original Scale		7.265
544										95% t UCL		9.19
545										95% Percentile Bootstrap UCL		9.125
546										95% BCA Bootstrap UCL		9.838
547										95% H-UCL		11.26
548												
549					Gamma Distribution Test with Detected Values Only					Data Distribution Test with Detected Values Only		
550					k star (bias corrected)	0.95				Data appear Normal at 5% Significance Level		

	A	B	C	D	E	F	G	H	I	J	K	L
551					Theta Star	10.08						
552					nu star	17.11						
553												
554					A-D Test Statistic	0.188	**Nonparametric Statistics**					
555					5% A-D Critical Value	0.738	Kaplan-Meier (KM) Method					
556					K-S Test Statistic	0.738	Mean					6.166
557					5% K-S Critical Value	0.285	SD					7.073
558	**Data appear Gamma Distributed at 5% Significance Level**						SE of Mean					1.846
559							95% KM (t) UCL					9.388
560	**Assuming Gamma Distribution**						95% KM (z) UCL					9.202
561	Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL					9.326
562					Minimum	0.000001	95% KM (bootstrap t) UCL					11.47
563					Maximum	27	95% KM (BCA) UCL					9.884
564					Mean	6.024	95% KM (Percentile Bootstrap) UCL					9.444
565					Median	3.397	95% KM (Chebyshev) UCL					14.21
566					SD	7.418	97.5% KM (Chebyshev) UCL					17.69
567					k star	0.238	99% KM (Chebyshev) UCL					24.53
568					Theta star	25.36						
569					Nu star	8.077	**Potential UCLs to Use**					
570					AppChi2	2.78	95% KM (t) UCL					9.388
571					95% Gamma Approximate UCL (Use when n >= 40)	17.5	95% KM (Percentile Bootstrap) UCL					9.444
572					95% Adjusted Gamma UCL (Use when n < 40)	19.75						
573	**Note: DL/2 is not a recommended method.**											
574												
575	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
576	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**											
577	**For additional insight, the user may want to consult a statistician.**											
578												
579												
580	**4,4'-DDT**											
581												
582					**General Statistics**							
583					Number of Valid Data	17	Number of Detected Data					9
584					Number of Distinct Detected Data	8	Number of Non-Detect Data					8
585							Percent Non-Detects					47.06%
586												
587					**Raw Statistics**		**Log-transformed Statistics**					
588					Minimum Detected	0.69	Minimum Detected					-0.371
589					Maximum Detected	46	Maximum Detected					3.829
590					Mean of Detected	12	Mean of Detected					1.765
591					SD of Detected	14.6	SD of Detected					1.382
592					Minimum Non-Detect	3.4	Minimum Non-Detect					1.224
593					Maximum Non-Detect	3.6	Maximum Non-Detect					1.281
594												
595	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect					11
596	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected					6
597	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage					64.71%
598												
599	**Warning: There are only 9 Detected Values in this data**											
600	**Note: It should be noted that even though bootstrap may be performed on this data set**											

	A	B	C	D	E	F	G	H	I	J	K	L
601	the resulting calculations may not be reliable enough to draw conclusions											
602												
603	It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.											
604												
605												
606	UCL Statistics											
607	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only					
608					Shapiro Wilk Test Statistic	0.776				Shapiro Wilk Test Statistic		0.971
609					5% Shapiro Wilk Critical Value	0.829				5% Shapiro Wilk Critical Value		0.829
610	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
611												
612	Assuming Normal Distribution						Assuming Lognormal Distribution					
613					DL/2 Substitution Method					DL/2 Substitution Method		
614					Mean	7.179				Mean		1.199
615					SD	11.59				SD		1.157
616					95% DL/2 (t) UCL	12.09				95% H-Stat (DL/2) UCL		15.03
617												
618					Maximum Likelihood Estimate(MLE) Method	N/A				Log ROS Method		
619	MLE yields a negative mean									Mean in Log Scale		1.014
620										SD in Log Scale		1.345
621										Mean in Original Scale		7.011
622										SD in Original Scale		11.69
623										95% t UCL		11.96
624										95% Percentile Bootstrap UCL		11.8
625										95% BCA Bootstrap UCL		13.85
626										95% H-UCL		20.07
627												
628	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only					
629					k star (bias corrected)	0.622	Data appear Gamma Distributed at 5% Significance Level					
630					Theta Star	19.31						
631					nu star	11.19						
632												
633					A-D Test Statistic	0.216	Nonparametric Statistics					
634					5% A-D Critical Value	0.749				Kaplan-Meier (KM) Method		
635					K-S Test Statistic	0.749				Mean		6.963
636					5% K-S Critical Value	0.289				SD		11.36
637	Data appear Gamma Distributed at 5% Significance Level									SE of Mean		2.926
638										95% KM (t) UCL		12.07
639	Assuming Gamma Distribution									95% KM (z) UCL		11.78
640					Gamma ROS Statistics using Extrapolated Data					95% KM (jackknife) UCL		11.94
641					Minimum	0.000001				95% KM (bootstrap t) UCL		18.87
642					Maximum	46				95% KM (BCA) UCL		13.2
643					Mean	6.823				95% KM (Percentile Bootstrap) UCL		11.92
644					Median	1.9				95% KM (Chebyshev) UCL		19.72
645					SD	11.82				97.5% KM (Chebyshev) UCL		25.24
646					k star	0.168				99% KM (Chebyshev) UCL		36.08
647					Theta star	40.64						
648					Nu star	5.708	Potential UCLs to Use					
649					AppChi2	1.492				95% KM (BCA) UCL		13.2
650					95% Gamma Approximate UCL (Use when n >= 40)	26.1						

	A	B	C	D	E	F	G	H	I	J	K	L
651				95% Adjusted Gamma UCL (Use when n < 40)		30.43						
652	Note: DL/2 is not a recommended method.											
653												
654	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
655	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
656	For additional insight, the user may want to consult a statistician.											
657												
658												
659	TPHd											
660												
661	General Statistics											
662				Number of Valid Observations		17				Number of Distinct Observations		15
663												
664	Raw Statistics						Log-transformed Statistics					
665				Minimum		1.1				Minimum of Log Data		0.0953
666				Maximum		460				Maximum of Log Data		6.131
667				Mean		110.1				Mean of log Data		3.823
668				Geometric Mean		45.72				SD of log Data		1.663
669				Median		58						
670				SD		126.2						
671				Std. Error of Mean		30.61						
672				Coefficient of Variation		1.147						
673				Skewness		1.561						
674												
675	Relevant UCL Statistics											
676	Normal Distribution Test						Lognormal Distribution Test					
677				Shapiro Wilk Test Statistic		0.813				Shapiro Wilk Test Statistic		0.939
678				Shapiro Wilk Critical Value		0.892				Shapiro Wilk Critical Value		0.892
679	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
680												
681	Assuming Normal Distribution						Assuming Lognormal Distribution					
682				95% Student's-t UCL		163.5				95% H-UCL		875.7
683	95% UCLs (Adjusted for Skewness)									95% Chebyshev (MVUE) UCL		476.1
684				95% Adjusted-CLT UCL (Chen-1995)		172.8				97.5% Chebyshev (MVUE) UCL		615.1
685				95% Modified-t UCL (Johnson-1978)		165.4				99% Chebyshev (MVUE) UCL		887.9
686												
687	Gamma Distribution Test						Data Distribution					
688				k star (bias corrected)		0.607	Data appear Gamma Distributed at 5% Significance Level					
689				Theta Star		181.3						
690				MLE of Mean		110.1						
691				MLE of Standard Deviation		141.3						
692				nu star		20.64						
693				Approximate Chi Square Value (.05)		11.32	Nonparametric Statistics					
694				Adjusted Level of Significance		0.0346				95% CLT UCL		160.4
695				Adjusted Chi Square Value		10.6				95% Jackknife UCL		163.5
696										95% Standard Bootstrap UCL		158.1
697				Anderson-Darling Test Statistic		0.226				95% Bootstrap-t UCL		186.9
698				Anderson-Darling 5% Critical Value		0.782				95% Hall's Bootstrap UCL		184.5
699				Kolmogorov-Smirnov Test Statistic		0.111				95% Percentile Bootstrap UCL		161.1
700				Kolmogorov-Smirnov 5% Critical Value		0.218				95% BCA Bootstrap UCL		170.9

	A	B	C	D	E	F	G	H	I	J	K	L
701	**Data appear Gamma Distributed at 5% Significance Level**										95% Chebyshev(Mean, Sd) UCL	243.5
702											97.5% Chebyshev(Mean, Sd) UCL	301.2
703	**Assuming Gamma Distribution**										99% Chebyshev(Mean, Sd) UCL	414.7
704				95% Approximate Gamma UCL (Use when n >= 40)		200.6						
705				95% Adjusted Gamma UCL (Use when n < 40)		214.2						
706												
707	**Potential UCL to Use**										Use 95% Approximate Gamma UCL	200.6
708												
709	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
710	**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**											
711	**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**											
712												

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects								
2		User Selected Options										
3		From File		After Excavation-A.wst								
4		Full Precision		OFF								
5		Confidence Coefficient		95%								
6		Number of Bootstrap Operations		2000								
7												
8												
9	Antimony											
10												
11					General Statistics							
12				Number of Valid Data		28			Number of Detected Data			9
13				Number of Distinct Detected Data		9			Number of Non-Detect Data			19
14									Percent Non-Detects			67.86%
15												
16				Raw Statistics					Log-transformed Statistics			
17				Minimum Detected		0.64			Minimum Detected			-0.446
18				Maximum Detected		1.1			Maximum Detected			0.0953
19				Mean of Detected		0.861			Mean of Detected			-0.163
20				SD of Detected		0.146			SD of Detected			0.174
21				Minimum Non-Detect		0.46			Minimum Non-Detect			-0.777
22				Maximum Non-Detect		3.5			Maximum Non-Detect			1.253
23												
24	Note: Data have multiple DLs - Use of KM Method is recommended								Number treated as Non-Detect			28
25	For all methods (except KM, DL/2, and ROS Methods),								Number treated as Detected			0
26	Observations < Largest ND are treated as NDs								Single DL Non-Detect Percentage			100.00%
27												
28				Warning: There are only 9 Detected Values in this data								
29				Note: It should be noted that even though bootstrap may be performed on this data set								
30				the resulting calculations may not be reliable enough to draw conclusions								
31												
32				It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.								
33												
34												
35					UCL Statistics							
36				Normal Distribution Test with Detected Values Only					Lognormal Distribution Test with Detected Values Only			
37				Shapiro Wilk Test Statistic		0.975			Shapiro Wilk Test Statistic			0.965
38				5% Shapiro Wilk Critical Value		0.829			5% Shapiro Wilk Critical Value			0.829
39				Data appear Normal at 5% Significance Level					Data appear Lognormal at 5% Significance Level			
40												
41				Assuming Normal Distribution					Assuming Lognormal Distribution			
42				DL/2 Substitution Method					DL/2 Substitution Method			
43				Mean		1.133			Mean			-0.0689
44				SD		0.557			SD			0.728
45				95% DL/2 (t) UCL		1.312			95% H-Stat (DL/2) UCL			1.644
46												
47				Maximum Likelihood Estimate(MLE) Method		N/A			Log ROS Method			
48				MLE method failed to converge properly					Mean in Log Scale			-0.321
49									SD in Log Scale			0.222
50									Mean in Original Scale			0.743

	A	B	C	D	E	F	G	H	I	J	K	L
51											SD in Original Scale	0.165
52											95% t UCL	0.796
53											95% Percentile Bootstrap UCL	0.792
54											95% BCA Bootstrap UCL	0.792
55											95% H-UCL	0.801
56												
57				**Gamma Distribution Test with Detected Values Only**					**Data Distribution Test with Detected Values Only**			
58					k star (bias corrected)	25.41			**Data appear Normal at 5% Significance Level**			
59					Theta Star	0.0339						
60					nu star	457.4						
61												
62					A-D Test Statistic	0.207			**Nonparametric Statistics**			
63					5% A-D Critical Value	0.721					Kaplan-Meier (KM) Method	
64					K-S Test Statistic	0.721					Mean	0.782
65					5% K-S Critical Value	0.279					SD	0.153
66				**Data appear Gamma Distributed at 5% Significance Level**							SE of Mean	0.0434
67											95% KM (t) UCL	0.856
68				**Assuming Gamma Distribution**							95% KM (z) UCL	0.854
69					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	0.851
70					Minimum	0.000001					95% KM (bootstrap t) UCL	0.857
71					Maximum	1.1					95% KM (BCA) UCL	0.908
72					Mean	0.654					95% KM (Percentile Bootstrap) UCL	0.891
73					Median	0.716					95% KM (Chebyshev) UCL	0.971
74					SD	0.298					97.5% KM (Chebyshev) UCL	1.053
75					k star	0.932					99% KM (Chebyshev) UCL	1.214
76					Theta star	0.702						
77					Nu star	52.21			**Potential UCLs to Use**			
78					AppChi2	36.62					95% KM (t) UCL	0.856
79					95% Gamma Approximate UCL (Use when n >= 40)	0.933					95% KM (Percentile Bootstrap) UCL	0.891
80					95% Adjusted Gamma UCL (Use when n < 40)	0.954						
81	**Note: DL/2 is not a recommended method.**											
82												
83	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
84	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**											
85	**For additional insight, the user may want to consult a statistician.**											
86												
87												
88	**Copper**											
89												
90					**General Statistics**							
91					Number of Valid Observations	28					Number of Distinct Observations	21
92												
93				**Raw Statistics**					**Log-transformed Statistics**			
94					Minimum	5.4					Minimum of Log Data	1.686
95					Maximum	70					Maximum of Log Data	4.248
96					Mean	26.1					Mean of log Data	3.133
97					Geometric Mean	22.94					SD of log Data	0.525
98					Median	23						
99					SD	14.19						
100					Std. Error of Mean	2.682						

	A	B	C	D	E	F	G	H	I	J	K	L
101					Coefficient of Variation	0.544						
102					Skewness	1.517						
103												
104					Relevant UCL Statistics							
105				Normal Distribution Test						Lognormal Distribution Test		
106					Shapiro Wilk Test Statistic	0.865					Shapiro Wilk Test Statistic	0.968
107					Shapiro Wilk Critical Value	0.924					Shapiro Wilk Critical Value	0.924
108				Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level		
109												
110				Assuming Normal Distribution						Assuming Lognormal Distribution		
111					95% Student's-t UCL	30.67					95% H-UCL	32.1
112				95% UCLs (Adjusted for Skewness)							95% Chebyshev (MVUE) UCL	38.04
113					95% Adjusted-CLT UCL (Chen-1995)	31.34					97.5% Chebyshev (MVUE) UCL	43.17
114					95% Modified-t UCL (Johnson-1978)	30.8					99% Chebyshev (MVUE) UCL	53.24
115												
116				Gamma Distribution Test						Data Distribution		
117					k star (bias corrected)	3.623				Data appear Gamma Distributed at 5% Significance Level		
118					Theta Star	7.205						
119					MLE of Mean	26.1						
120					MLE of Standard Deviation	13.71						
121					nu star	202.9						
122					Approximate Chi Square Value (.05)	170.9				Nonparametric Statistics		
123					Adjusted Level of Significance	0.0404					95% CLT UCL	30.51
124					Adjusted Chi Square Value	169.1					95% Jackknife UCL	30.67
125											95% Standard Bootstrap UCL	30.49
126					Anderson-Darling Test Statistic	0.527					95% Bootstrap-t UCL	31.83
127					Anderson-Darling 5% Critical Value	0.75					95% Hall's Bootstrap UCL	32.22
128					Kolmogorov-Smirnov Test Statistic	0.142					95% Percentile Bootstrap UCL	30.26
129					Kolmogorov-Smirnov 5% Critical Value	0.166					95% BCA Bootstrap UCL	31.51
130				Data appear Gamma Distributed at 5% Significance Level							95% Chebyshev(Mean, Sd) UCL	37.79
131											97.5% Chebyshev(Mean, Sd) UCL	42.85
132				Assuming Gamma Distribution							99% Chebyshev(Mean, Sd) UCL	52.79
133					95% Approximate Gamma UCL (Use when n >= 40)	30.98						
134					95% Adjusted Gamma UCL (Use when n < 40)	31.32						
135												
136				Potential UCL to Use							Use 95% Approximate Gamma UCL	30.98
137												
138				Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.								
139				These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)								
140				and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.								
141												
142												
143	Lead											
144												
145					General Statistics							
146					Number of Valid Observations	28					Number of Distinct Observations	26
147												
148				Raw Statistics						Log-transformed Statistics		
149					Minimum	2.5					Minimum of Log Data	0.916
150					Maximum	160					Maximum of Log Data	5.075

	A	B	C	D	E	F	G	H	I	J	K	L
151					Mean	57.06					Mean of log Data	3.535
152					Geometric Mean	34.3					SD of log Data	1.184
153					Median	35.75						
154					SD	48.53						
155					Std. Error of Mean	9.172						
156					Coefficient of Variation	0.851						
157					Skewness	0.686						
158												
159					**Relevant UCL Statistics**							
160				**Normal Distribution Test**					**Lognormal Distribution Test**			
161					Shapiro Wilk Test Statistic	0.885					Shapiro Wilk Test Statistic	0.927
162					Shapiro Wilk Critical Value	0.924					Shapiro Wilk Critical Value	0.924
163				**Data not Normal at 5% Significance Level**					**Data appear Lognormal at 5% Significance Level**			
164												
165				**Assuming Normal Distribution**					**Assuming Lognormal Distribution**			
166					95% Student's-t UCL	72.68					95% H-UCL	127.7
167				**95% UCLs (Adjusted for Skewness)**							95% Chebyshev (MVUE) UCL	143.3
168					95% Adjusted-CLT UCL (Chen-1995)	73.42					97.5% Chebyshev (MVUE) UCL	176.5
169					95% Modified-t UCL (Johnson-1978)	72.88					99% Chebyshev (MVUE) UCL	241.8
170												
171				**Gamma Distribution Test**					**Data Distribution**			
172					k star (bias corrected)	1.024			**Data appear Gamma Distributed at 5% Significance Level**			
173					Theta Star	55.75						
174					MLE of Mean	57.06						
175					MLE of Standard Deviation	56.4						
176					nu star	57.32						
177					Approximate Chi Square Value (.05)	40.92			**Nonparametric Statistics**			
178					Adjusted Level of Significance	0.0404					95% CLT UCL	72.15
179					Adjusted Chi Square Value	40.06					95% Jackknife UCL	72.68
180											95% Standard Bootstrap UCL	71.72
181					Anderson-Darling Test Statistic	0.426					95% Bootstrap-t UCL	73.43
182					Anderson-Darling 5% Critical Value	0.771					95% Hall's Bootstrap UCL	73.5
183					Kolmogorov-Smirnov Test Statistic	0.129					95% Percentile Bootstrap UCL	71.98
184					Kolmogorov-Smirnov 5% Critical Value	0.17					95% BCA Bootstrap UCL	73.41
185				**Data appear Gamma Distributed at 5% Significance Level**							95% Chebyshev(Mean, Sd) UCL	97.04
186											97.5% Chebyshev(Mean, Sd) UCL	114.3
187				**Assuming Gamma Distribution**							99% Chebyshev(Mean, Sd) UCL	148.3
188					95% Approximate Gamma UCL (Use when n >= 40)	79.94						
189					95% Adjusted Gamma UCL (Use when n < 40)	81.65						
190												
191				**Potential UCL to Use**							Use 95% Approximate Gamma UCL	79.94
192												
193				**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**								
194				**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**								
195				**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**								
196												
197												
198	**Selenium**											
199												
200					**General Statistics**							

	A	B	C	D	E	F	G	H	I	J	K	L
201					Number of Valid Data	28					Number of Detected Data	13
202					Number of Distinct Detected Data	12					Number of Non-Detect Data	15
203											Percent Non-Detects	53.57%
204												
205				Raw Statistics						Log-transformed Statistics		
206					Minimum Detected	2.3					Minimum Detected	0.833
207					Maximum Detected	4					Maximum Detected	1.386
208					Mean of Detected	3.169					Mean of Detected	1.142
209					SD of Detected	0.502					SD of Detected	0.162
210					Minimum Non-Detect	0.46					Minimum Non-Detect	-0.777
211					Maximum Non-Detect	0.53					Maximum Non-Detect	-0.635
212												
213	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	15
214	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	13
215	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	53.57%
216												
217					UCL Statistics							
218				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
219					Shapiro Wilk Test Statistic	0.98					Shapiro Wilk Test Statistic	0.974
220					5% Shapiro Wilk Critical Value	0.866					5% Shapiro Wilk Critical Value	0.866
221				Data appear Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level		
222												
223				Assuming Normal Distribution						Assuming Lognormal Distribution		
224					DL/2 Substitution Method						DL/2 Substitution Method	
225					Mean	1.599					Mean	-0.239
226					SD	1.526					SD	1.314
227					95% DL/2 (t) UCL	2.09					95% H-Stat (DL/2) UCL	3.852
228												
229					Maximum Likelihood Estimate(MLE) Method						Log ROS Method	
230					Mean	0.662					Mean in Log Scale	0.899
231					SD	2.617					SD in Log Scale	0.267
232					95% MLE (t) UCL	1.504					Mean in Original Scale	2.545
233					95% MLE (Tiku) UCL	1.737					SD in Original Scale	0.699
234											95% t UCL	2.77
235											95% Percentile Bootstrap UCL	2.763
236											95% BCA Bootstrap UCL	2.769
237											95% H UCL	2.791
238												
239				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		
240					k star (bias corrected)	32.39				Data appear Normal at 5% Significance Level		
241					Theta Star	0.0978						
242					nu star	842.3						
243												
244					A-D Test Statistic	0.16				Nonparametric Statistics		
245					5% A-D Critical Value	0.733					Kaplan-Meier (KM) Method	
246					K-S Test Statistic	0.733					Mean	2.704
247					5% K-S Critical Value	0.236					SD	0.544
248				Data appear Gamma Distributed at 5% Significance Level							SE of Mean	0.107
249											95% KM (t) UCL	2.886
250				Assuming Gamma Distribution							95% KM (z) UCL	2.88

	A–E	F	G–K	L
251	Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2.869
252	Minimum	0.000001	95% KM (bootstrap t) UCL	2.88
253	Maximum	4	95% KM (BCA) UCL	3.154
254	Mean	1.793	95% KM (Percentile Bootstrap) UCL	3.029
255	Median	1.699	95% KM (Chebyshev) UCL	3.17
256	SD	1.42	97.5% KM (Chebyshev) UCL	3.372
257	k star	0.261	99% KM (Chebyshev) UCL	3.768
258	Theta star	6.871		
259	Nu star	14.61	**Potential UCLs to Use**	
260	AppChi2	6.993	95% KM (t) UCL	2.886
261	95% Gamma Approximate UCL (Use when n >= 40)	3.746	95% KM (Percentile Bootstrap) UCL	3.029
262	95% Adjusted Gamma UCL (Use when n < 40)	3.929		
263	**Note: DL/2 is not a recommended method.**			
264				
265	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**			
266	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**			
267	**For additional insight, the user may want to consult a statistician.**			
268				
269				
270	**Zinc**			
271				
272	**General Statistics**			
273	Number of Valid Observations	31	Number of Distinct Observations	27
274				
275	**Raw Statistics**		**Log-transformed Statistics**	
276	Minimum	26	Minimum of Log Data	3.258
277	Maximum	180	Maximum of Log Data	5.193
278	Mean	72.1	Mean of log Data	4.182
279	Geometric Mean	65.47	SD of log Data	0.45
280	Median	64		
281	SD	33.02		
282	Std. Error of Mean	5.93		
283	Coefficient of Variation	0.458		
284	Skewness	1.21		
285				
286	**Relevant UCL Statistics**			
287	**Normal Distribution Test**		**Lognormal Distribution Test**	
288	Shapiro Wilk Test Statistic	0.921	Shapiro Wilk Test Statistic	0.987
289	Shapiro Wilk Critical Value	0.929	Shapiro Wilk Critical Value	0.929
290	**Data not Normal at 5% Significance Level**		**Data appear Lognormal at 5% Significance Level**	
291				
292	**Assuming Normal Distribution**		**Assuming Lognormal Distribution**	
293	95% Student's-t UCL	82.16	95% H-UCL	84.59
294	**95% UCLs (Adjusted for Skewness)**		95% Chebyshev (MVUE) UCL	98.51
295	95% Adjusted-CLT UCL (Chen-1995)	83.23	97.5% Chebyshev (MVUE) UCL	109.9
296	95% Modified-t UCL (Johnson-1978)	82.38	99% Chebyshev (MVUE) UCL	132.3
297				
298	**Gamma Distribution Test**		**Data Distribution**	
299	k star (bias corrected)	4.849	**Data appear Gamma Distributed at 5% Significance Level**	
300	Theta Star	14.87		

	A	B	C	D	E	F	G	H	I	J	K	L
301					MLE of Mean	72.1						
302					MLE of Standard Deviation	32.74						
303					nu star	300.7						
304					Approximate Chi Square Value (.05)	261.5			**Nonparametric Statistics**			
305					Adjusted Level of Significance	0.0413					95% CLT UCL	81.85
306					Adjusted Chi Square Value	259.5					95% Jackknife UCL	82.16
307											95% Standard Bootstrap UCL	81.45
308					Anderson-Darling Test Statistic	0.166					95% Bootstrap-t UCL	83.01
309					Anderson-Darling 5% Critical Value	0.747					95% Hall's Bootstrap UCL	84.99
310					Kolmogorov-Smirnov Test Statistic	0.0654					95% Percentile Bootstrap UCL	82.39
311					Kolmogorov-Smirnov 5% Critical Value	0.158					95% BCA Bootstrap UCL	82.61
312			**Data appear Gamma Distributed at 5% Significance Level**								95% Chebyshev(Mean, Sd) UCL	97.95
313											97.5% Chebyshev(Mean, Sd) UCL	109.1
314			**Assuming Gamma Distribution**								99% Chebyshev(Mean, Sd) UCL	131.1
315					95% Approximate Gamma UCL (Use when n >= 40)	82.9						
316					95% Adjusted Gamma UCL (Use when n < 40)	83.54						
317												
318			**Potential UCL to Use**								Use 95% Approximate Gamma UCL	82.9
319												
320					**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**							
321					**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**							
322					**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**							
323												
324												
325	**alpha-Chlordane**											
326												
327					**General Statistics**							
328					Number of Valid Data	28					Number of Detected Data	6
329					Number of Distinct Detected Data	6					Number of Non-Detect Data	22
330											Percent Non-Detects	78.57%
331												
332			**Raw Statistics**						**Log-transformed Statistics**			
333					Minimum Detected	3.9					Minimum Detected	1.361
334					Maximum Detected	36					Maximum Detected	3.584
335					Mean of Detected	11.37					Mean of Detected	2.114
336					SD of Detected	12.21					SD of Detected	0.777
337					Minimum Non-Detect	1.7					Minimum Non-Detect	0.531
338					Maximum Non-Detect	9.3					Maximum Non-Detect	2.23
339												
340	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	26
341	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	2
342	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	92.86%
343												
344					**Warning: There are only 6 Detected Values in this data**							
345					**Note: It should be noted that even though bootstrap may be performed on this data set**							
346					**the resulting calculations may not be reliable enough to draw conclusions**							
347												
348					**It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.**							
349												
350												

	A	B	C	D	E	F	G	H	I	J	K	L
351	UCL Statistics											
352	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only					
353					Shapiro Wilk Test Statistic	0.637				Shapiro Wilk Test Statistic		0.829
354					5% Shapiro Wilk Critical Value	0.788				5% Shapiro Wilk Critical Value		0.788
355	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
356												
357	Assuming Normal Distribution						Assuming Lognormal Distribution					
358					DL/2 Substitution Method					DL/2 Substitution Method		
359					Mean	3.938				Mean		0.805
360					SD	6.671				SD		0.955
361					95% DL/2 (t) UCL	6.085				95% H-Stat (DL/2) UCL		5.485
362												
363					Maximum Likelihood Estimate(MLE) Method	N/A				Log ROS Method		
364	MLE method failed to converge properly									Mean in Log Scale		0.108
365										SD in Log Scale		1.286
366										Mean in Original Scale		3.066
367										SD in Original Scale		6.879
368										95% t UCL		5.28
369										95% Percentile Bootstrap UCL		5.516
370										95% BCA Bootstrap UCL		7.023
371										95% H-UCL		5.133
372												
373	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only					
374					k star (bias corrected)	0.975	Data Follow Appr. Gamma Distribution at 5% Significance Level					
375					Theta Star	11.66						
376					nu star	11.7						
377												
378					A-D Test Statistic	0.808	Nonparametric Statistics					
379					5% A-D Critical Value	0.706				Kaplan-Meier (KM) Method		
380					K-S Test Statistic	0.706				Mean		5.532
381					5% K-S Critical Value	0.337				SD		6
382	Data follow Appr. Gamma Distribution at 5% Significance Level									SE of Mean		1.243
383										95% KM (t) UCL		7.65
384	Assuming Gamma Distribution									95% KM (z) UCL		7.577
385					Gamma ROS Statistics using Extrapolated Data					95% KM (jackknife) UCL		7.328
386					Minimum	0.000001				95% KM (bootstrap t) UCL		13.08
387					Maximum	36				95% KM (BCA) UCL		10.27
388					Mean	2.436				95% KM (Percentile Bootstrap) UCL		8.783
389					Median	0.000001				95% KM (Chebyshev) UCL		10.95
390					SD	7.084				97.5% KM (Chebyshev) UCL		13.3
391					k star	0.0903				99% KM (Chebyshev) UCL		17.9
392					Theta star	26.97						
393					Nu star	5.057	Potential UCLs to Use					
394					AppChi2	1.178				95% KM (t) UCL		7.65
395					95% Gamma Approximate UCL (Use when n >= 40)	10.45						
396					95% Adjusted Gamma UCL (Use when n < 40)	11.52						
397	Note: DL/2 is not a recommended method.											
398												
399	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
400	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											

	A	B	C	D	E	F	G	H	I	J	K	L
401	For additional insight, the user may want to consult a statistician.											
402												
403												
404	gamma-Chlordane											
405												
406	General Statistics											
407	Number of Valid Data					28	Number of Detected Data					8
408	Number of Distinct Detected Data					8	Number of Non-Detect Data					20
409							Percent Non-Detects					71.43%
410												
411	Raw Statistics						Log-transformed Statistics					
412	Minimum Detected					5.6	Minimum Detected					1.723
413	Maximum Detected					25	Maximum Detected					3.219
414	Mean of Detected					10.54	Mean of Detected					2.244
415	SD of Detected					6.249	SD of Detected					0.468
416	Minimum Non-Detect					1.7	Minimum Non-Detect					0.531
417	Maximum Non-Detect					9.3	Maximum Non-Detect					2.23
418												
419	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect					25
420	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected					3
421	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage					89.29%
422												
423	Warning: There are only 8 Detected Values in this data											
424	Note: It should be noted that even though bootstrap may be performed on this data set											
425	the resulting calculations may not be reliable enough to draw conclusions											
426												
427	It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.											
428												
429												
430	UCL Statistics											
431	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only					
432	Shapiro Wilk Test Statistic					0.726	Shapiro Wilk Test Statistic					0.878
433	5% Shapiro Wilk Critical Value					0.818	5% Shapiro Wilk Critical Value					0.818
434	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
435												
436	Assuming Normal Distribution						Assuming Lognormal Distribution					
437	DL/2 Substitution Method						DL/2 Substitution Method					
438	Mean					4.271	Mean					0.887
439	SD					5.262	SD					1.056
440	95% DL/2 (t) UCL					5.965	95% H-Stat (DL/2) UCL					7.085
441												
442	Maximum Likelihood Estimate(MLE) Method					N/A	Log ROS Method					
443	MLE yields a negative mean						Mean in Log Scale					1.23
444							SD in Log Scale					0.762
445							Mean in Original Scale					4.744
446							SD in Original Scale					4.954
447							95% t UCL					6.339
448							95% Percentile Bootstrap UCL					6.378
449							95% BCA Bootstrap UCL					7.13
450							95% H-UCL					6.307

	A	B	C	D	E	F	G	H	I	J	K	L
451												
452	**Gamma Distribution Test with Detected Values Only**						**Data Distribution Test with Detected Values Only**					
453					k star (bias corrected)	2.991	**Data appear Gamma Distributed at 5% Significance Level**					
454					Theta Star	3.525						
455					nu star	47.86						
456												
457					A-D Test Statistic	0.662	**Nonparametric Statistics**					
458					5% A-D Critical Value	0.719	Kaplan-Meier (KM) Method					
459					K-S Test Statistic	0.719	Mean					7.051
460					5% K-S Critical Value	0.295	SD					3.839
461	**Data appear Gamma Distributed at 5% Significance Level**						SE of Mean					0.778
462							95% KM (t) UCL					8.377
463	**Assuming Gamma Distribution**						95% KM (z) UCL					8.331
464				Gamma ROS Statistics using Extrapolated Data			95% KM (jackknife) UCL					8.126
465					Minimum	0.000001	95% KM (bootstrap t) UCL					9.889
466					Maximum	25	95% KM (BCA) UCL					9.933
467					Mean	3.013	95% KM (Percentile Bootstrap) UCL					9.4
468					Median	0.000001	95% KM (Chebyshev) UCL					10.44
469					SD	5.801	97.5% KM (Chebyshev) UCL					11.91
470					k star	0.0958	99% KM (Chebyshev) UCL					14.79
471					Theta star	31.43						
472					Nu star	5.367	**Potential UCLs to Use**					
473					AppChi2	1.325	95% KM (t) UCL					8.377
474					95% Gamma Approximate UCL (Use when n >= 40)	12.2						
475					95% Adjusted Gamma UCL (Use when n < 40)	13.4						
476	**Note: DL/2 is not a recommended method.**											
477												
478	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
479	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**											
480	**For additional insight, the user may want to consult a statistician.**											
481												
482												
483	**4,4'-DDT**											
484												
485	**General Statistics**											
486					Number of Valid Data	28	Number of Detected Data					16
487					Number of Distinct Detected Data	15	Number of Non-Detect Data					12
488							Percent Non-Detects					42.86%
489												
490	**Raw Statistics**						**Log-transformed Statistics**					
491					Minimum Detected	0.69	Minimum Detected					-0.371
492					Maximum Detected	30	Maximum Detected					3.401
493					Mean of Detected	12.39	Mean of Detected					2.035
494					SD of Detected	9.453	SD of Detected					1.202
495					Minimum Non-Detect	3.3	Minimum Non-Detect					1.194
496					Maximum Non-Detect	10	Maximum Non-Detect					2.303
497												
498	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect					18
499	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected					10
500	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage					64.29%

	A	B	C	D	E	F	G	H	I	J	K	L
501												
502						UCL Statistics						
503				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
504						Shapiro Wilk Test Statistic	0.918				Shapiro Wilk Test Statistic	0.874
505						5% Shapiro Wilk Critical Value	0.887				5% Shapiro Wilk Critical Value	0.887
506				Data appear Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level		
507												
508				Assuming Normal Distribution						Assuming Lognormal Distribution		
509						DL/2 Substitution Method					DL/2 Substitution Method	
510						Mean	8.28				Mean	1.549
511						SD	8.601				SD	1.112
512						95% DL/2 (t) UCL	11.05				95% H-Stat (DL/2) UCL	15.23
513												
514						Maximum Likelihood Estimate(MLE) Method					Log ROS Method	
515						Mean	5.834				Mean in Log Scale	1.462
516						SD	11.9				SD in Log Scale	1.15
517						95% MLE (t) UCL	9.664				Mean in Original Scale	8.001
518						95% MLE (Tiku) UCL	11.66				SD in Original Scale	8.747
519											95% t UCL	10.82
520											95% Percentile Bootstrap UCL	10.6
521											95% BCA Bootstrap UCL	11.05
522											95% H UCL	15
523												
524				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		
525						k star (bias corrected)	0.998			Data appear Normal at 5% Significance Level		
526						Theta Star	12.42					
527						nu star	31.92					
528												
529						A-D Test Statistic	0.709			Nonparametric Statistics		
530						5% A-D Critical Value	0.76				Kaplan-Meier (KM) Method	
531						K-S Test Statistic	0.76				Mean	7.864
532						5% K-S Critical Value	0.22				SD	8.688
533				Data follow Appr. Gamma Distribution at 5% Significance Level							SE of Mean	1.706
534											95% KM (t) UCL	10.77
535				Assuming Gamma Distribution							95% KM (z) UCL	10.67
536						Gamma ROS Statistics using Extrapolated Data					95% KM (jackknife) UCL	10.74
537						Minimum	0.000001				95% KM (bootstrap t) UCL	11.25
538						Maximum	30				95% KM (BCA) UCL	10.69
539						Mean	8.042				95% KM (Percentile Bootstrap) UCL	10.63
540						Median	4.45				95% KM (Chebyshev) UCL	15.3
541						SD	8.822				97.5% KM (Chebyshev) UCL	18.52
542						k star	0.265				99% KM (Chebyshev) UCL	24.83
543						Theta star	30.34					
544						Nu star	14.85			Potential UCLs to Use		
545						AppChi2	7.154				95% KM (t) UCL	10.77
546						95% Gamma Approximate UCL (Use when n >= 40)	16.69				95% KM (Percentile Bootstrap) UCL	10.63
547						95% Adjusted Gamma UCL (Use when n < 40)	17.49					
548	Note: DL/2 is not a recommended method.											
549												
550	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											

	A	B	C	D	E	F	G	H	I	J	K	L
551	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
552	For additional insight, the user may want to consult a statistician.											
553												
554												
555	TPHd											
556												
557	General Statistics											
558	Number of Valid Observations					28	Number of Distinct Observations					25
559												
560	Raw Statistics						Log-transformed Statistics					
561	Minimum					1	Minimum of Log Data					0
562	Maximum					460	Maximum of Log Data					6.131
563	Mean					66.78	Mean of log Data					3.358
564	Geometric Mean					28.72	SD of log Data					1.531
565	Median					37						
566	SD					92.74						
567	Std. Error of Mean					17.53						
568	Coefficient of Variation					1.389						
569	Skewness					3.116						
570												
571	Relevant UCL Statistics											
572	Normal Distribution Test						Lognormal Distribution Test					
573	Shapiro Wilk Test Statistic					0.659	Shapiro Wilk Test Statistic					0.953
574	Shapiro Wilk Critical Value					0.924	Shapiro Wilk Critical Value					0.924
575	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
576												
577	Assuming Normal Distribution						Assuming Lognormal Distribution					
578	95% Student's-t UCL					96.63	95% H-UCL					236.3
579	95% UCLs (Adjusted for Skewness)						95% Chebyshev (MVUE) UCL					220.8
580	95% Adjusted-CLT UCL (Chen-1995)					106.6	97.5% Chebyshev (MVUE) UCL					279.5
581	95% Modified-t UCL (Johnson-1978)					98.35	99% Chebyshev (MVUE) UCL					394.6
582												
583	Gamma Distribution Test						Data Distribution					
584	k star (bias corrected)					0.662	Data appear Gamma Distributed at 5% Significance Level					
585	Theta Star					100.9						
586	MLE of Mean					66.78						
587	MLE of Standard Deviation					82.1						
588	nu star					37.05						
589	Approximate Chi Square Value (.05)					24.11	Nonparametric Statistics					
590	Adjusted Level of Significance					0.0404	95% CLT UCL					95.6
591	Adjusted Chi Square Value					23.47	95% Jackknife UCL					96.63
592							95% Standard Bootstrap UCL					96.19
593	Anderson-Darling Test Statistic					0.203	95% Bootstrap-t UCL					121.4
594	Anderson-Darling 5% Critical Value					0.788	95% Hall's Bootstrap UCL					223.8
595	Kolmogorov-Smirnov Test Statistic					0.0805	95% Percentile Bootstrap UCL					98.45
596	Kolmogorov-Smirnov 5% Critical Value					0.172	95% BCA Bootstrap UCL					111
597	Data appear Gamma Distributed at 5% Significance Level						95% Chebyshev(Mean, Sd) UCL					143.2
598							97.5% Chebyshev(Mean, Sd) UCL					176.2
599	Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL					241.2
600	95% Approximate Gamma UCL (Use when n >= 40)					102.6						

	A	B	C	D	E	F	G	H	I	J	K	L
601			95% Adjusted Gamma UCL (Use when n < 40)			105.4						
602												
603			**Potential UCL to Use**							Use 95% Approximate Gamma UCL		102.6
604												
605	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
606	**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**											
607	**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**											
608												

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects								
2		User Selected Options										
3		From File		After Excavation-B.wst								
4		Full Precision		OFF								
5		Confidence Coefficient		95%								
6		Number of Bootstrap Operations		2000								
7												
8												
9	Antimony											
10												
11				General Statistics								
12			Number of Valid Data			14			Number of Detected Data			0
13			Number of Distinct Detected Data			0			Number of Non-Detect Data			14
14									Percent Non-Detects			100.00%
15												
16				Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!								
17				Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!								
18				The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).								
19												
20				The data set for variable Antimony was not processed!								
21												
22												
23												
24	Copper											
25												
26				General Statistics								
27			Number of Valid Observations			14			Number of Distinct Observations			13
28												
29			Raw Statistics						Log-transformed Statistics			
30			Minimum			5.4			Minimum of Log Data			1.686
31			Maximum			70			Maximum of Log Data			4.248
32			Mean			30.17			Mean of log Data			3.203
33			Geometric Mean			24.6			SD of log Data			0.703
34			Median			25.5						
35			SD			18.81						
36			Std. Error of Mean			5.027						
37			Coefficient of Variation			0.623						
38			Skewness			0.77						
39												
40				Relevant UCL Statistics								
41			Normal Distribution Test						Lognormal Distribution Test			
42			Shapiro Wilk Test Statistic			0.933			Shapiro Wilk Test Statistic			0.97
43			Shapiro Wilk Critical Value			0.874			Shapiro Wilk Critical Value			0.874
44			Data appear Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level			
45												
46			Assuming Normal Distribution						Assuming Lognormal Distribution			
47			95% Student's-t UCL			39.07			95% H-UCL			49.75
48			95% UCLs (Adjusted for Skewness)						95% Chebyshev (MVUE) UCL			57.42
49			95% Adjusted-CLT UCL (Chen-1995)			39.55			97.5% Chebyshev (MVUE) UCL			68.91
50			95% Modified-t UCL (Johnson-1978)			39.25			99% Chebyshev (MVUE) UCL			91.49

	A	B	C	D	E	F	G	H	I	J	K	L
51												
52				**Gamma Distribution Test**					**Data Distribution**			
53					k star (bias corrected)	2.094			**Data appear Normal at 5% Significance Level**			
54					Theta Star	14.41						
55					MLE of Mean	30.17						
56					MLE of Standard Deviation	20.85						
57					nu star	58.63						
58					Approximate Chi Square Value (.05)	42.02			**Nonparametric Statistics**			
59					Adjusted Level of Significance	0.0312					95% CLT UCL	38.44
60					Adjusted Chi Square Value	40.16					95% Jackknife UCL	39.07
61											95% Standard Bootstrap UCL	38.08
62					Anderson-Darling Test Statistic	0.165					95% Bootstrap-t UCL	41.31
63					Anderson-Darling 5% Critical Value	0.744					95% Hall's Bootstrap UCL	40.34
64					Kolmogorov-Smirnov Test Statistic	0.109					95% Percentile Bootstrap UCL	38.36
65					Kolmogorov-Smirnov 5% Critical Value	0.231					95% BCA Bootstrap UCL	39.64
66				**Data appear Gamma Distributed at 5% Significance Level**							95% Chebyshev(Mean, Sd) UCL	52.08
67											97.5% Chebyshev(Mean, Sd) UCL	61.57
68				**Assuming Gamma Distribution**							99% Chebyshev(Mean, Sd) UCL	80.19
69					95% Approximate Gamma UCL (Use when n >= 40)	42.09						
70					95% Adjusted Gamma UCL (Use when n < 40)	44.04						
71												
72				**Potential UCL to Use**							Use 95% Student's-t UCL	39.07
73												
74												
75												
76												
77												
78												
79	**Lead**											
80												
81						**General Statistics**						
82					Number of Valid Observations	14					Number of Distinct Observations	14
83												
84				**Raw Statistics**					**Log-transformed Statistics**			
85					Minimum	2.5					Minimum of Log Data	0.916
86					Maximum	140					Maximum of Log Data	4.942
87					Mean	36.74					Mean of log Data	3.006
88					Geometric Mean	20.21					SD of log Data	1.194
89					Median	24						
90					SD	42.44						
91					Std. Error of Mean	11.34						
92					Coefficient of Variation	1.155						
93					Skewness	1.793						
94												
95						**Relevant UCL Statistics**						
96				**Normal Distribution Test**					**Lognormal Distribution Test**			
97					Shapiro Wilk Test Statistic	0.747					Shapiro Wilk Test Statistic	0.977
98					Shapiro Wilk Critical Value	0.874					Shapiro Wilk Critical Value	0.874
99				**Data not Normal at 5% Significance Level**					**Data appear Lognormal at 5% Significance Level**			
100												

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

	A–E	F	G–K	L
101	**Assuming Normal Distribution**		**Assuming Lognormal Distribution**	
102	95% Student's-t UCL	56.82	95% H-UCL	116
103	**95% UCLs (Adjusted for Skewness)**		95% Chebyshev (MVUE) UCL	96.84
104	95% Adjusted-CLT UCL (Chen-1995)	61.2	97.5% Chebyshev (MVUE) UCL	122.2
105	95% Modified-t UCL (Johnson-1978)	57.73	99% Chebyshev (MVUE) UCL	172.1
106				
107	**Gamma Distribution Test**		**Data Distribution**	
108	k star (bias corrected)	0.81	**Data appear Gamma Distributed at 5% Significance Level**	
109	Theta Star	45.38		
110	MLE of Mean	36.74		
111	MLE of Standard Deviation	40.83		
112	nu star	22.67		
113	Approximate Chi Square Value (.05)	12.84	**Nonparametric Statistics**	
114	Adjusted Level of Significance	0.0312	95% CLT UCL	55.39
115	Adjusted Chi Square Value	11.87	95% Jackknife UCL	56.82
116			95% Standard Bootstrap UCL	54.3
117	Anderson-Darling Test Statistic	0.289	95% Bootstrap-t UCL	82.3
118	Anderson-Darling 5% Critical Value	0.761	95% Hall's Bootstrap UCL	158.6
119	Kolmogorov-Smirnov Test Statistic	0.121	95% Percentile Bootstrap UCL	56.2
120	Kolmogorov-Smirnov 5% Critical Value	0.235	95% BCA Bootstrap UCL	62.34
121	**Data appear Gamma Distributed at 5% Significance Level**		95% Chebyshev(Mean, Sd) UCL	86.18
122			97.5% Chebyshev(Mean, Sd) UCL	107.6
123	**Assuming Gamma Distribution**		99% Chebyshev(Mean, Sd) UCL	149.6
124	95% Approximate Gamma UCL (Use when n >= 40)	64.85		
125	95% Adjusted Gamma UCL (Use when n < 40)	70.17		
126				
127	**Potential UCL to Use**		Use 95% Approximate Gamma UCL	64.85
128				
129	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**			
130	**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**			
131	**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**			
132				
133				
134	**Selenium**			
135				
136	**General Statistics**			
137	Number of Valid Data	14	Number of Detected Data	13
138	Number of Distinct Detected Data	12	Number of Non-Detect Data	1
139			Percent Non-Detects	7.14%
140				
141	**Raw Statistics**		**Log-transformed Statistics**	
142	Minimum Detected	2.3	Minimum Detected	0.833
143	Maximum Detected	4	Maximum Detected	1.386
144	Mean of Detected	3.169	Mean of Detected	1.142
145	SD of Detected	0.502	SD of Detected	0.162
146	Minimum Non-Detect	0.53	Minimum Non-Detect	-0.635
147	Maximum Non-Detect	0.53	Maximum Non-Detect	-0.635
148				
149				
150	**UCL Statistics**			

	A–E	F	G–K	L
151	**Normal Distribution Test with Detected Values Only**		**Lognormal Distribution Test with Detected Values Only**	
152	Shapiro Wilk Test Statistic	0.98	Shapiro Wilk Test Statistic	0.974
153	5% Shapiro Wilk Critical Value	0.866	5% Shapiro Wilk Critical Value	0.866
154	**Data appear Normal at 5% Significance Level**		**Data appear Lognormal at 5% Significance Level**	
155				
156	**Assuming Normal Distribution**		**Assuming Lognormal Distribution**	
157	DL/2 Substitution Method		DL/2 Substitution Method	
158	Mean	2.962	Mean	0.965
159	SD	0.914	SD	0.678
160	95% DL/2 (t) UCL	3.394	95% H-Stat (DL/2) UCL	5.105
161				
162	Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
163	Mean	2.962	Mean in Log Scale	1.113
164	SD	0.884	SD in Log Scale	0.189
165	95% MLE (t) UCL	3.38	Mean in Original Scale	3.093
166	95% MLE (Tiku) UCL	3.395	SD in Original Scale	0.56
167			95% t UCL	3.358
168			95% Percentile Bootstrap UCL	3.322
169			95% BCA Bootstrap UCL	3.343
170			95% H UCL	3.406
171				
172	**Gamma Distribution Test with Detected Values Only**		**Data Distribution Test with Detected Values Only**	
173	k star (bias corrected)	32.39	**Data appear Normal at 5% Significance Level**	
174	Theta Star	0.0978		
175	nu star	842.3		
176				
177	A-D Test Statistic	0.16	**Nonparametric Statistics**	
178	5% A-D Critical Value	0.733	Kaplan-Meier (KM) Method	
179	K-S Test Statistic	0.733	Mean	3.107
180	5% K-S Critical Value	0.236	SD	0.516
181	**Data appear Gamma Distributed at 5% Significance Level**		SE of Mean	0.144
182			95% KM (t) UCL	3.361
183	**Assuming Gamma Distribution**		95% KM (z) UCL	3.343
184	Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	3.358
185	Minimum	1.408	95% KM (bootstrap t) UCL	3.358
186	Maximum	4	95% KM (BCA) UCL	3.343
187	Mean	3.043	95% KM (Percentile Bootstrap) UCL	3.35
188	Median	3.15	95% KM (Chebyshev) UCL	3.733
189	SD	0.674	97.5% KM (Chebyshev) UCL	4.004
190	k star	13.95	99% KM (Chebyshev) UCL	4.536
191	Theta star	0.218		
192	Nu star	390.7	**Potential UCLs to Use**	
193	AppChi2	345.8	95% KM (t) UCL	3.361
194	95% Gamma Approximate UCL (Use when n >= 40)	3.438	95% KM (Percentile Bootstrap) UCL	3.35
195	95% Adjusted Gamma UCL (Use when n < 40)	3.494		
196	**Note: DL/2 is not a recommended method.**			
197				
198	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**			
199	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**			
200	**For additional insight, the user may want to consult a statistician.**			

	A	B	C	D	E	F	G	H	I	J	K	L
201												
202												
203	Zinc											
204												
205						General Statistics						
206					Number of Valid Observations	17				Number of Distinct Observations		16
207												
208				Raw Statistics						Log-transformed Statistics		
209					Minimum	30				Minimum of Log Data		3.401
210					Maximum	180				Maximum of Log Data		5.193
211					Mean	70.88				Mean of log Data		4.14
212					Geometric Mean	62.78				SD of log Data		0.494
213					Median	60						
214					SD	39.23						
215					Std. Error of Mean	9.515						
216					Coefficient of Variation	0.553						
217					Skewness	1.558						
218												
219						Relevant UCL Statistics						
220				Normal Distribution Test						Lognormal Distribution Test		
221					Shapiro Wilk Test Statistic	0.848				Shapiro Wilk Test Statistic		0.965
222					Shapiro Wilk Critical Value	0.892				Shapiro Wilk Critical Value		0.892
223				Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level		
224												
225				Assuming Normal Distribution						Assuming Lognormal Distribution		
226					95% Student's-t UCL	87.49				95% H-UCL		91.11
227				95% UCLs (Adjusted for Skewness)						95% Chebyshev (MVUE) UCL		108.3
228					95% Adjusted-CLT UCL (Chen-1995)	90.37				97.5% Chebyshev (MVUE) UCL		124.7
229					95% Modified-t UCL (Johnson-1978)	88.09				99% Chebyshev (MVUE) UCL		156.9
230												
231				Gamma Distribution Test						Data Distribution		
232					k star (bias corrected)	3.561				Data appear Gamma Distributed at 5% Significance Level		
233					Theta Star	19.9						
234					MLE of Mean	70.88						
235					MLE of Standard Deviation	37.56						
236					nu star	121.1						
237					Approximate Chi Square Value (.05)	96.68				Nonparametric Statistics		
238					Adjusted Level of Significance	0.0346				95% CLT UCL		86.53
239					Adjusted Chi Square Value	94.39				95% Jackknife UCL		87.49
240										95% Standard Bootstrap UCL		86.12
241					Anderson-Darling Test Statistic	0.412				95% Bootstrap-t UCL		93.22
242					Anderson-Darling 5% Critical Value	0.742				95% Hall's Bootstrap UCL		96.55
243					Kolmogorov-Smirnov Test Statistic	0.175				95% Percentile Bootstrap UCL		86.82
244					Kolmogorov-Smirnov 5% Critical Value	0.21				95% BCA Bootstrap UCL		90.76
245				Data appear Gamma Distributed at 5% Significance Level						95% Chebyshev(Mean, Sd) UCL		112.4
246										97.5% Chebyshev(Mean, Sd) UCL		130.3
247				Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL		165.6
248					95% Approximate Gamma UCL (Use when n >= 40)	88.78						
249					95% Adjusted Gamma UCL (Use when n < 40)	90.93						
250												

	A	B	C	D	E	F	G	H	I	J	K	L
251	Potential UCL to Use						Use 95% Approximate Gamma UCL					88.78
252												
253	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
254	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
255	and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.											
256												
257												
258	alpha-Chlordane											
259												
260	General Statistics											
261	Number of Valid Data					14	Number of Detected Data					0
262	Number of Distinct Detected Data					0	Number of Non-Detect Data					14
263							Percent Non-Detects					100.00%
264												
265	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
266	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
267	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
268												
269	The data set for variable alpha-Chlordane was not processed!											
270												
271												
272												
273	gamma-Chlordane											
274												
275	General Statistics											
276	Number of Valid Data					14	Number of Detected Data					0
277	Number of Distinct Detected Data					0	Number of Non-Detect Data					14
278							Percent Non-Detects					100.00%
279												
280	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
281	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
282	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
283												
284	The data set for variable gamma-Chlordane was not processed!											
285												
286												
287												
288	4,4'-DDT											
289												
290	General Statistics											
291	Number of Valid Data					14	Number of Detected Data					7
292	Number of Distinct Detected Data					7	Number of Non-Detect Data					7
293							Percent Non-Detects					50.00%
294												
295	Raw Statistics						Log-transformed Statistics					
296	Minimum Detected					0.69	Minimum Detected					-0.371
297	Maximum Detected					12	Maximum Detected					2.485
298	Mean of Detected					3.67	Mean of Detected					0.909
299	SD of Detected					3.914	SD of Detected					0.926
300	Minimum Non-Detect					3.4	Minimum Non-Detect					1.224

	A–E	F	G–K	L
301	Maximum Non-Detect	3.6	Maximum Non-Detect	1.281
302				
303	Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	12
304	For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	2
305	Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	85.71%
306				
307	**Warning: There are only 7 Detected Values in this data**			
308	**Note: It should be noted that even though bootstrap may be performed on this data set**			
309	**the resulting calculations may not be reliable enough to draw conclusions**			
310				
311	**It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.**			
312				
313				
314	**UCL Statistics**			
315	**Normal Distribution Test with Detected Values Only**		**Lognormal Distribution Test with Detected Values Only**	
316	Shapiro Wilk Test Statistic	0.746	Shapiro Wilk Test Statistic	0.977
317	5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
318	**Data not Normal at 5% Significance Level**		**Data appear Lognormal at 5% Significance Level**	
319				
320	**Assuming Normal Distribution**		**Assuming Lognormal Distribution**	
321	DL/2 Substitution Method		DL/2 Substitution Method	
322	Mean	2.71	Mean	0.734
323	SD	2.84	SD	0.655
324	95% DL/2 (t) UCL	4.054	95% H-Stat (DL/2) UCL	3.912
325				
326	Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
327	**MLE method failed to converge properly**		Mean in Log Scale	0.694
328			SD in Log Scale	0.725
329			Mean in Original Scale	2.702
330			SD in Original Scale	2.881
331			95% t UCL	4.065
332			95% Percentile Bootstrap UCL	4.018
333			95% BCA Bootstrap UCL	4.72
334			95% H-UCL	4.191
335				
336	**Gamma Distribution Test with Detected Values Only**		**Data Distribution Test with Detected Values Only**	
337	k star (bias corrected)	0.908	**Data appear Gamma Distributed at 5% Significance Level**	
338	Theta Star	4.041		
339	nu star	12.72		
340				
341	A-D Test Statistic	0.358	**Nonparametric Statistics**	
342	5% A-D Critical Value	0.722	Kaplan-Meier (KM) Method	
343	K-S Test Statistic	0.722	Mean	2.714
344	5% K-S Critical Value	0.317	SD	2.784
345	**Data appear Gamma Distributed at 5% Significance Level**		SE of Mean	0.837
346			95% KM (t) UCL	4.196
347	**Assuming Gamma Distribution**		95% KM (z) UCL	4.091
348	Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	4.168
349	Minimum	0.0626	95% KM (bootstrap t) UCL	5.696
350	Maximum	12	95% KM (BCA) UCL	4.23

351					Mean	2.912			95% KM (Percentile Bootstrap) UCL		4.123
352					Median	2.059			95% KM (Chebyshev) UCL		6.363
353					SD	3			97.5% KM (Chebyshev) UCL		7.942
354					k star	0.914			99% KM (Chebyshev) UCL		11.04
355					Theta star	3.187					
356					Nu star	25.59	**Potential UCLs to Use**				
357					AppChi2	15.06			95% KM (t) UCL		4.196
358				95% Gamma Approximate UCL (Use when n >= 40)		4.947					
359				95% Adjusted Gamma UCL (Use when n < 40)		5.323					
360	**Note: DL/2 is not a recommended method.**										
361											
362	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**										
363	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**										
364	**For additional insight, the user may want to consult a statistician.**										
365											
366											
367	**TPHd**										
368											
369	**General Statistics**										
370				Number of Valid Observations		14			Number of Distinct Observations		12
371											
372	**Raw Statistics**						**Log-transformed Statistics**				
373				Minimum		1.1			Minimum of Log Data		0.0953
374				Maximum		460			Maximum of Log Data		6.131
375				Mean		83.79			Mean of log Data		3.427
376				Geometric Mean		30.78			SD of log Data		1.654
377				Median		35					
378				SD		124					
379				Std. Error of Mean		33.15					
380				Coefficient of Variation		1.48					
381				Skewness		2.476					
382											
383	**Relevant UCL Statistics**										
384	**Normal Distribution Test**						**Lognormal Distribution Test**				
385				Shapiro Wilk Test Statistic		0.676			Shapiro Wilk Test Statistic		0.967
386				Shapiro Wilk Critical Value		0.874			Shapiro Wilk Critical Value		0.874
387	**Data not Normal at 5% Significance Level**						**Data appear Lognormal at 5% Significance Level**				
388											
389	**Assuming Normal Distribution**						**Assuming Lognormal Distribution**				
390				95% Student's-t UCL		142.5			95% H-UCL		751.7
391	**95% UCLs (Adjusted for Skewness)**								95% Chebyshev (MVUE) UCL		318.4
392				95% Adjusted-CLT UCL (Chen-1995)		161.7			97.5% Chebyshev (MVUE) UCL		412.9
393				95% Modified-t UCL (Johnson-1978)		146.1			99% Chebyshev (MVUE) UCL		598.4
394											
395	**Gamma Distribution Test**						**Data Distribution**				
396				k star (bias corrected)		0.531	**Data appear Gamma Distributed at 5% Significance Level**				
397				Theta Star		157.9					
398				MLE of Mean		83.79					
399				MLE of Standard Deviation		115					
400				nu star		14.86					

	A	B	C	D	E	F	G	H	I	J	K	L
401					Approximate Chi Square Value (.05)	7.163			**Nonparametric Statistics**			
402					Adjusted Level of Significance	0.0312					95% CLT UCL	138.3
403					Adjusted Chi Square Value	6.465					95% Jackknife UCL	142.5
404											95% Standard Bootstrap UCL	135.6
405					Anderson-Darling Test Statistic	0.327					95% Bootstrap-t UCL	212.1
406					Anderson-Darling 5% Critical Value	0.783					95% Hall's Bootstrap UCL	357.3
407					Kolmogorov-Smirnov Test Statistic	0.184					95% Percentile Bootstrap UCL	140.2
408					Kolmogorov-Smirnov 5% Critical Value	0.24					95% BCA Bootstrap UCL	158.4
409			**Data appear Gamma Distributed at 5% Significance Level**								95% Chebyshev(Mean, Sd) UCL	228.3
410											97.5% Chebyshev(Mean, Sd) UCL	290.8
411			**Assuming Gamma Distribution**								99% Chebyshev(Mean, Sd) UCL	413.6
412					95% Approximate Gamma UCL (Use when n >= 40)	173.8						
413					95% Adjusted Gamma UCL (Use when n < 40)	192.5						
414												
415			**Potential UCL to Use**								Use 95% Approximate Gamma UCL	173.8
416												
417	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
418	**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)**											
419	**and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**											
420												

APPENDIX C

Removal Action Alternative Cost Estimates

TABLE C-1
REMEDIATION COST ESTIMATE[1]
ALTERNATIVE 2 - CONTAINMENT
DRAFT REMOVAL ACTION WORK PLAN, BARNARD AVENUE PROTECTED RANGE
Presidio of San Francisco, California

EXCAVATION REQUIREMENTS:				
Surface Area (plan):	20,900	sf	0.48	acres
Vol. of Excavation[2]:	--	cy		
Vol. of Imported Clean Soil:	2,330	cy		
Mass of Excavation[2]:	--	ton		
Mass of Imported Clean Soil:	3,500	ton		

	Unit	Quantity	Unit Cost	Total Cost
1. MOBILIZATION/DEMOBILIZATION				
a. Mobilization/Demobilization	ls	1	$ 10,000	$ 10,000
Mobilization/Demobilization:				**$ 10,000**
2. SITE PREPARATION				
a. Clearing, Grubbing, Stripping, Stockpiling[3]	sf	20,900.0	$ 1	$ 20,900
b. Tree removal	tree	-	$ 3,000	
Site Prep:				**$ 20,900**
3. EXCAVATION				
a. Exavation - vacuum truck/hand digging	cy	-	$ 250	$ -
b. Exavation - backhoe	cy	-	$ 25	
Excavation:				**$ -**
4. SAMPLING				
a. Confirmation Sampling (metals, TPH-d, 4,4'-DDT, 4,4'-DDE)	sample	0	$ 550	$ -
b. Stockpile Sampling (VOCs, TPH-g, -d, -mo, SVOCs, Metals, pH)	sample	0	$ 500	$ -
Confirmation Sampling:				**$ -**
5. TRANSPORTATION/DISPOSAL				
a. Transportation/Disposal (Class 2)[3]	ton	-	$ 65	$ -
Transportation/Disposal:				**$ -**
6. IMPORTING AND COMPACTING CLEAN FILL				
a. Importing Clean Fill[4]	cy	2,330	$ 12	$ 28,000
b. Placing & Compacting Clean Fill[5]	cy	2,330	$ 15	$ 35,000
Final Cover Soil Layers:				**$ 63,000**
SUBTOTAL FINAL CONTAINMENT COSTS				**$ 93,900**
7. CONSTRUCTION MANAGEMENT AND CONSTRUCTION QUALITY ASSURANCE				
a. Construction Management / Project Management	ls	15%		$ 14,100
b. CQA Services / Monitoring	ls	10%		$ 9,400
Final Engineering and CM:				**$ 23,500**
SUBTOTAL FINAL CONTAINMENT & CM/QA				**$ 117,400**
8. REVEGETATION/RESTORATION				
a. Vegetate imported cover	acre	0.48	$ 52,220	$ 25,100
Revegetation/Restoration				**$ 25,100**
9. POST-CONSTRUCTION STORMWATER MANAGEMENT AND EROSION CONTROL				
a. Furnish and install erosion control measures	sf	20900	$ 0.33	**$ 6,900**
Stormwater Management & Erosion Control				**$ 6,900**
10. CONTINGENCY				
a. Contingency	ls	15%		$ 22,500
Contingency:				**$ 22,500**
11. REMOVAL ACTION COMPLETION REPORT	ls	1	$ 40,000	**$ 40,000**
12. ANNUAL MAINTENANCE COSTS	year	30	$ 8,000	**$ 240,000**

REMEDIATION COST SUMMARY

ITEM	COST
1. MOBILIZATION/DEMOBILIZATION	$ 10,000
2. SITE PREPARATION	$ 20,900
3. EXCAVATION	$ -
4. SAMPLING	$ -
5. TRANSPORTATION/DISPOSAL	$ -
6. IMPORTING AND COMPACTING CLEAN FILL	$ 63,000
7. CONSTRUCTION MANAGEMENT AND CONSTRUCTION QUALITY ASSURANCE	$ 23,500
8. REVEGETATION/RESTORATION	$ 25,100
9. POST-CONSTRUCTION STORMWATER MANAGEMENT AND EROSION CONTROL	$ 6,900
10. CONTINGENCY	$ 22,500
11. REMOVAL ACTION COMPLETION REPORT	$ 40,000
12. ANNUAL MAINTENANCE COSTS	$ 240,000
TOTAL REMEDIATION COSTS:	**$ 451,900**

REMEDIATION COST ESTIMATE[1]
ALTERNATIVE 2 - CONTAINMENT
DRAFT REMOVAL ACTION WORK PLAN, BARNARD AVENUE PROTECTED RANGE
Presidio of San Francisco, California

Assumptions:
1 - In 2012 Dollars. Costs assume prevailing wages for labor, material and equipment costs, and taxes.
2 - Containment of 11 borings which have impacts up to 1.5 feet (BAPSB204 through BAPSB209, BAPSB213, BAPSB215, BAPSB218, BAPSB13, BAPSB18). Actual containmnent bounded to the south by existing Landfill E toe.
3 - Assumes handling of existing materials can be performed using Level D PPE.
4 - **Assumes material is free**, but cost of loading/hauling/unloading is based on 25-30 mile haul in 10 cy haul trucks
5 - Assumes placement keeps pace with import, approximately 1200 cy/day.

TABLE C-2
REMEDIATION COST ESTIMATE[1]
ALTERNATIVE 3 - EXCAVATION AND OFFSITE DISPOSAL
DRAFT REMOVAL ACTION WORK PLAN, BARNARD AVENUE PROTECTED RANGE
Presidio of San Francisco, California

EXCAVATION REQUIREMENTS:		
Surface Area (plan):	20,900 sf	0.48 acres
Vol. of Excavation	870 cy	
Vol. of Contingency (50%) [2]	435 cy	
Total Vol. of Excavation[3]:	1,305 cy	
Vol. of Imported Clean Soil:	1,305 cy	
Mass of Excavation[3]:	1,960 ton	
Mass of Imported Clean Soil:	1,960 ton	

	Unit	Quantity	Unit Cost	Total Cost
1. MOBILIZATION/DEMOBILIZATION				
a. Mobilization/Demobilization	ls	1	$ 10,000	$ 10,000
Mobilization/Demobilization:				**$ 10,000**
2. SITE PREPARATION				
a. Clearing, Stripping, Stockpiling[4]	sf	20,900.0	$ 1	$ 20,900
b. Tree removal	tree	13.0	$ 3,000	$ 39,000
Site Prep:				**$ 59,900**
3. EXCAVATION				
a. Exavation - vacuum truck/hand digging	cy	125	$ 250	$ 31,300
b. Exavation - backhoe	cy	1,180	$ 25	$ 29,500
Excavation:				**$ 60,800**
4. SAMPLING				
a. Confirmation Sampling (metals, TPH-d, 4,4'-DDT, 4,4'-DDE	sample	30	$ 529	$ 15,900
b. Stockpile Sampling (VOCs, TPH-g, -d, -mo, SVOCs, Metals, pH)	sample	20	$ 200	$ 4,000
Confirmation Sampling:				**$ 19,900**
5. TRANSPORTATION/DISPOSAL				
a. Transportation/Disposal (Class 2)[4]	ton	1,960	$ 50	$ 98,000
Transportation/Disposal:				**$ 98,000**
6. IMPORTING AND COMPACTING CLEAN FILL				
a. Importing Clean Fill[5]	cy	1,305	$ 12	$ 16,000
b. Placing & Compacting Clean Fill[6]	cy	1,305	$ 15	$ 20,000
Final Cover Soil Layers:				**$ 36,000**
SUBTOTAL FINAL EXCAVATION COSTS:				**$ 264,700**
7. CONSTRUCTION MANAGEMENT AND CONSTRUCTION QUALITY ASSURANCE				
a. Construction Management / Project Management	ls	10%		$ 26,500
b. CQA Services / Monitoring	ls	10%		$ 26,500
Final Engineering and CM:				**$ 53,000**
SUBTOTAL FINAL EXCAVATION & CM/QA:				**$ 317,700**
8. REVEGETATION/RESTORATION				
a. Vegetate imported fill	acre	0.48	$ 52,220	$ 25,100
Revegetation/Restoration:				**$ 25,100**
9. POST-CONSTRUCTION STORMWATER MANAGEMENT AND EROSION CONTROL				
a. Furnish and install erosion control measures	sf	20900	$ 0.33	**$ 6,900**
Stormwater Management & Erosion Control:				**$ 6,900**
10. CONTINGENCY				
a. Contingency	ls	15%		$ 39,800
Contingency:				**$ 39,800**
11. REMOVAL ACTION COMPLETION REPORT	ls	1	$ 40,000	**$ 40,000**

REMEDIATION COST SUMMARY

ITEM	COST
1. MOBILIZATION/DEMOBILIZATION	$ 10,000
2. SITE PREPARATION	$ 59,900
3. EXCAVATION	$ 60,800
4. SAMPLING	$ 19,900
5. TRANSPORTATION/DISPOSAL	$ 98,000
6. IMPORTING AND COMPACTING CLEAN FILL	$ 36,000
7. CONSTRUCTION MANAGEMENT AND CONSTRUCTION QUALITY ASSURANCE	$ 53,000
8. REVEGETATION/RESTORATION	$ 25,100
9. POST-CONSTRUCTION STORMWATER MANAGEMENT AND EROSION CONTROL	$ 6,900
10. CONTINGENCY	$ 39,800
11. REMOVAL ACTION COMPLETION REPORT	$ 40,000
TOTAL REMEDIATION COSTS:	**$ 449,400**

REMEDIATION COST ESTIMATE[1]
ALTERNATIVE 3 - EXCAVATION AND OFFSITE DISPOSAL
DRAFT REMOVAL ACTION WORK PLAN, BARNARD AVENUE PROTECTED RANGE
Presidio of San Francisco, California

Assumptions:
1 - In 2012 Dollars. Costs assume prevailing wages for labor, material and equipment costs, and taxes.
2 - Based on confirmation sampling, an additional 50% in volume is added for contingency
3 - Excavation encompass 11 borings which have impacts up to 1.5 feet (BAPSB204 through BAPSB209, BAPSB213, BAPSB215, BAPSB218, BAPSB13, BAPSB18). Actual excavation bounded to the south by existing Landfil E toe.
4 - Assumes handling of existing materials can be performed using Level D PPE.
5 - **Assumes material is free**, but cost of loading/hauling/unloading is based on 25-30 mile haul in 10 cy haul trucks
6 - Assumes placement keeps pace with import, approximately 1200 cy/day.

APPENDIX D

Removal Action Implementation Plans

- Archeological Management Assessment, BAPR Remediation
- SWPPP
- Transportation Plan
- Dust Control Plan
- Decontamination Plan

ARCHAEOLOGICAL MANAGEMENT ASSESSMENT
BARNARD AVENUE PROTECTED RANGE (BAPR) REMEDIATION

Prepared by

Kari Jones
Presidio Archaeology Lab

Prepared for

Genevieve Coyle
Presidio Trust Remediation

December 2012

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ARCHAEOLOGICAL MANAGEMENT ASSESSMENT
BARNARD AVENUE PROTECTED RANGE (BAPR) REMEDIATION

I. Background

In accordance with Stipulation XII Archaeology of the "Programmatic Agreement Among The Presidio Trust, National Park Service, The Advisory Council On Historic Preservation, And The California State Historic Preservation Officer Regarding The Presidio Of San Francisco, Golden Gate National Recreation Area" the treatment of archaeological properties shall be handled in accordance with the terms of an Archaeological Management Assessment and Monitoring Program (AMA/MP) that is prepared for individual undertakings or groups of related undertakings.

II. Project Description

The Project Area, the Barnard Avenue Protected Range (BAPR) covers an area approximately 20,900 square feet or 0.5 acre and is bounded by Barnard Avenue on the west, Fernandez Avenue to the north and open space on the east and south. The proposed remedial action for BAPR calls for surficial excavation ranging in depth from 0.5 to 1.5 feet below current ground surface. Over-excavation will be conducted in areas where field soil sampling indicates that cleanup levels have not been achieved.

III. Archaeological Context

A small portion of the proposed remediation area is within the predicted extents of *El Presidio de San Francisco,* a contributing archaeological area of the Presidio National Historic Landmark District (see Figure 1).

El Presidio de San Francisco

El Presidio de San Francisco was initially settled in 1776. The post was situated at the northernmost edge of Spain's North American colonies, and was integral to Spanish efforts to consolidate power and expand control over the region. The main quadrangle served as the center of military affairs, as well as religious and family life, during the Spanish and Mexican colonial periods. It was home to a cluster of buildings around a central place that provided space for settlers and soldiers to worship, process food, build and repair the many items necessary to sustain the community, as well as perform the administrative tasks required of the post. While the general layout of the quadrangle remained consistent over time, its dimensions and method of construction varied with each building phase. After the conclusion of the Mexican-American War, in early 1847, General Kearny ordered the regular Army to occupy El Presidio. The soldiers renovated and settled in the existing adobe structures in addition to constructing new buildings. Over several decades, they eventually expanded the post northward and westward to create the Main Post.

Significance: NHL/NRHP criteria 1/A Historical Events and 6/D Information Potential

El Presidio is a unique archaeological resource with the potential to examine all phases of Presidio occupation including Spanish-Colonial, Mexican and American. Research at *El Presidio* will contribute to: reconstructing the processes by which the Spanish *El Presidio* site was structured; documenting the

designs and technologies used; understanding the Native American involvement with the Spanish colonial/Mexican Presidio; documenting working conditions and the daily use of space; reconstructing dietary patterns; understanding the development of community and identity including the dynamics of class, ethnicity, and gender; and the role of material culture and consumerism in the contexts of military institutions.

Integrity: Variable

Archaeological investigations have demonstrated the high integrity of archaeological deposits associated with the Spanish and Mexican colonial periods. In particular, architectural remains of the presumed 1815 reconstruction and expansion of the *El Presidio quadrangle* and associated structures have yielded thousands of archaeological artifacts and features. Some portions of the broader *El Presidio* site, however, are not yet known and still others have been destroyed during historic and modern construction episodes. The current project area has not been subject to archaeological identification testing, but monitoring in adjacent areas (Ballard 2012) has not located any deposits with physical integrity.

IV. Assessment

The proposed remediation of the BAPR will be completed through shallow excavation of contaminated soils. A portion of the proposed remedial excavation is within the predicted extents of *El Presidio de San Francisco*, which has been encountered at depths as shallow as 6 inches below ground surface. While the Presidio Elevation Change Model (Blind and Barnaal 2008) suggests that 5-10 feet of post-1871 fill may cover the area, neither archaeological monitoring of construction of the directly adjacent Building 42 rain garden (Ballard 2012) nor initial site characterization coring (Geosyntec 2012) confirmed the presence of fill. The absence of fill suggests that any remains associated with El Presidio would be close to current ground surface. Monitoring of excavation in the directly adjacent rain garden did not result in the discovery of any archaeological material, however (Ballard 2012). There is, therefore, a low to moderate potential to encounter archaeological remains in the proposed remedial area. Excavation within the predicted extents of *El Presidio*, as shown on Figure 1, should be monitored by a qualified archaeologist to aid in identification of deposits, if present. In areas outside of *El Presidio* the inadvertent discovery protocols outlined in Section V should be followed.

V. Inadvertent Discovery Protocols

An inadvertent discovery refers to any situation where previously unidentified archaeological resources or human remains are encountered during ground-disturbing activities. Inadvertent discovery protocols apply to those archaeological finds that are exposed during construction or construction-related activities ***whether an archaeologist is present or not.***

There are three types of inadvertent discoveries that are covered by this monitoring plan:

- Human remains.
- Cultural resources that are significant or have the potential to be significant.
- Cultural resources that a qualified archaeologist determines do not require further consideration.

If any of these three types is inadvertently discovered during construction, the contractor and archaeological monitor should follow the steps outlined below:

- All contractors will immediately report to the archaeological monitor if archaeological materials are uncovered during construction activities.
- Operations within the vicinity of the find should be temporarily halted until the archaeological monitor is consulted.
- In the majority of cases the archaeological monitor should be able to make a determination of significance for the find.
- If a clear significance determination is not possible, the Presidio Trust Archaeologist should be consulted.
- All materials, whether determined significant or not, are property of the Presidio Trust and are not to be taken for personal use or display.

Archaeological resources include stone, brick, and concrete building foundations, isolated historic artifacts, historic landfill deposits, historic privy pits and household waste deposits, and items of Native American derivation such as stone tools, shell and animal bone waste, shell beads, and habitation areas. A more detailed list follows:

- Human remains;
- Concentrations of rock, ash, animal bone or shell;
- Earth containing a dark, almost black or very dark brown soil often containing charcoal;
- Easily crumbled dark gray-brown soil with abundant shell fragments, animal bone, charcoal and artifacts such as shell beads, mortars, pestles, arrowheads, bone tools, etc.;
- Concentrations of artifacts such as stone bowls, arrowheads, bone tools, shell beads, etc.;
- Deposits containing large amounts of shell;
- Deposits containing glass bottles, metal, old cans or other obvious trash dumps (Note: single bottles, modern aluminum cans or beer bottles are not considered significant finds);
- Foundations (stone, concrete, brick or wood);
- Wells (outline, brick or wood lined);
- Trash dumps containing food debris (e.g. cut bone, seeds, pits); and,
- Adobe (unfired or fired) clay bricks.

Other materials that do not qualify as archaeological resources might also be encountered. These include: modern subsurface utilities such as water or sewer lines, materials manufactured after 1950, and small concentrations of broken concrete, broken asphalt, and/or unmarked, unmortared bricks that have been deposited as fill, if no other cultural materials are present.

Human remains

Project-related ground-disturbing activities have been designed to avoid human remains. If human remains, funerary objects, sacred objects, or objects of cultural patrimony are inadvertently discovered they shall be ***protected in place*** and ***avoided*** by all project activities. Ground disturbing work in the vicinity of the find must immediately cease and the Presidio Trust archaeologist must be contacted. Presidio Archaeology Lab staff will notify the Presidio Trust's Federal Preservation Officer. If necessary, the Presidio Trust will notify the San Francisco Medical Examiner of the inadvertent discovery of human remains.

The immediate protection of human remains at the site shall be accomplished by (1) keeping any discovery confidential, and (2) securing the location to prevent disturbance of the remains and any associated materials.

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The Presidio Trust archaeologist shall determine whether the Native American Graves Protection and Repatriation Act (NAGPRA) applies to the discovery and will ensure that the finds are treated in compliance with all requirements outlined at 43 CFR 10.4. Any materials not subject to NAGPRA will remain under Federal control.

The Presidio Trust archaeologist shall determine whether the human remains are a single isolated burial or are potentially part of a cemetery or a larger archaeological site. This may necessitate the involvement of a consulting physical anthropologist. Articulated human remains, either as part of a single burial or larger cemetery, will be ***protected in place*** and ***avoided*** by all project activities. This may involve abandonment or redesign of the project.

If the discovery is limited to disarticulated human remains, the Presidio Trust archaeologist or a consulting physical anthropologist will direct necessary collection efforts. Further identification work may be necessary to determine the frequency of disarticulated human remains in the project area and to determine an appropriate course of action. Any disarticulated remains collected from the site will be stored in archival boxes in a secure location until appropriate re-interment can take place. No human remains will be accessioned into the Presidio Trust Archaeological Collections.

V. Contact Information

In the event of a discovery that requires a significance determination in consultation with the Presidio Archaeology Lab, Kari Jones, the designated project manager for archaeology, should be contacted. Most other inquires can also be directed to Ms. Jones. Liz Clevenger, Curator of Archaeology, should be contacted for information relating to the collection and/or discard of archaeological materials.

Hans Barnaal, GIS Specialist, can be contacted for GIS or mapping assistance. Eric Blind, Principal Archaeologist, should be contacted in the event that any of the aforementioned staff members are unavailable.

Name	**Office phone** *(415) 561-*	**Mobile phone**	**Email**
Eric Blind *Principal Archaeologist*	5091	850-5166	eblind@presidiotrust.gov
Liz Clevenger *Curator of Archaeology*	5086	716-6786	lclevenger@presidiotrust.gov
Kari Jones *Archaeologist*	5090	716-8519	kjones@presidiotrust.gov
Hans Barnaal *GIS Specialist*	4835	760-0127	hbarnaal@presidiotrust.gov
Archaeology Lab Fax	5089		

DRAFT

References

Ballard, Hannah

2012 Archaeological Identification Testing and Monitoring Report for the Building 42 (Pershing Hall) Rehabilitation Project. On file at the Presidio Archaeology Lab.

Barnaal, Hans A.

2009 Presidio National Historic Landmark District Map of Predicted Archaeological Features. On file at the Presidio Archaeology Lab.

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2008 Presidio Elevation Change Model . On file at the Presidio Archaeology Lab.

Geosyntec

2012 Remedial Investigation Summary Report, Barnard Avenue Protected Range (BAPR). Presidio of San Francisco. On file with the Presidio Trust.

DRAFT

Prepared for

The Presidio Trust
103 Montgomery Street
San Francisco, California

DRAFT
Storm Water Pollution Prevention Plan

Barnard Avenue Protected Range (BAPR)
Presidio of San Francisco, California

Prepared by

Geosyntec consultants

engineers | scientists | innovators

1111 Broadway, 6th floor
Oakland, California 94607

Project Number WR1512

January 2013

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Appendix A	Best Management Practices
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1. INTRODUCTION

The Barnard Avenue Protected Range Soil Removal Project (Project) will take place adjacent to Barnard Avenue at the Presidio of San Francisco, California. The Barnard Avenue Protected Range (BAPR or Site) is located on the eastern side of the Presidio, bounded by Barnard Ave. on the northwest and Fernandez Street on the north. The Project will involve the removal of shallow soil up to a depth of 1.5 feet at the Site. The limits of disturbance will encompass approximately 0.5 acres.

Although NPDES permit coverage is not required for this Project due to authorization under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and is exempt from the state General Construction Permit because the area of disturbance is less than the 1 acre minimum site size, this Storm Water Pollution Prevention Plan (SWPPP) has been prepared to present the measures that will be implemented to minimize sediment and other potential pollutants in storm water discharges during soil removal activities.

The SWPPP shall be readily available on-site for the duration of the Project and shall be made available upon request to a Federal, State or Municipal inspector. One copy shall be in possession of the Contractor at all times, and another available at the nearby offices of the Presidio Trust at 67 Martinez Street.

The SWPPP shall be implemented concurrently with the start of soil removal activities.

2. PROJECT INFORMATION

2.1 Site Description

The Presidio is located in the City of San Francisco, at the northern tip of the San Francisco peninsula. The Presidio is a 1,491-acre former military post, bounded by San Francisco Bay on the north and the Pacific Ocean on the west. Densely populated residential areas of San Francisco border the Presidio to the south and east.

Between the 1800s and the early to mid-1900s the U.S. Army (Army) used several small arms firing ranges throughout the Presidio (Treadwell & Rollo, Inc., 2004a). The BAPR was constructed prior to 1907 within the western drainage of the Tennessee Hollow area within Area B, the 1,168 acre inland area of the Presidio. The firing line was located in the lowermost (northeastern) extent of the drainage and the target area was located in the uppermost (southwestern) extent of the drainage (Figure 1).

A significant area of the northeastern portion of the BAPR is covered by one to seven feet of compacted construction fill from Buildings 808 and 809, which is not fill associated with LFE (Figure 1) (Treadwell & Rollo, 2004a). The southern portion of the BAPR was covered by the fill placed in LFE, which has been closed (Geosyntec, 2012b). The uncovered portion of the BAPR to the west of residential Buildings 808, 809, and 810 is heavily vegetated with trees, shrubs, and ivy.

The BAPR is within the Western Tributary of the Tennessee Hollow Watershed. The Tributary is fed by runoff from LFE to the south and the surrounding canyon that comprises the Western Tributary. Remedial work at LFE created both channelized and piped flow of this runoff, releasing to energy dissipation pads at the southern boundary of the BAPR (at the toe of the LFE slope). From here flow follows the topography as it has historically done, with discharge to a culvert pipe at the northern perimeter of the BAPR, running under Fernandez Street. This short culvert then opens up to the historical, topographically-controlled channel, merging with the Central Tributary and then with the Eastern Tributary of the Tennessee Hollow watershed, which are both spring-fed and drain year round. Eventually surface water drains to the Crissy Field Marsh in the northern Presidio, on the perimeter of the San Francisco Bay (Trust, 2007).

Geomorphically, the BAPR is located just below (north) of a natural transition from steep headwaters to a broad valley bottom. Based on a geomorphic assessment Geosyntec conducted in June 2010, the BAPR stream segment is highly vegetated indicating that the system is stable and not prone to in-stream erosion.

2.2 Soil Removal Activities

As part of this soil removal effort, a construction entrance/exit will be constructed at the south end of the Site. The approximate disturbed area during the removal activity will be about 0.5 acres. The outline of the excavation area is included in Figure 2.

2.3 Project Schedule

Soil excavation, removal and backfilling are expected to occur in early 2013.

2.4 Potential Construction Site Pollutant Sources

As a result of the limited disturbance to the soil that will be occurring during the Project, potential pollutants are expected to be limited to those resulting from construction activities mobilizing surface layer sediments.

The following is a list of construction materials that will be used and activities that will be performed that will have the potential to contribute pollutants, other than sediment, to storm water runoff:

- Disturbed soil and debris stockpiles
- Vehicle fluids, including oil, grease, petroleum, and coolants
- Sanitation facilities
- General litter

Activities that have the potential to contribute sediment to storm water include:

- Soil and debris stockpiling
- Waste transport operations
- Backfilling operations

2.5 Identification of Non-Storm Water Discharges

Non-storm water discharges consist of all discharges to a municipal storm water conveyance which do not originate from precipitation events (i.e., all discharges from a conveyance system other than storm water). Non-storm water discharges that must be prevented include:

- Vehicle and equipment wash water
- Runoff from dust control applications of water
- Sanitary and septic wastes from portable toilet facilities

Steps shall be taken, including the implementation of appropriate BMPs, to ensure that such discharges are eliminated, controlled, disposed of, or treated on-site. Discharges of construction materials and wastes, such as fuel, resulting from dumping, spills, or direct contact with rainwater or storm water runoff, are also prohibited.

3. BEST MANAGEMENT PRACTICES

This section describes the BMPs that shall be implemented during the Project. The list of selected BMPs for the Project is provided in Appendix A. Temporary BMPs are shown on the Excavation and Grading Plan (Figure 2), with Final BMPs shown on the Post-Construction Erosion and Sediment Control Plan on Figure 3. Section 3.5 summarizes the BMPs to be implemented for the Project.

3.1 Erosion Control and Sediment Control

Erosion and sediment controls provide effective reduction or elimination of sediment related pollutants in storm water and authorized non-storm water discharges from the Site. Applicable BMPs are identified in this section for erosion control, sediment control, tracking control, and wind erosion control.

3.1.1 Erosion Control

Erosion control, also referred to as soil stabilization, consists of source control measures that are designed to prevent soil particles from detaching and becoming transported in storm water runoff. Erosion control BMPs protect the soil surface by covering and/or binding soil particles. This Project shall incorporate erosion control measures required by the contract documents and other measures, as selected by the Contractor.

The primary placement of erosion controls shall be on any resultant exposed soil during or immediately following soil removal activities. Implementation and locations of temporary erosion control BMPs are shown on Figure 2.

These temporary erosion control BMPs shall be implemented in conformance with the following guidelines and as outlined in the BMP Factsheets provided in Appendix A:

- Area of soil disturbing operations shall be controlled such that the contractor shall be able to implement erosion control BMPs quickly and effectively.
- Existing vegetation shall be preserved where no construction activities are intended to occur, or where existing trees, shrubs, or other vegetation creates favorable erosion control.
- Additional temporary erosion control measures shall be implemented as necessary.

3.1.2 Sediment Control

Sediment controls are temporary or permanent structural measures that are intended to complement the selected erosion control measures and reduce sediment discharges from active construction areas. Sediment controls are designed to intercept and settle out soil particles that have been detached and transported by the force of water. Implementation and locations of temporary sediment control BMPs are shown on Figures 2 and 3. These temporary sediment control BMPs shall be implemented in general accordance with the BMP Factsheets provided in Appendix A.

3.1.3 Wind Erosion Control

To minimize wind erosion, the following BMPs will be implemented:

- Exposed soil will be sprayed with water for dust control, as necessary. The amount of dust suppression water will be controlled to prevent runoff of non-storm water from the site.

- During windy conditions (forecast or actual wind conditions of approximately 25 mph or greater), dust control shall be applied to disturbed areas to adequately control wind erosion.

- Vehicle traffic will be limited to paved roadways. All vehicles exiting and entering loading and unloading areas will be inspected and have dirt and mud removed.

3.2 Non-Storm Water Management

Non-storm water discharges consist of all discharges to a storm water conveyance, which do not originate from precipitation events (i.e., all discharges to a conveyance system other than storm water). Non-storm water discharges into storm drainage systems or waterways, which are not authorized under a NPDES permit, are prohibited. Non-storm water discharges which may be applicable to the BAPR Site include:

- Vehicle and equipment wash water

- Sanitary and septic wastes from portable toilet facilities

Fact Sheets for the following selected BMPs to control non-storm water pollution are included in Appendix A:

- NS-1, Water Conservation Practices

- NS-6, Illicit Connection/Illegal Discharge Detection and Reporting
- NS-7, Potable Water/Irrigation
- NS-10, Vehicle and Equipment Maintenance

3.3 Waste and Material Management

Materials pollution control (materials handling) consist of implementing procedural and structural BMPs for handling, storing and using construction materials to prevent the release of those materials into storm water discharges.

Waste management and materials pollution control BMPs shall be implemented to minimize storm water contact with construction materials, wastes, exposed soils, and service areas, and to prevent materials and wastes discharge off-site. Fact Sheets for the following selected BMPs are included in Appendix A:

- WM-1, Material Delivery and Storage
- WM-2, Material Use
- WM-3, Stockpile Management
- WM-4, Spill Prevention and Control
- WM-5, Solid Waste Management
- WM-9, Sanitary/Septic Waste Management

3.4 Post-Construction Storm Water Management Measures

Post-Construction BMPs are permanent measures installed during construction, designed to reduce or eliminate pollutant discharges from the site after soil removal activities are complete. Biodegradable BMPs (e.g., erosion control blankets) and planted vegetated cover will be applied to all disturbed areas in accordance with project specifications.

3.5 BMP Summary

All BMPs shall be implemented in general accordance with this SWPPP and the Factsheets provided in Appendix A. The BMPs selected for implementation during soil removal activities are summarized in Table 3-1 below.

Table 3-1 Selected BMPS for the Barnard Avenue Protected Range Soil Removal Project

	BMP	Area
Erosion Control	EC-1, Scheduling	Entire Site
	EC-2, Preservation of Existing Vegetation	Selected Vegetated Areas
Sediment Control	SE-1, Silt Fence	Northeast Perimeter;
	SE-5, Fiber Rolls	Northeast Perimeter
	SE-7, Street Sweeping and Vacuuming	Site Entrance/Exit
Tracking Control	TC-1, Stabilized Construction Entrance/Exit	Site Entrance/Exit
	TC-3, Entrance/Outlet Tire Wash	Site Entrance/Exit (as needed)
Wind Erosion Control	WE-1, Wind Erosion Control	Disturbed Area and Support Area
Non-Storm Water Controls	NS-1, Water Conservation Practices	Entire Site
	NS-6, Illicit Connection/Illegal Discharge Detection and Reporting	Entire Site
	NS-10, Vehicle and Equipment Maintenance	Support Area
Management Waste and Material	WM-1, Material Delivery and Storage	Support Area
	WM-2, Material Use	Support Area
	WM-3, Stockpile Management	Support Area
	WM-4, Spill Prevention and Control	Support Area
	WM-5, Solid Waste Management	Support Area
	WM-9, Sanitary/Septic Waste Management	Support Area

4. BMP INSPECTION AND MAINTENANCE

The contractor will perform inspections of BMPs in accordance with the project specifications. An inspection checklist must be filled out for all inspections and maintained onsite with the SWPPP. A blank inspection checklist can be found in Appendix B.

BMPs shall be maintained regularly to ensure proper and effective functionality. If necessary, corrective actions shall be implemented within 72 hours of identified deficiencies and accompanying amendments to the SWPPP.

Specific details for maintenance, inspection, and repair of Site BMPs can be found in the BMP Factsheets in Appendix A.

5. REFERENCES

California State Water Resources Control Board, 2009. National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associate with construction and Land Disturbance Activities. Order No. 2009-0009-DWQ. NPDES No. CAS000002

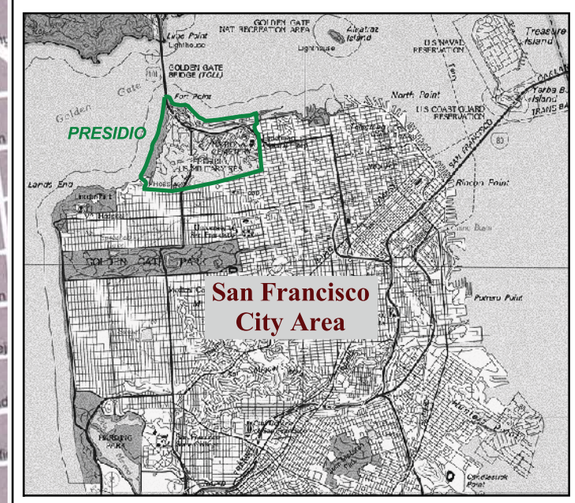
California Stormwater Quality Association, 2010. Stormwater Best Management Practice Handbook Portal: Construction. Appendix B, Stormwater Pollution Prevention Plan Outline.

FIGURES

LEGEND

Area A and B boundary

Notes:
Area A Stewardship by the National Park Service.
Area B Stewardship by the Presidio Trust.



Geosyntec

SITE LOCATION MAP
BARNARD AVENUE PROTECTED RANGE
REMOVAL ACTION WORKPLAN
PRESIDIO TRUST
SAN FRANCISCO, CA

THE PRESIDIO TRUST

DECEMBER 2012
FIGURE 1

SOURCE: Base map provided by Treadwell & Rollo, November 2004. *Draft Small Arms Firing Range Feasibility Study Report*, Figure 6.

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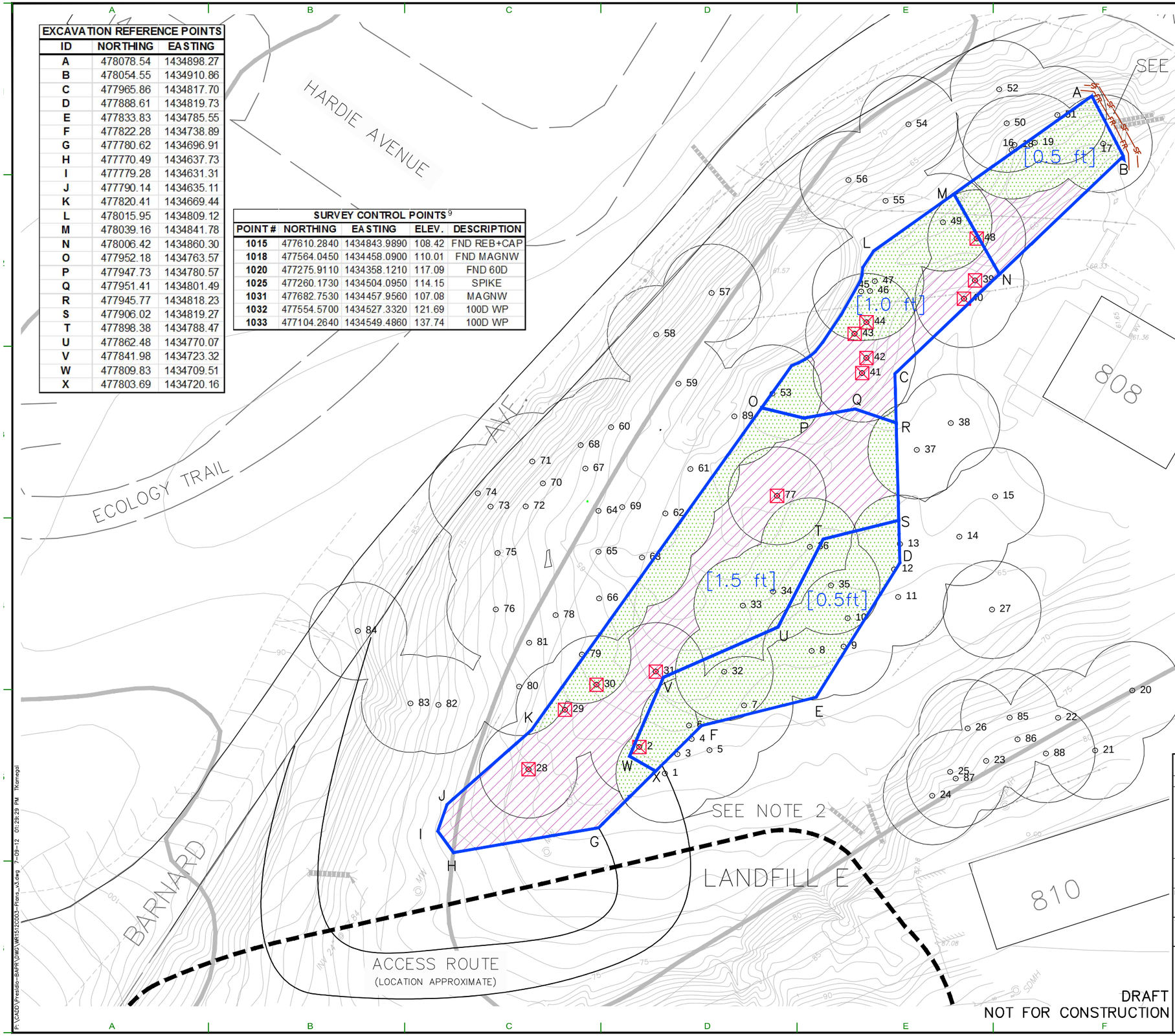
EXCAVATION REFERENCE POINTS		
ID	NORTHING	EASTING
A	478078.54	1434898.27
B	478054.55	1434910.86
C	477965.86	1434817.70
D	477888.61	1434819.73
E	477833.83	1434785.55
F	477822.28	1434738.89
G	477780.62	1434696.91
H	477770.49	1434637.73
I	477779.28	1434631.31
J	477790.14	1434635.11
K	477820.41	1434669.44
L	478015.95	1434809.12
M	478039.16	1434841.78
N	478006.42	1434860.30
O	477952.18	1434763.57
P	477947.73	1434780.57
Q	477951.41	1434801.49
R	477945.77	1434818.23
S	477906.02	1434819.27
T	477898.38	1434788.47
U	477862.48	1434770.07
V	477841.98	1434723.32
W	477809.83	1434709.51
X	477803.69	1434720.16

SURVEY CONTROL POINTS[9]				
POINT #	NORTHING	EASTING	ELEV.	DESCRIPTION
1015	477610.2840	1434843.9890	108.42	FND REB+CAP
1018	477564.0450	1434458.0900	110.01	FND MAGNW
1020	477275.9110	1434358.1210	117.09	FND 60D
1025	477260.1730	1434504.0950	114.15	SPIKE
1031	477682.7530	1434457.9560	107.08	MAGNW
1032	477554.5700	1434527.3320	121.69	100D WP
1033	477104.2640	1434549.4860	137.74	100D WP



LEGEND

- EXCAVATION BOUNDARY
- [0.5 ft] APPROXIMATE EXCAVATION DEPTH
- CONVENTIONAL EXCAVATION IN THIS AREA
- VACUUM/HAND EXCAVATION IN THIS AREA
- TREE TO BE REMOVED[6] (REMOVAL BY OTHERS)
- TREE TO BE PRESERVED
- TREE PROTECTION ZONE
- A EXCAVATION REFERENCE POINTS[7]
- FR FIBER ROLL (SE-5)
- SF SILT FENCE (SE-1)

NOTES:

1. EXISTING TOPOGRAPHY BASED ON 29 FEBRUARY 2012 SURVEY BY CHAUDHARY & ASSOCIATES INC. OF NAPA, CALIFORNIA. BASIS OF BEARING: CALIFORNIA STATE PLANE 1927 STATE PLANE III. VERTICAL DATUM: NAVD 88. SEE SURVEY CONTROL POINTS TABLE.
2. FINAL ACCESS ROUTE TO BE DETERMINED IN FIELD WITH THE ENGINEER.
3. SILT FENCE AND STRAW BALES TO BE INSTALLED AT THE NORTH EAST END OF THE WORK AREA. LOCATION TO BE DETERMINED IN THE FIELD WITH THE ENGINEER.
4. EXCAVATE TO SPECIFIED DEPTHS.
5. UPON ENGINEER'S APPROVAL, CONTRACTOR SHALL BACKFILL EXCAVATED AREAS TO ORIGINAL GRADE WITH DUST BOWL SOIL TO BE DESIGNATED BY THE ENGINEER.
6. TREE PROTECTION ZONE WILL BE STAKED IN THE FIELD BY THE PRESIDIO TRUST AND ENGINEER PRIOR TO THE BEGINNING OF WORK.
7. TREES TO BE REMOVED INCLUDE NUMBERS 2, 28, 29, 30, 31, 39, 40, 41, 42, 43, 44, 48, AND 77.
8. SEE "EXCAVATION REFERENCE POINTS" TABLE FOR NORTHING AND EASTING COORDINATES FOR EXCAVATION BOUNDARY.
9. SURVEY CONTROL POINTS INDICATED IN TABLE ARE LOCATED SOUTH OF EXCAVATION AREA. SEE SHEET 2.

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
1111 BROADWAY, 6TH FLOOR
OAKLAND, CALIFORNIA 94607 USA
PHONE: 510.836.3034

THE PRESIDIO TRUST
67 MARTINEZ STREET
SAN FRANSICO, CALIFORNIA 94129
PHONE: 415.XXX.XXXX

TITLE: EXCAVATION AND GRADING PLAN

PROJECT: BARNARD AVENUE PROTECTED RANGE — SOIL REMOVAL

SITE: PRESIDIO TRUST, SAN FRANCISCO, CALIFORNIA

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.

SIGNATURE

DATE

DESIGN BY:	TMKK	DATE:	JULY 2012
DRAWN BY:	TMKK	PROJECT NO.:	WR1512
CHECKED BY:	LVT	FILE:	WR1512C003-Plans_v3
REVIEWED BY:	LVT	DRAWING NO.:	2
APPROVED BY:	LVT		

DRAFT
NOT FOR CONSTRUCTION

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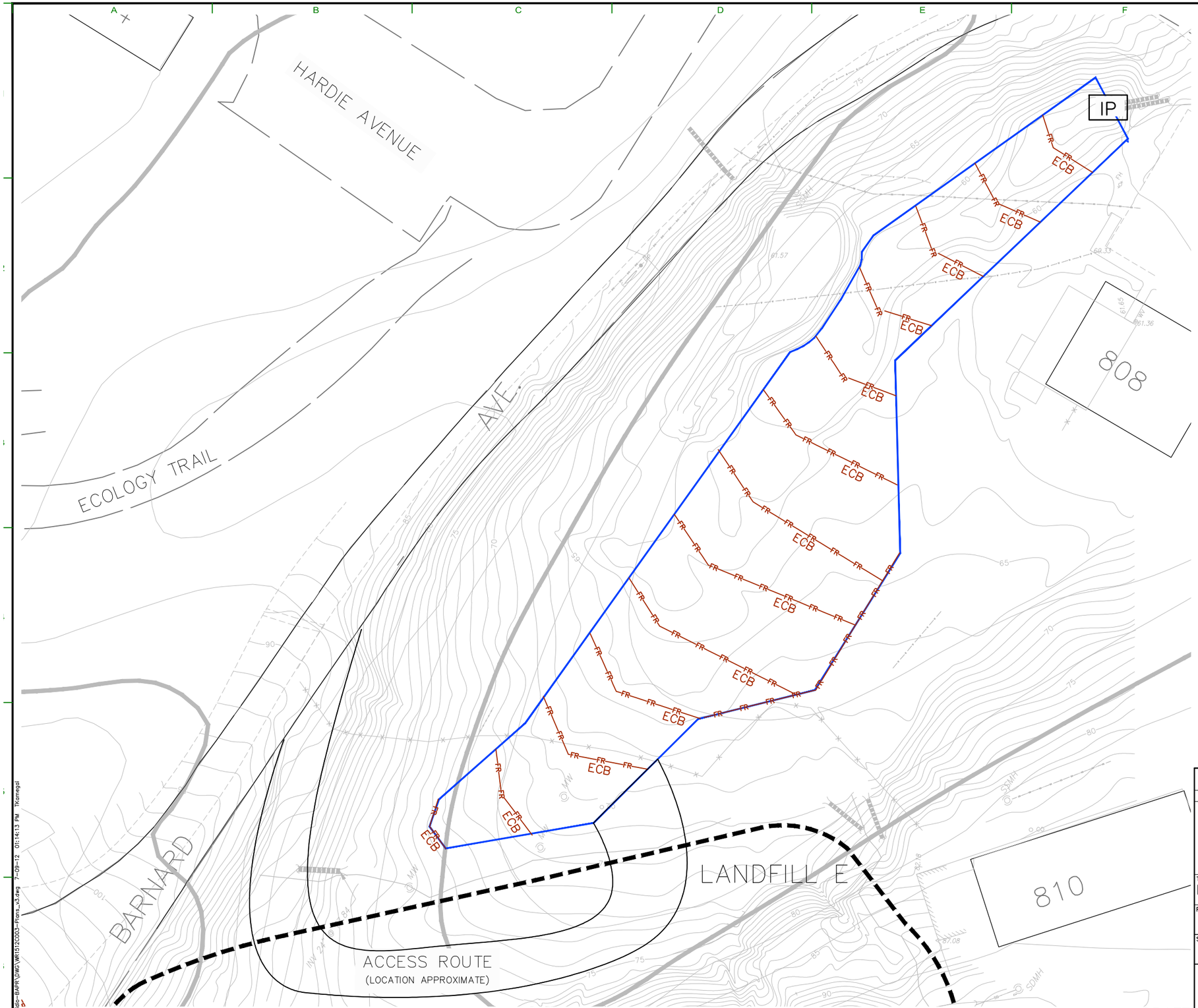

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SCALE IN FEET

LEGEND

- APPROXIMATE EXCAVATION BOUNDARY
- FR — FIBER ROLL (SE-5)
- IP — INLET PROTECTION (SE-10)
- FR / ECB — FIBER ROLL WITH UNDERLAYING EROSION CONTROL BLANKET (SEE NOTE 5)

NOTES:

1. EXISTING TOPOGRAPHY BASED ON 29 FEBRUARY 2012 SURVEY BY CHAUDHARY & ASSOCIATES INC. OF NAPA, CALIFORNIA. BASIS OF BEARING: CALIFORNIA STATE PLANE 1927. VERTICAL DATUM: NAVD 88.
2. SILT FENCE AND STRAW BALES TO BE INSTALLED AT THE NORTHEAST END OF THE WORK AREA. LOCATION TO BE DETERMINED IN THE FIELD WITH THE ENGINEER.
3. EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES (BMPS) CALLED OUT IN THIS PLAN ARE THOSE DETAILED IN CASQA CONSTRUCTION BMP MANUAL, DATED 2009.
4. FIBER ROLLS SHALL BE PLACED EVERY 10 HORIZONTAL FEET WITH AN UNDERLYING EROSION CONTROL BLANKET ALONG THE CHANNEL BOTTOM AND SIDE SLOPES. LAYOUT SHOWN ON 35 FOOT INTERVAL.
5. THE TRUST WILL STABILIZE THE SITE BY REVEGETATING NEW SOIL SLOPES CONSISTENT WITH THE VEGETATION MANAGEMENT PLAN AND ENVIRONMENTAL ASSESSMENT (TRUST AND NPS, 2001). THE FINAL BMPS WILL BE INTEGRATED WITH THE SITE RESTORATION TO ADDRESS EROSION CONTROL DURING THE PLANT ESTABLISHMENT PERIOD.
6. FIBER ROLLS AND EROSION CONTROL BLANKET TO BE FITTED AROUND REMAINING TREES.

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
1111 BROADWAY, 6TH FLOOR
OAKLAND, CALIFORNIA 94607 USA
PHONE: 510.836.3034

THE PRESIDIO TRUST
67 MARTINEZ STREET
SAN FRANSICO, CALIFORNIA 94129
PHONE: 415.XXX.XXXX

TITLE:
POST-CONSTRUCTION EROSION AND SEDIMENT CONTROL PLAN

PROJECT:
BARNARD AVENUE PROTECTED RANGE SOIL REMOVAL

SITE:
PRESIDIO TRUST
SAN FRANCISCO, CALIFORNIA

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.

SIGNATURE

DATE

DESIGN BY:	TMKK	DATE:	JULY 2012
DRAWN BY:	TMKK	PROJECT NO.:	WR1512
CHECKED BY:	LVT	FILE:	WR1512C003-Plans_v3
REVIEWED BY:	LVT	DRAWING NO.:	
APPROVED BY:	LVT		3

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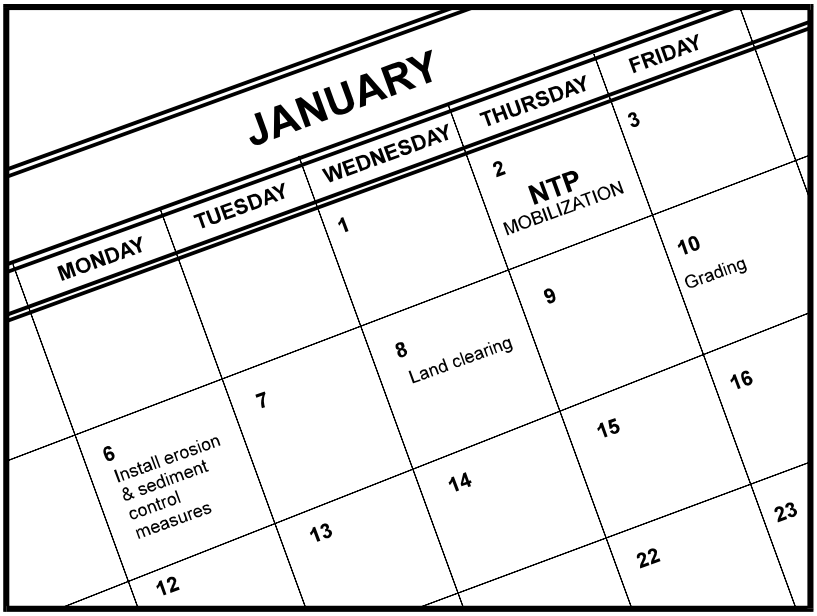
APPENDIX A

Best Management Practices

Scheduling EC-1



Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.
- Plan the project and develop a schedule showing each phase

of construction. Clearly show how the rainy season relates to soil disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion control BMPs
  - Sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs
  - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
  - Sequence trenching activities so that most open portions are closed before new trenching begins.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

Inspection and Maintenance

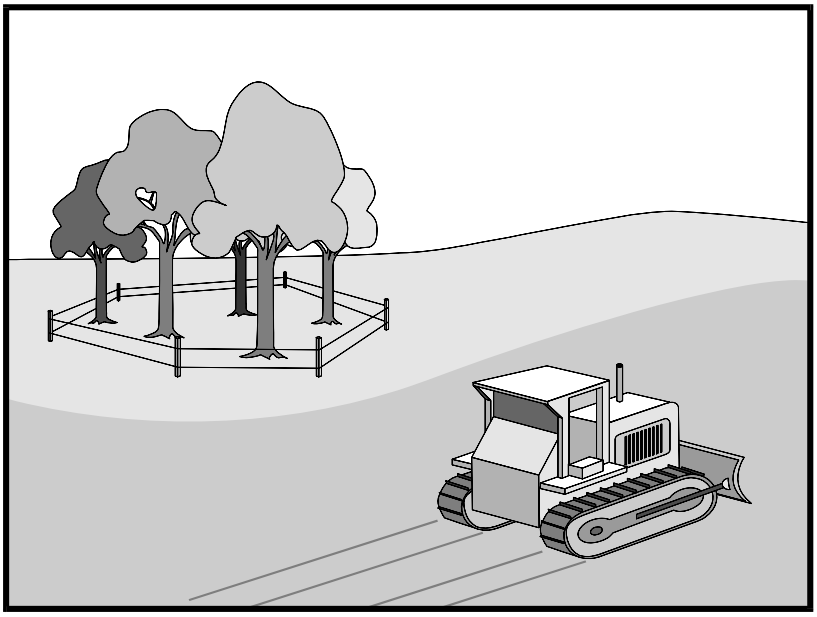
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

Preservation Of Existing Vegetation EC-2



Categories

EC	Erosion Control	☑
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WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Carefully planned preservation of existing vegetation minimizes the potential of removing or injuring existing trees, vines, shrubs, and grasses that protect soil from erosion.

Suitable Applications

Preservation of existing vegetation is suitable for use on most projects. Large project sites often provide the greatest opportunity for use of this BMP. Suitable applications include the following:

- Areas within the site where no construction activity occurs, or occurs at a later date. This BMP is especially suitable to multi year projects where grading can be phased.
- Areas where natural vegetation exists and is designated for preservation. Such areas often include steep slopes, watercourse, and building sites in wooded areas.
- Areas where local, state, and federal government require preservation, such as vernal pools, wetlands, marshes, certain oak trees, etc. These areas are usually designated on the plans, or in the specifications, permits, or environmental documents.
- Where vegetation designated for ultimate removal can be temporarily preserved and be utilized for erosion control and sediment control.

Limitations

- Requires forward planning by the owner/developer,

contractor, and design staff.

- Limited opportunities for use when project plans do not incorporate existing vegetation into the site design.
- For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactory for the planned development.

Implementation

The best way to prevent erosion is to not disturb the land. In order to reduce the impacts of new development and redevelopment, projects may be designed to avoid disturbing land in sensitive areas of the site (e.g., natural watercourses, steep slopes), and to incorporate unique or desirable existing vegetation into the site's landscaping plan. Clearly marking and leaving a buffer area around these unique areas during construction will help to preserve these areas as well as take advantage of natural erosion prevention and sediment trapping.

Existing vegetation to be preserved on the site must be protected from mechanical and other injury while the land is being developed. The purpose of protecting existing vegetation is to ensure the survival of desirable vegetation for shade, beautification, and erosion control. Mature vegetation has extensive root systems that help to hold soil in place, thus reducing erosion. In addition, vegetation helps keep soil from drying rapidly and becoming susceptible to erosion. To effectively save existing vegetation, no disturbances of any kind should be allowed within a defined area around the vegetation. For trees, no construction activity should occur within the drip line of the tree.

Timing

- Provide for preservation of existing vegetation prior to the commencement of clearing and grubbing operations or other soil disturbing activities in areas where no construction activity is planned or will occur at a later date.

Design and Layout

- Mark areas to be preserved with temporary fencing. Include sufficient setback to protect roots.
  - Orange colored plastic mesh fencing works well.
  - Use appropriate fence posts and adequate post spacing and depth to completely support the fence in an upright position.
- Locate temporary roadways, stockpiles, and layout areas to avoid stands of trees, shrubs, and grass.
- Consider the impact of grade changes to existing vegetation and the root zone.
- Maintain existing irrigation systems where feasible. Temporary irrigation may be required.
- Instruct employees and subcontractors to honor protective devices. Prohibit heavy equipment, vehicular traffic, or storage of construction materials within the protected area.

Costs

There is little cost associated with preserving existing vegetation if properly planned during the project design, and these costs may be offset by aesthetic benefits that enhance property values. During construction, the cost for preserving existing vegetation will likely be less than the cost of applying erosion and sediment controls to the disturbed area. Replacing vegetation inadvertently destroyed during construction can be extremely expensive, sometimes in excess of $10,000 per tree.

Inspection and Maintenance

During construction, the limits of disturbance should remain clearly marked at all times. Irrigation or maintenance of existing vegetation should be described in the landscaping plan. If damage to protected trees still occurs, maintenance guidelines described below should be followed:

- Verify that protective measures remain in place. Restore damaged protection measures immediately.
- Serious tree injuries shall be attended to by an arborist.
- Damage to the crown, trunk, or root system of a retained tree shall be repaired immediately.
- Trench as far from tree trunks as possible, usually outside of the tree drip line or canopy. Curve trenches around trees to avoid large roots or root concentrations. If roots are encountered, consider tunneling under them. When trenching or tunneling near or under trees to be retained, place tunnels at least 18 in. below the ground surface, and not below the tree center to minimize impact on the roots.
- Do not leave tree roots exposed to air. Cover exposed roots with soil as soon as possible. If soil covering is not practical, protect exposed roots with wet burlap or peat moss until the tunnel or trench is ready for backfill.
- Cleanly remove the ends of damaged roots with a smooth cut.
- Fill trenches and tunnels as soon as possible. Careful filling and tamping will eliminate air spaces in the soil, which can damage roots.
- If bark damage occurs, cut back all loosened bark into the undamaged area, with the cut tapered at the top and bottom and drainage provided at the base of the wood. Limit cutting the undamaged area as much as possible.
- Aerate soil that has been compacted over a trees root zone by punching holes 12 in. deep with an iron bar, and moving the bar back and forth until the soil is loosened. Place holes 18 in. apart throughout the area of compacted soil under the tree crown.
- Fertilization
  - Fertilize stressed or damaged broadleaf trees to aid recovery.
  - Fertilize trees in the late fall or early spring.

- Apply fertilizer to the soil over the feeder roots and in accordance with label instructions, but never closer than 3 ft to the trunk. Increase the fertilized area by one-fourth of the crown area for conifers that have extended root systems.

- Retain protective measures until all other construction activity is complete to avoid damage during site cleanup and stabilization.

References

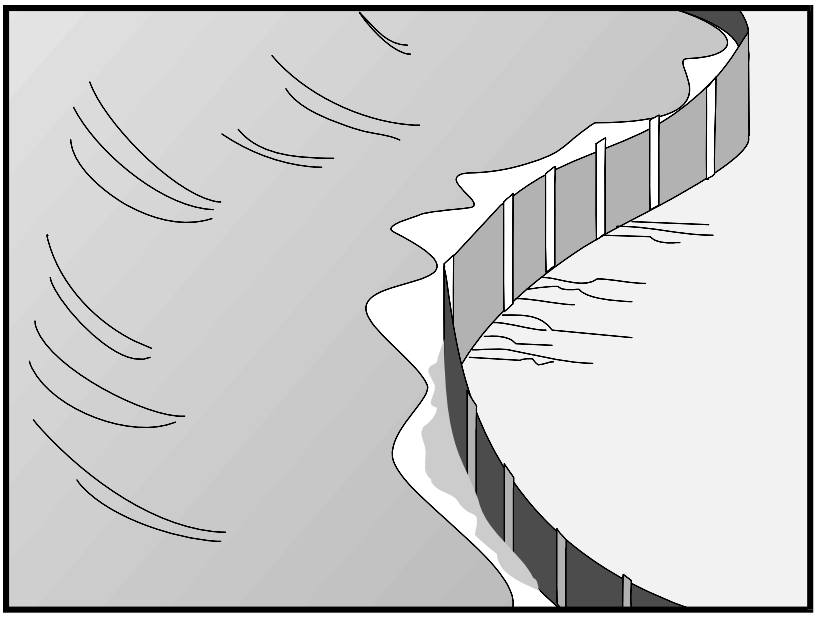
County of Sacramento Tree Preservation Ordinance, September 1981.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for The Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Silt Fence SE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-10 Storm Drain Inlet Protection

SE-14 Biofilter Bags

Description and Purpose

A silt fence is made of a woven geotextile that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They could also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion and around inlets within disturbed areas (SE-10). Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows. Silt fences are most effective when used in combination with erosion controls. Suitable applications include:

- Along the perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Around inlets.
- Below other small cleared areas.

Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Do not use in locations where ponded water may cause a flooding hazard. Runoff typically ponds temporarily on the upstream side of silt fence.
- Do not use silt fence to divert water flows or place across any contour line. Fences not constructed on a level contour, or fences used to divert flow will concentrate flows resulting in additional erosion and possibly overtopping or failure of the silt fence.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Not effective unless trenched and keyed in.
- Not intended for use as mid-slope protection on slopes greater than 4:1 (H:V).
- Do not use on slopes subject to creeping, slumping, or landslides.

Implementation

General

A silt fence is a temporary sediment barrier consisting of woven geotextile stretched across and attached to supporting posts, trenched-in, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap sediment by intercepting and detaining small amounts of sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

The following layout and installation guidance can improve performance and should be followed:

- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- The maximum length of slope draining to any point along the silt fence should be 200 ft or less.
- The maximum slope perpendicular to the fence line should be 1:1.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft^2 of ponding area should be provided for every acre draining to the fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.

- Silt fences should remain in place until the disturbed area is permanently stabilized, after which, the silt fence should be removed and properly disposed.
- Silt fence should be used in combination with erosion source controls up slope in order to provide the most effective sediment control.
- Be aware of local regulations regarding the type and installation requirements of silt fence, which may differ from those presented in this fact sheet.

Design and Layout

The fence should be supported by a plastic or wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Woven geotextile material should contain ultraviolet inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 °F to 120 °F.

- Layout in accordance with attached figures.
- For slopes steeper than 2:1 (H:V) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.
- For slopes adjacent to sensitive receiving waters or Environmentally Sensitive Areas (ESAs), silt fence should be used in conjunction with erosion control BMPs.

Standard vs. Heavy Duty Silt Fence

Standard Silt Fence

- Generally applicable in cases where the slope of area draining to the silt fence is 4:1 (H:V) or less.
- Used for shorter durations, typically 5 months or less
- Area draining to fence produces moderate sediment loads.

Heavy Duty Silt Fence

- Use is generally limited to 8 months or less.
- Area draining to fence produces moderate sediment loads.
- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
  - Fence fabric has higher tensile strength.
  - Fabric is reinforced with wire backing or additional support.
  - Posts are spaced closer than pre-manufactured, standard silt fence products.
  - Posts are metal (steel or aluminum)

Materials

<u>Standard Silt Fence</u>

- Silt fence material should be woven geotextile with a minimum width of 36 in. and a minimum tensile strength of 100 lb force. The fabric should conform to the requirements in ASTM designation D4632 and should have an integral reinforcement layer. The

reinforcement layer should be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric should be between 0.1 sec^{-1} and 0.15 sec^{-1} in conformance with the requirements in ASTM designation D4491.

- Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

Heavy-Duty Silt Fence

- Some silt fence has a wire backing to provide additional support, and there are products that may use prefabricated plastic holders for the silt fence and use metal posts or bar reinforcement instead of wood stakes. If bar reinforcement is used in lieu of wood stakes, use number four or greater bar. Provide end protection for any exposed bar reinforcement for health and safety purposes.

Installation Guidelines – Traditional Method

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line of the proposed silt fence (trenches should not be excavated wider or deeper than necessary for proper silt fence installation).

- Bottom of the silt fence should be keyed-in a minimum of 12 in.

- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.

- When standard strength geotextile is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench.

- When extra-strength geotextile and closer post spacing are used, the mesh support fence may be eliminated.

- Woven geotextile should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, geotextile should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.

- The trench should be backfilled with native material and compacted.

- Construct silt fences with a setback of at least 3 ft from the toe of a slope. Where, due to specific site conditions, a 3 ft setback is not available, the silt fence may be constructed at the

toe of the slope, but should be constructed as far from the toe of the slope as practicable. Silt fences close to the toe of the slope will be less effective and more difficult to maintain.

- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.
- Cross barriers should be a minimum of $^1/_3$ and a maximum of ½ the height of the linear barrier.
- See typical installation details at the end of this fact sheet.

Installation Guidelines - Static Slicing Method

- Static Slicing is defined as insertion of a narrow blade pulled behind a tractor, similar to a plow blade, at least 10 inches into the soil while at the same time pulling silt geotextile fabric into the ground through the opening created by the blade to the depth of the blade. Once the gerotextile is installed, the soil is compacted using tractor tires.
- This method will not work with pre-fabricated, wire backed silt fence.
- Benefits:
    - Ease of installation (most often done with a 2 person crew). In addition, installation using static slicing has been found to be more efficient on slopes, in rocky soils, and in saturated soils.
    - Minimal soil disturbance.
    - Greater level of compaction along fence, leading to higher performance (i.e. greater sediment retention).
    - Uniform installation.
    - Less susceptible to undercutting/undermining.

Costs

- It should be noted that costs vary greatly across regions due to available supplies and labor costs.
- Average annual cost for installation using the traditional silt fence installation method (assumes 6 month useful life) is $7 per linear foot based on vendor research. Range of cost is $3.50 - $9.10 per linear foot.
- In tests, the slicing method required 0.33 man hours per 100 linear feet, while the trenched based systems required as much as 1.01 man hours per linear foot.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair undercut silt fences.

- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Silt fences should be left in place until the upstream area is permanently stabilized. Until then, the silt fence should be inspected and maintained regularly.
- Remove silt fence when upgradient areas are stabilized. Fill and compact post holes and anchor trench, remove sediment accumulation, grade fence alignment to blend with adjacent ground, and stabilize disturbed area.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, and Inventory of Current Practices (Draft), UESPA, 1990.

Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991

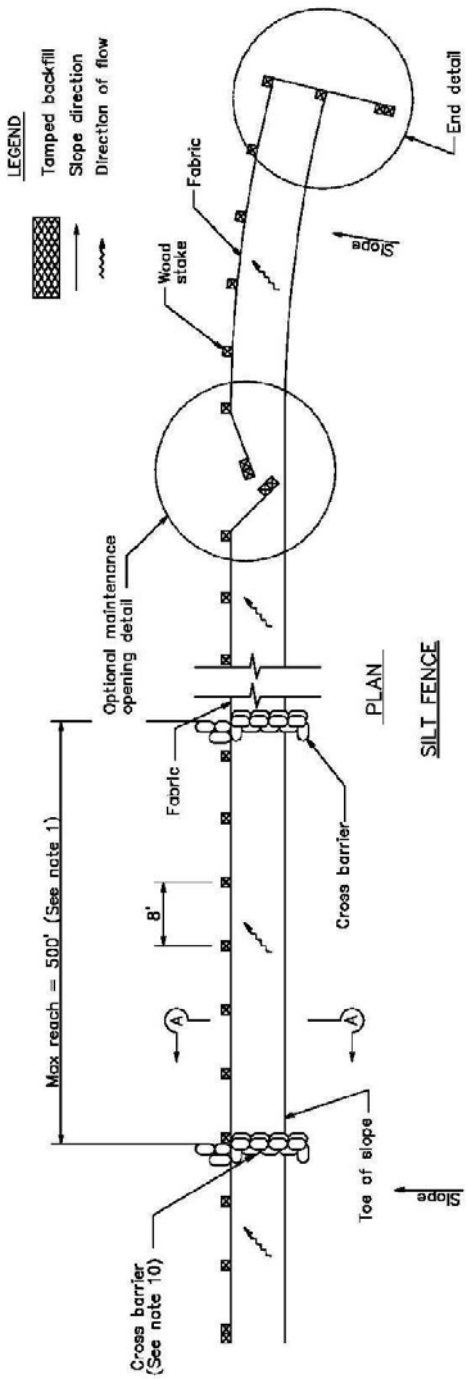
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

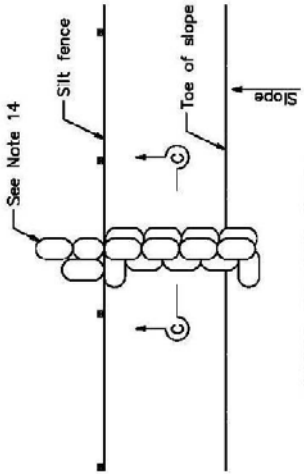
Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

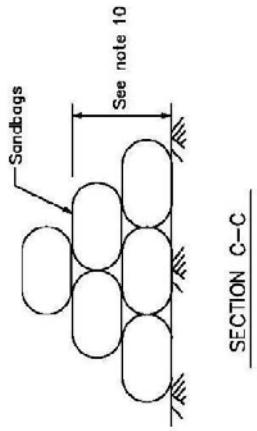
U.S. Environmental Protection Agency (USEPA). Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

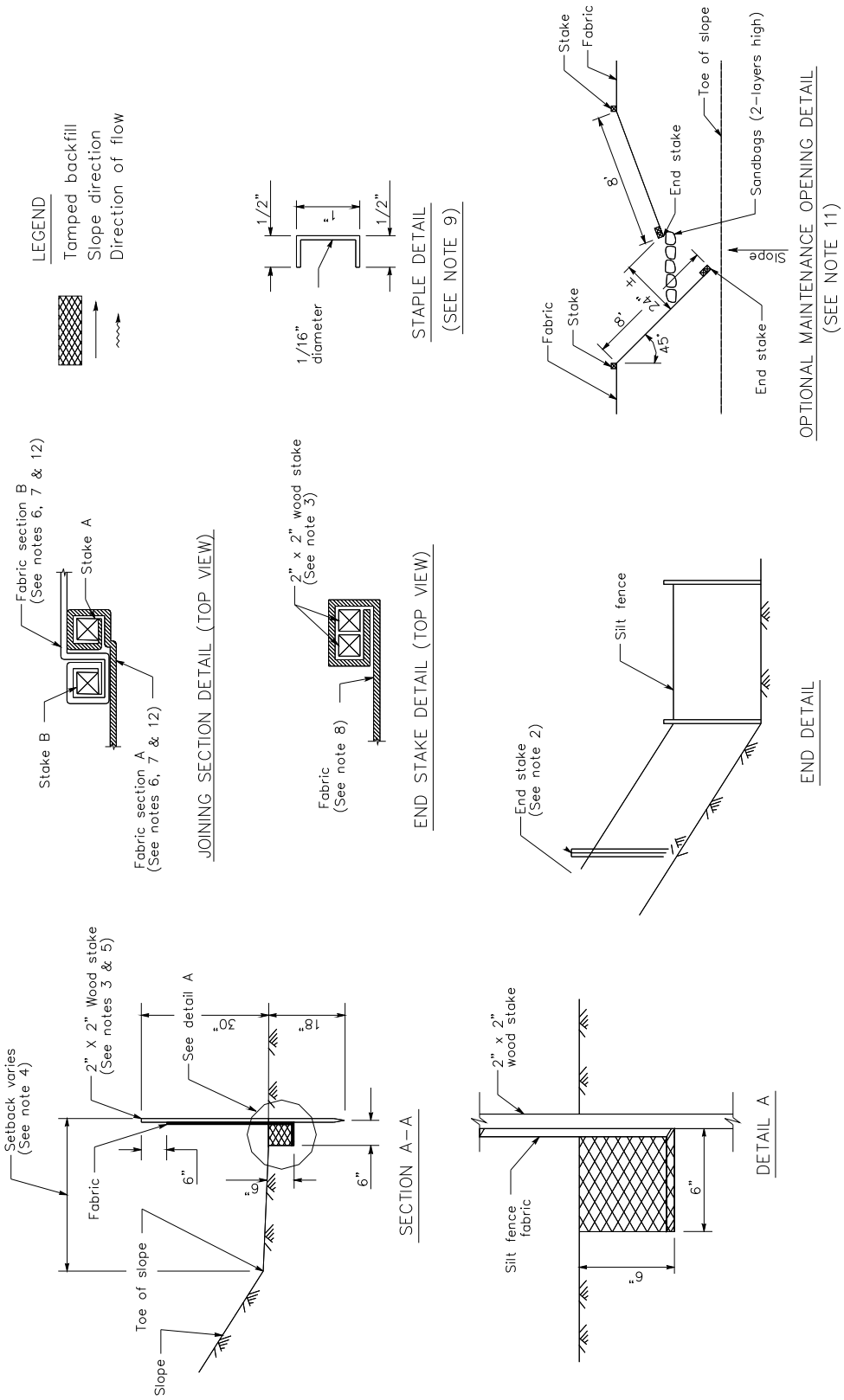




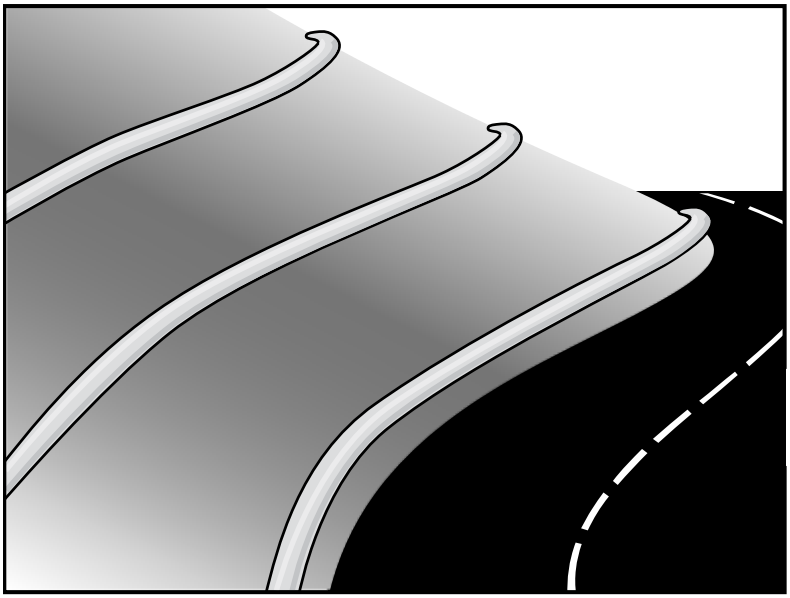


NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 500'.
2. The last 8'–0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'–0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow–through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes are full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.
14. Add 3–4 bags to cross barrier on downgradient side of silt fence as needed to prevent bypass or undermining and as allowable based on site limits of disturbance.


LEGEND
Tamped backfill
Slope direction
Direction of flow
1/2"
1"
1/2"
1/16" diameter
STAPLE DETAIL
(SEE NOTE 9)
Stake
Fabric
Toe of slope
Sandbags (2-layers high)
End stake
8'
24"
8'
45°
Slope
Fabric
Stake
End stake
OPTIONAL MAINTENANCE OPENING DETAIL
(SEE NOTE 11)
Fabric section B
(See notes 6, 7 & 12)
Stake A
Stake B
Fabric section A
(See notes 6, 7 & 12)
JOINING SECTION DETAIL (TOP VIEW)
2" x 2" wood stake
(See note 3)
Fabric
(See note 8)
END STAKE DETAIL (TOP VIEW)
Silt fence
End stake
(See note 2)
END DETAIL
Setback varies
(See note 4)
2" X 2" Wood stake
(See notes 3 & 5)
See detail A
30"
18"
Fabric
6"
6"
6"
Toe of slope
Slope
SECTION A-A
2" x 2"
wood stake
Silt fence
fabric
6"
6"
DETAIL A

Fiber Rolls SE-5



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped by netting, which can be photodegradable or natural. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.
- At operational storm drains as a form of inlet protection.

- Around temporary stockpiles.

Limitations

- Fiber rolls are not effective unless trenched in and staked.
- Not intended for use in high flow situations.
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months depending upon local conditions.

Implementation

Fiber Roll Materials

- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed free rice straw, flax, or a similar agricultural material bound into a tight tubular roll by netting.
- Typical fiber rolls vary in diameter from 9 in. to 20 in. Larger diameter rolls are available as well.

Installation

- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Prepare the slope before beginning installation.
- Dig small trenches across the slope on the contour. The trench depth should be ¼ to 1/3 of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.
- Start building trenches and installing rolls from the bottom of the slope and work up.
- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into the trench.
  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.
- See typical fiber roll installation details at the end of this fact sheet.

Removal

- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Typically, fiber rolls encased with plastic netting are used for a temporary application because the netting does not biodegrade. Fiber rolls used in a permanent application are typically encased with a biodegradeable material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance.
- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But, they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

Costs

Material costs for regular fiber rolls range from $20 - $30 per 25 ft roll.

Material costs for PAM impregnated fiber rolls range between 7.00-$9.00 per linear foot, based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed

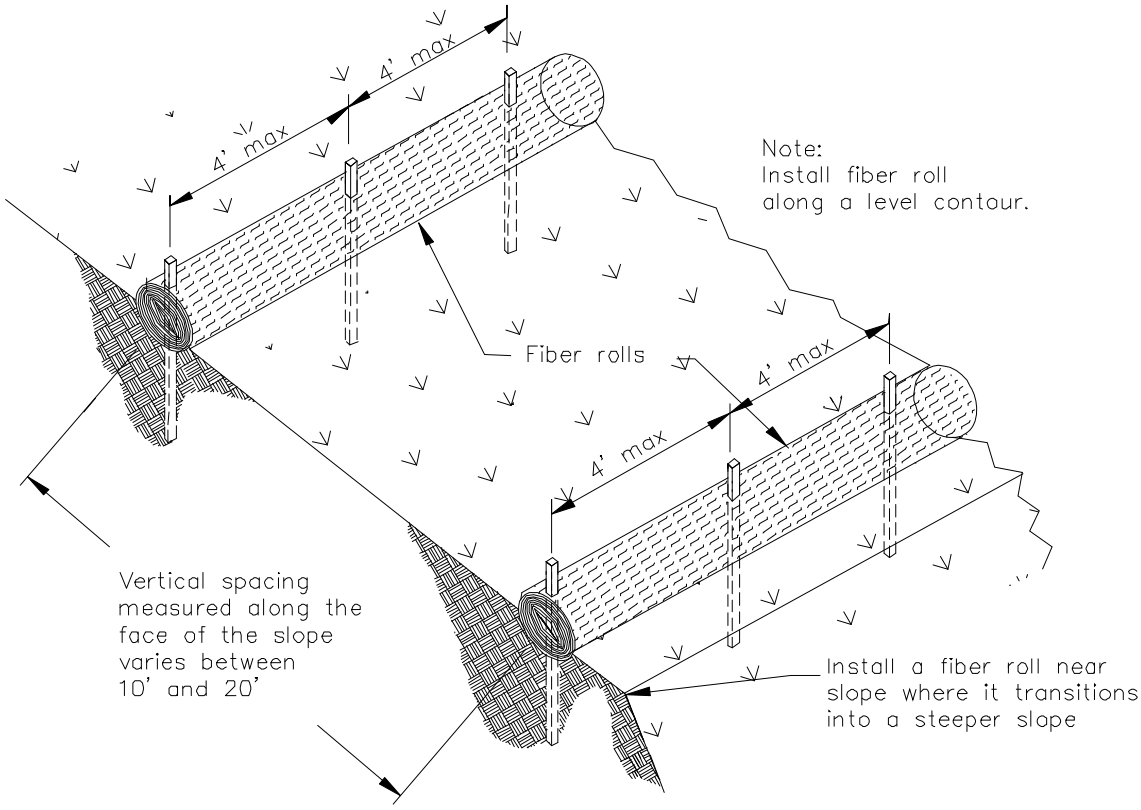
in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.
- Repair any rills or gullies promptly.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



TYPICAL FIBER ROLL INSTALLATION

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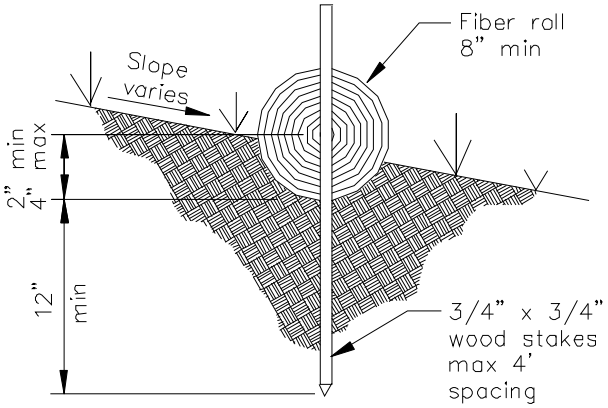


ENTRENCHMENT DETAIL

N.T.S.

Street Sweeping and Vacuuming SE-7

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.
- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.

- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd^3 hopper) to $88/hour (9 yd^3 hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

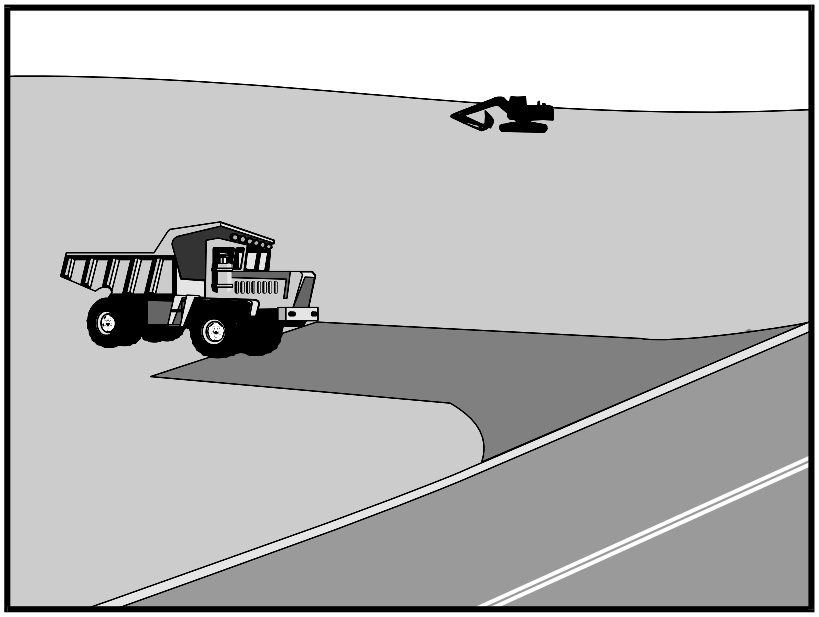
- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

Stabilized Construction Entrance / Exit TC-1



Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water

runoff.

Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

Design and Layout

- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 12 in. or as recommended by soils engineer.
- Construct length of 50 ft minimum, and 30 ft minimum width.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.

- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7, Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction

Costs

Average annual cost for installation and maintenance may vary from $1,200 to $4,800 each, averaging $2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from $1,200 - $6,000 each, averaging $3,600 per entrance.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

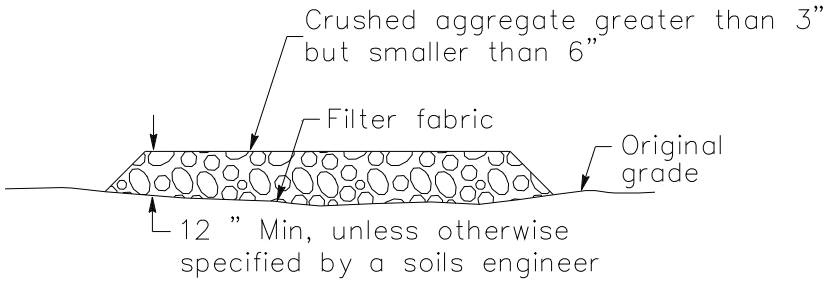
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

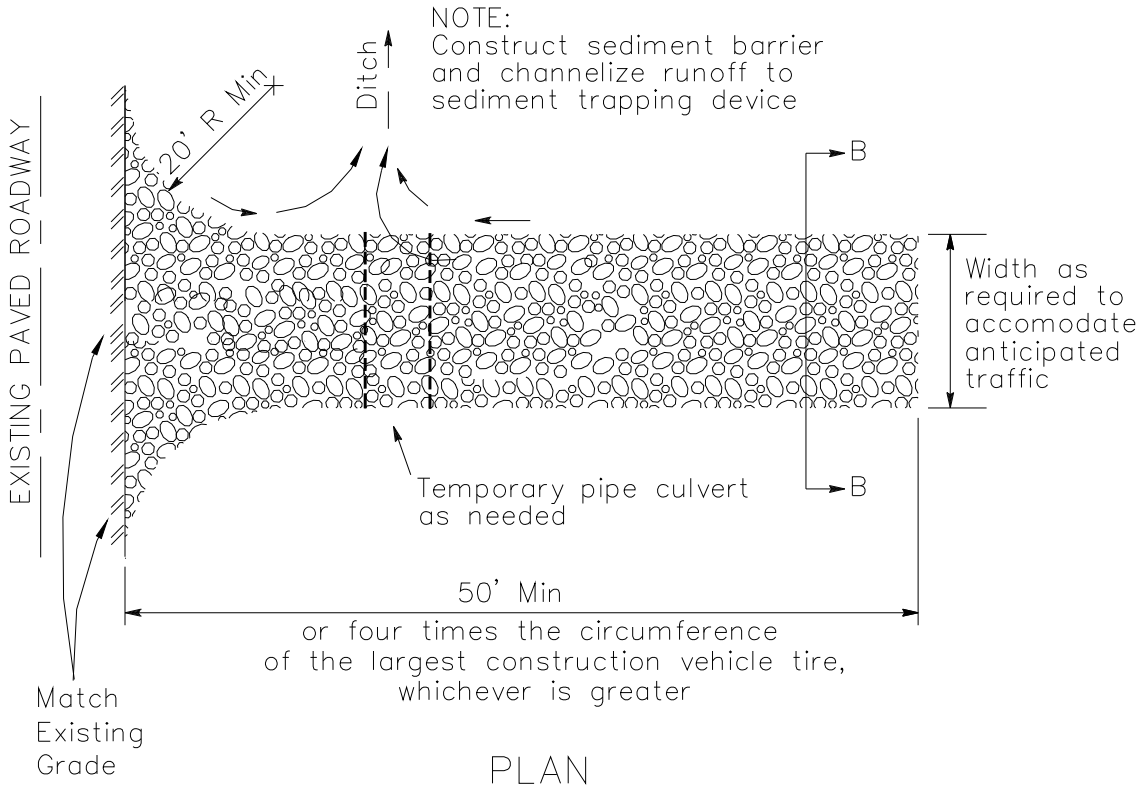
Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



SECTION B–B
NTS



PLAN
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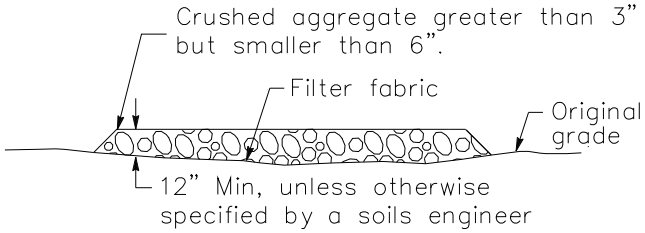

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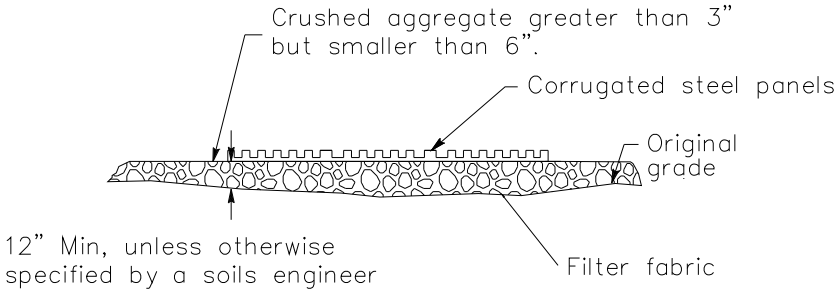

SECTION A–A
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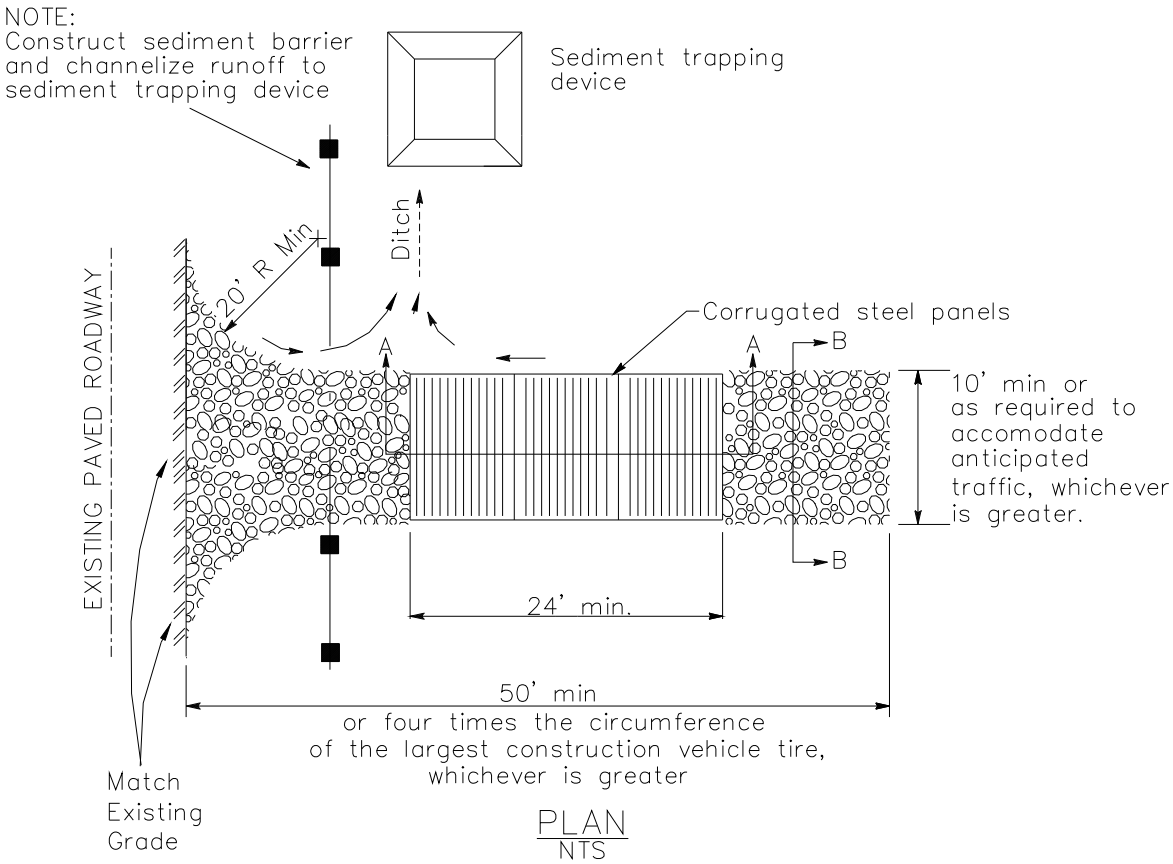

PLAN
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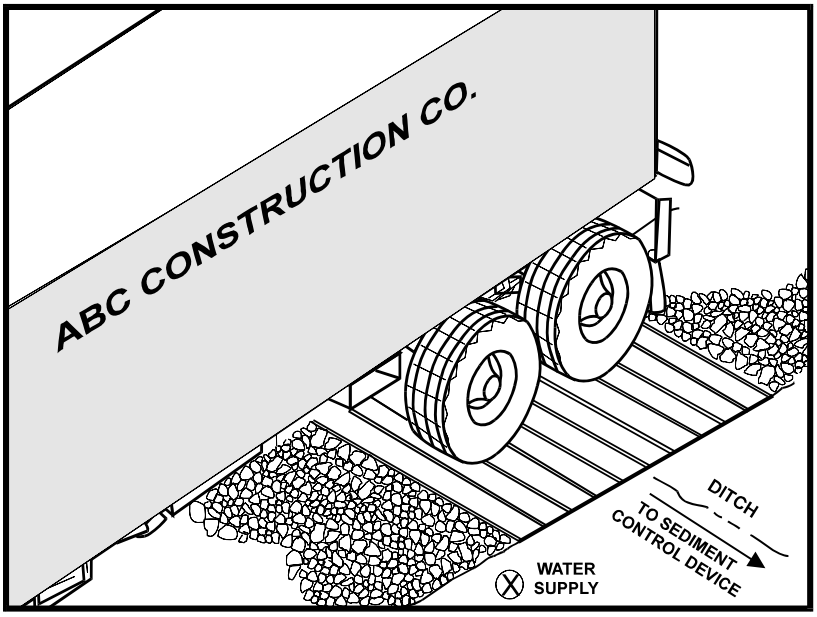
Entrance/Outlet Tire Wash TC-3



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

TC-1 Stabilized Construction Entrance/Exit

Description and Purpose

A tire wash is an area located at stabilized construction access points to remove sediment from tires and under carriages and to prevent sediment from being transported onto public roadways.

Suitable Applications

Tire washes may be used on construction sites where dirt and mud tracking onto public roads by construction vehicles may occur.

Limitations

- The tire wash requires a supply of wash water.
- A turnout or doublewide exit is required to avoid having entering vehicles drive through the wash area.
- Do not use where wet tire trucks leaving the site leave the road dangerously slick.

Implementation

- Incorporate with a stabilized construction entrance/exit. See TC-1, Stabilized Construction Entrance/Exit.
- Construct on level ground when possible, on a pad of coarse aggregate greater than 3 in. but smaller than 6 in. A geotextile fabric should be placed below the aggregate.
- Wash rack should be designed and constructed/manufactured for anticipated traffic loads.

- Provide a drainage ditch that will convey the runoff from the wash area to a sediment trapping device. The drainage ditch should be of sufficient grade, width, and depth to carry the wash runoff.
- Use hoses with automatic shutoff nozzles to prevent hoses from being left on.
- Require that all employees, subcontractors, and others that leave the site with mud caked tires and undercarriages to use the wash facility.
- Implement SC-7, Street Sweeping and Vacuuming, as needed.

Costs

Costs are low for installation of wash rack.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Remove accumulated sediment in wash rack and/or sediment trap to maintain system performance.
- Inspect routinely for damage and repair as needed.

References

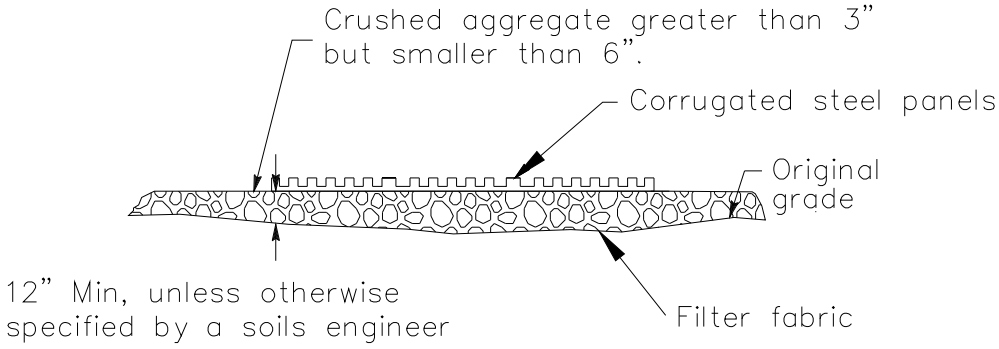
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.



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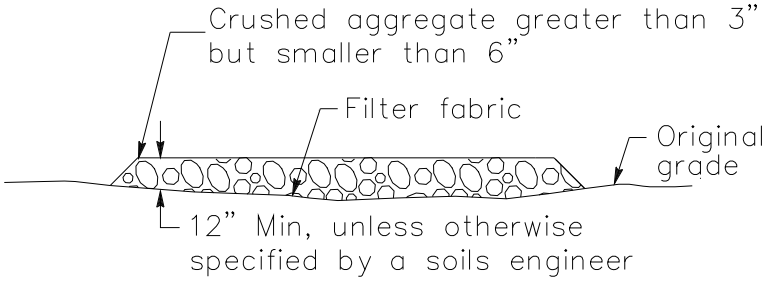

SECTION B–B
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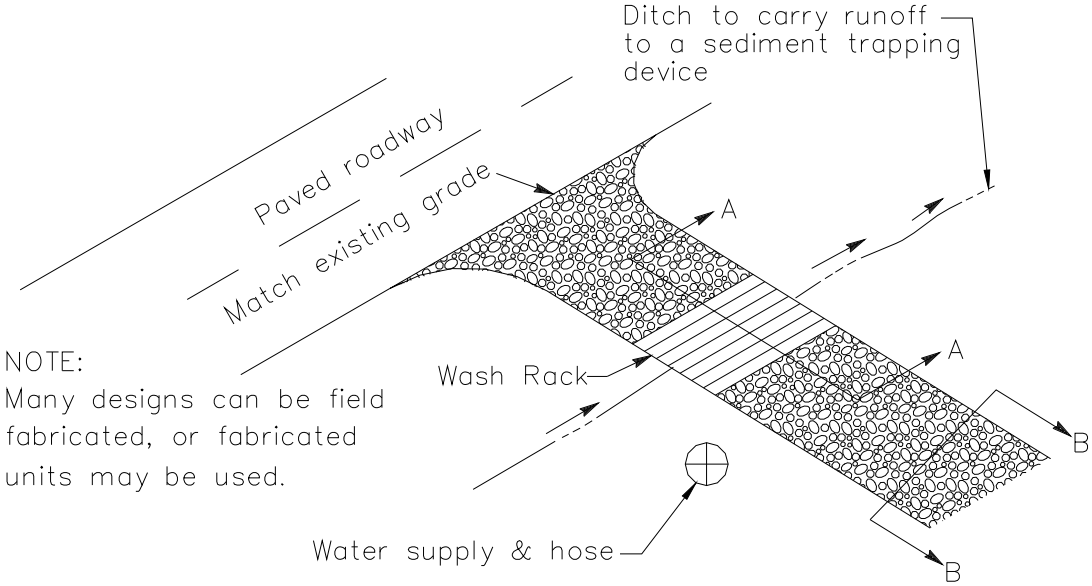
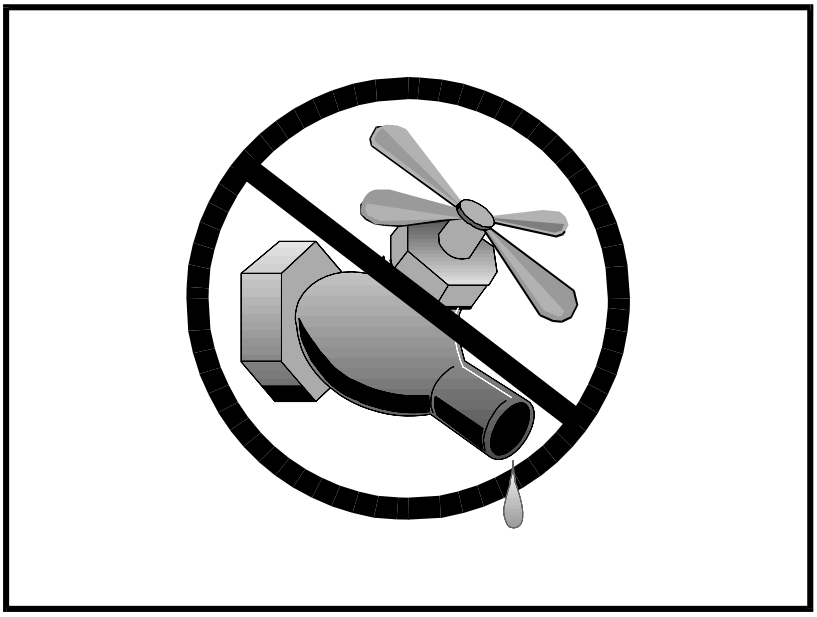


TYPICAL TIRE WASH
NOT TO SCALE

Water Conservation Practices NS-1



Categories		
EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Water conservation practices are activities that use water during the construction of a project in a manner that avoids causing erosion and the transport of pollutants offsite. These practices can reduce or eliminate non-stormwater discharges.

Suitable Applications

Water conservation practices are suitable for all construction sites where water is used, including piped water, metered water, trucked water, and water from a reservoir.

Limitations

- None identified.

Implementation

- Keep water equipment in good working condition.
- Stabilize water truck filling area.
- Repair water leaks promptly.
- Washing of vehicles and equipment on the construction site is discouraged.
- Avoid using water to clean construction areas. If water must be used for cleaning or surface preparation, surface should be swept and vacuumed first to remove dirt. This will minimize amount of water required.
- Direct construction water runoff to areas where it can soak

into the ground or be collected and reused.

- Authorized non-stormwater discharges to the storm drain system, channels, or receiving waters are acceptable with the implementation of appropriate BMPs.
- Lock water tank valves to prevent unauthorized use.

Costs

The cost is small to none compared to the benefits of conserving water.

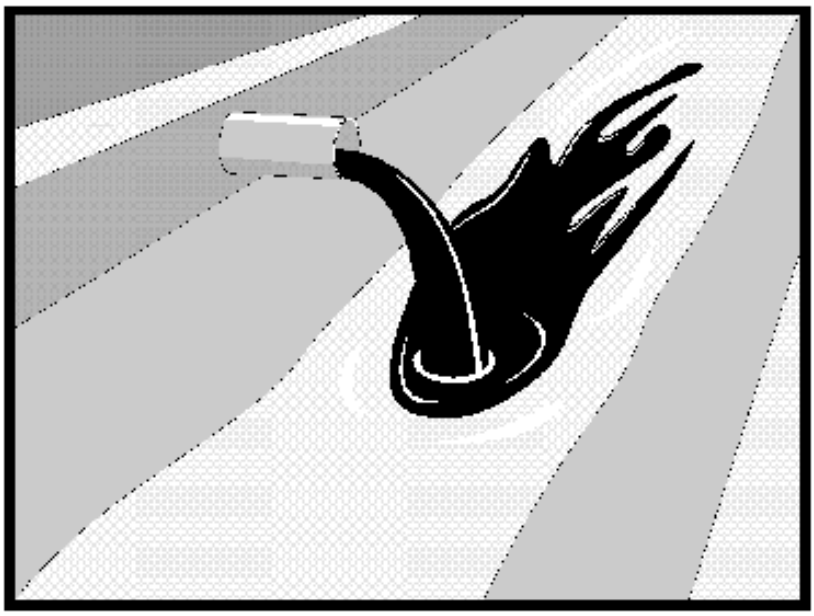
Inspection and Maintenance

- Inspect and verify that activity based BMPs are in place prior to the commencement of authorized non-stormwater discharges.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges are occuring.
- Repair water equipment as needed to prevent unintended discharges.
  - Water trucks
  - Water reservoirs (water buffalos)
  - Irrigation systems
  - Hydrant connections

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Illicit Connection / Discharge NS-6



Categories		
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NS	Non-Stormwater Management Control	☑
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Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Procedures and practices designed for construction contractors to recognize illicit connections or illegally dumped or discharged materials on a construction site and report incidents.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Illicit connection/discharge and reporting is applicable anytime an illicit connection or discharge is discovered or illegally dumped material is found on the construction site.

Limitations

Illicit connections and illegal discharges or dumping, for the purposes of this BMP, refer to discharges and dumping caused by parties other than the contractor. If pre-existing hazardous materials or wastes are known to exist onsite, they should be identified in the SWPPP and handled as set forth in the SWPPP.

Implementation

Planning

- Review the SWPPP. Pre-existing areas of contamination should be identified and documented in the SWPPP.
- Inspect site before beginning the job for evidence of illicit connections, illegal dumping or discharges. Document any pre-existing conditions and notify the owner.
- Inspect site regularly during project execution for evidence

of illicit connections, illegal dumping or discharges.

- Observe site perimeter for evidence for potential of illicitly discharged or illegally dumped material, which may enter the job site.

Identification of Illicit Connections and Illegal Dumping or Discharges

- **General –** unlabeled and unidentifiable material should be treated as hazardous.
- **Solids** - Look for debris, or rubbish piles. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way.
- **Liquids** - signs of illegal liquid dumping or discharge can include:
  - Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Abnormal water flow during the dry weather season
- **Urban Areas** - Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes. Signs of an illicit connection or illegal discharge can include:
  - Abnormal water flow during the dry weather season
  - Unusual flows in sub drain systems used for dewatering
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Excessive sediment deposits, particularly adjacent to or near active offsite construction projects
- **Rural Areas** - Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:
  - Abnormal water flow during the non-irrigation season
  - Non-standard junction structures
  - Broken concrete or other disturbances at or near junction structures

Reporting

Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery. For illicit connections or discharges to the storm drain system, notify the local stormwater management agency. For illegal dumping, notify the local law enforcement agency.

Cleanup and Removal

The responsibility for cleanup and removal of illicit or illegal dumping or discharges will vary by location. Contact the local stormwater management agency for further information.

Costs

Costs to look for and report illicit connections and illegal discharges and dumping are low. The best way to avoid costs associated with illicit connections and illegal discharges and dumping is to keep the project perimeters secure to prevent access to the site, to observe the site for vehicles that should not be there, and to document any waste or hazardous materials that exist onsite before taking possession of the site.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect the site regularly to check for any illegal dumping or discharge.
- Prohibit employees and subcontractors from disposing of non-job related debris or materials at the construction site.
- Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery.

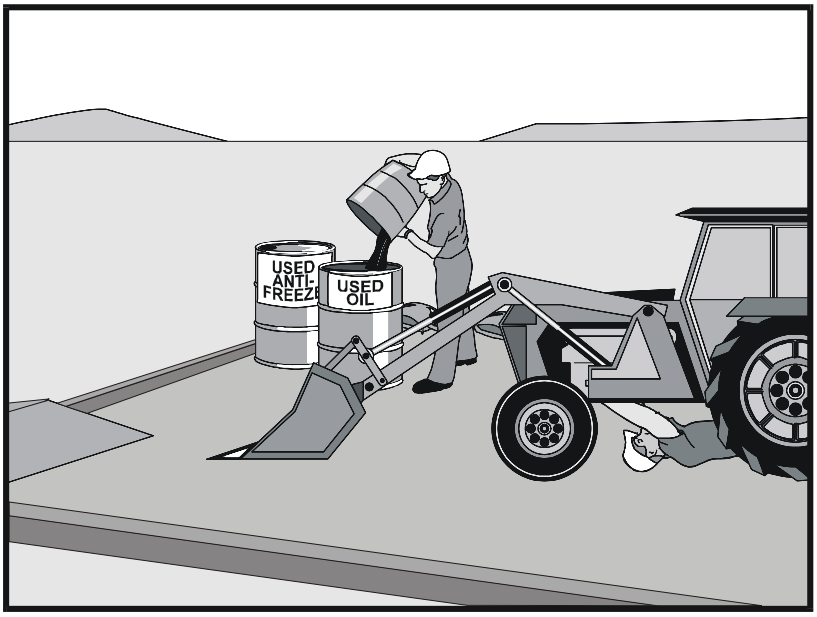
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle & Equipment Maintenance NS-10



Categories		
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SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a "dry and clean site". The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

Suitable Applications

These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8, Vehicle and Equipment Cleaning, and NS-9, Vehicle and

Equipment Fueling.

Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runon and runoff, and should be located at least 50 ft from downstream drainage facilities and watercourses.
- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
- Use adsorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately.
- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- Drip pans or plastic sheeting should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.
- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.
- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.

- Repair leaks of fluids and oil immediately.

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

Safer Alternative Products

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an "environmentally friendly" label.
- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.
- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in California Toxic Rule as priority pollutants. These materials are harmful and must not contaminate stormwater. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The "chlor" term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling and Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like,-trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Costs

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Keep ample supplies of spill cleanup materials onsite.
- Maintain waste fluid containers in leak proof condition.
- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

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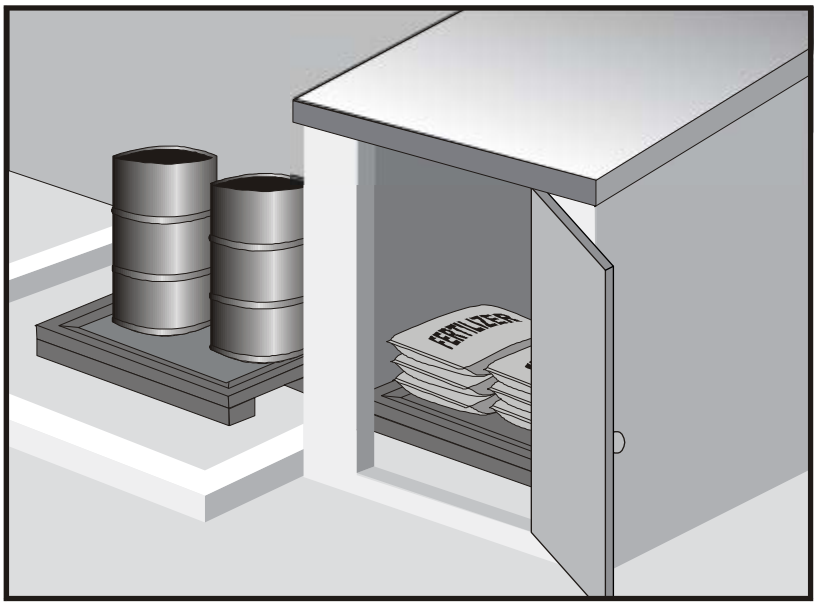
Material Delivery and Storage WM-1



Categories

EC	Erosion Control	
SE	Sediment Control	
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WE	Wind Erosion Control	
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WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in watertight containers and/or a completely enclosed designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease

- Asphalt and concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

- Space limitation may preclude indoor storage.
- Storage sheds often must meet building and fire code requirements.

Implementation

The following steps should be taken to minimize risk:

- Chemicals must be stored in water tight containers with appropriate secondary containment or in a storage shed.
- When a material storage area is located on bare soil, the area should be lined and bermed.
- Use containment pallets or other practical and available solutions, such as storing materials within newly constructed buildings or garages, to meet material storage requirements.
- Stack erodible landscape material on pallets and cover when not in use.
- Contain all fertilizers and other landscape materials when not in use.
- Temporary storage areas should be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) should be available on-site for all materials stored that have the potential to effect water quality.
- Construction site areas should be designated for material delivery and storage.
- Material delivery and storage areas should be located away from waterways, if possible.
  - Avoid transport near drainage paths or waterways.
  - Surround with earth berms or other appropriate containment BMP. See EC-9, Earth Dikes and Drainage Swales.
  - Place in an area that will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- An up to date inventory of materials delivered and stored onsite should be kept.

- Hazardous materials storage onsite should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- Keep ample spill cleanup supplies appropriate for the materials being stored. Ensure that cleanup supplies are in a conspicuous, labeled area.
- Employees and subcontractors should be trained on the proper material delivery and storage practices.
- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose of materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Materials should be covered prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.
- Stockpiles should be protected in accordance with WM-3, Stockpile Management.
- Materials should be stored indoors within existing structures or completely enclosed storage sheds when available.
- Proper storage instructions should be posted at all times in an open and conspicuous location.
- An ample supply of appropriate spill clean up material should be kept near storage areas.
- Also see WM-6, Hazardous Waste Management, for storing of hazardous wastes.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.
- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.
- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.
- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.
- If spills or leaks of materials occur that are not contained and could discharge to surface waters, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

Cost

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Keep storage areas clean and well organized, including a current list of all materials onsite.
- Inspect labels on containers for legibility and accuracy.

- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

References

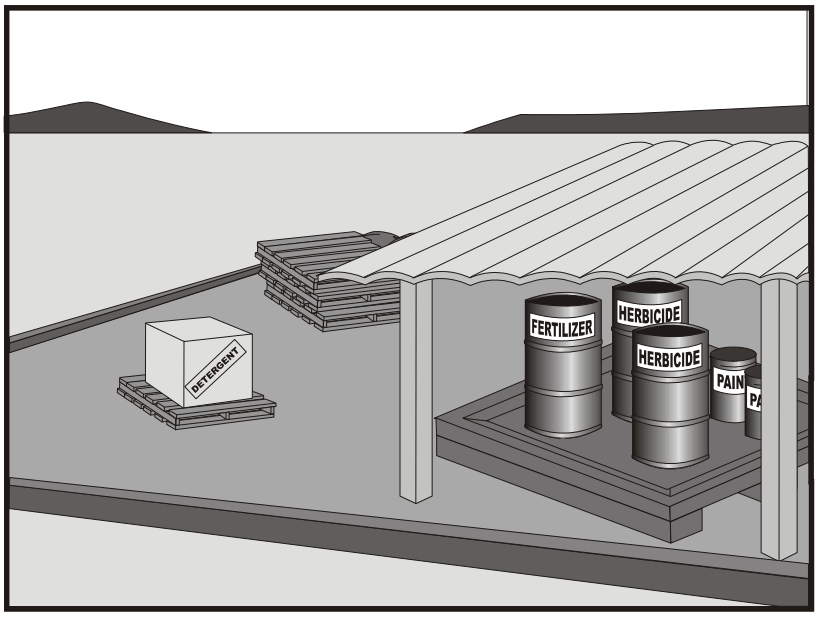
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Material Use WM-2



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Other materials that may be detrimental if released to the environment

Limitations

Safer alternative building and construction products may not be available or suitable in every instance.

Implementation

The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.
- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.
- The preferred method of termiticide application is soil injection near the existing or proposed structure foundation/slab; however, if not feasible, soil drench application of termiticides should follow EPA label guidelines and the following recommendations (most of which are applicable to most pesticide applications):
  - Do not treat soil that is water-saturated or frozen.
  - Application shall not commence within 24-hours of a predicted precipitation event with a 40% or greater probability. Weather tracking must be performed on a daily basis prior to termiticide application and during the period of termiticide application.
  - Do not allow treatment chemicals to runoff from the target area. Apply proper quantity to prevent excess runoff. Provide containment for and divert stormwater from application areas using berms or diversion ditches during application.
  - Dry season: Do not apply within 10 feet of storm drains. Do not apply within 25 feet of aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds).
  - Wet season: Do not apply within 50 feet of storm drains or aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds) unless a vegetative buffer is present (if so, refer to dry season requirements).
  - Do not make on-grade applications when sustained wind speeds are above 10 mph (at application site) at nozzle end height.
  - Cover treatment site prior to a rain event in order to prevent run-off of the pesticide into non-target areas. The treated area should be limited to a size that can be backfilled and/or covered by the end of the work shift. Backfilling or covering of the treated area shall be done by the end of the same work shift in which the application is made.
  - The applicator must either cover the soil him/herself or provide written notification of the above requirement to the contractor on site and to the person commissioning the

application (if different than the contractor). If notice is provided to the contractor or the person commissioning the application, then they are responsible under the Federal Insecticide Fungicide, and Rodenticide Act (FIFRA) to ensure that: 1) if the concrete slab cannot be poured over the treated soil within 24 hours of application, the treated soil is covered with a waterproof covering (such as polyethylene sheeting), and 2) the treated soil is covered if precipitation is predicted to occur before the concrete slab is scheduled to be poured.

- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydraulic application. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals before predicted rainfall.
- Train employees and subcontractors in proper material use.
- Supply Material Safety Data Sheets (MSDS) for all materials.
- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.
- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.
- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or contain for proper disposal off site. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical.
- Document the location, time, chemicals applied, and applicator's name and qualifications.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.
- Discontinue use of erodible landscape material within 2 days prior to a forecasted rain event and materials should be covered and/or bermed.

- Provide containment for material use areas such as masons' areas or paint mixing/preparation areas to prevent materials/pollutants from entering stormwater.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Ensure employees and subcontractors throughout the job are using appropriate practices.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

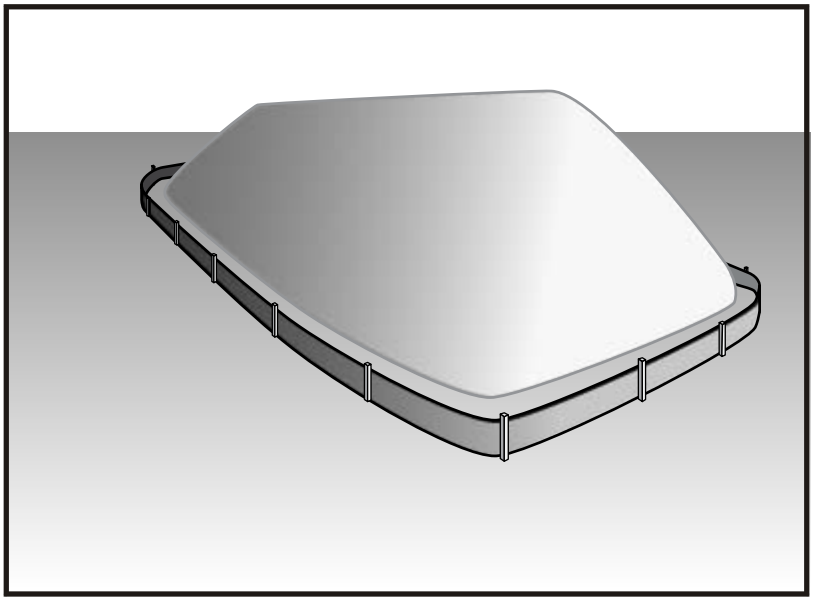
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Comments on Risk Assessments Risk Reduction Options for Cypermethrin: Docket No. OPP–2005–0293; California Stormwater Quality Association (CASQA) letter to USEPA, 2006.Environmental Hazard and General Labeling for Pyrethroid Non-Agricultural Outdoor Products, EPA-HQ-OPP-2008-0331-0021; USEPA, 2008.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Stockpile Management WM-3



Categories		
EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Stockpile management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, soil amendments, sand, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other loose materials.

Limitations

- Plastic sheeting as a stockpile protection is temporary and hard to manage in windy conditions. Where plastic is used, consider use of plastic tarps with nylon reinforcement which may be more durable than standard sheeting.
- Plastic sheeting can increase runoff volume due to lack of infiltration and potentially cause perimeter control failure.
- Plastic sheeting breaks down faster in sunlight.
- The use of Plastic materials and photodegradable plastics should be avoided.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

- On larger sites, a minimum of 50 ft separation from concentrated flows of stormwater, drainage courses, and inlets is recommended.
- All stockpiles are required to be protected immediately if they are not scheduled to be used within 14 days.
- Protect all stockpiles from stormwater runon using temporary perimeter sediment barriers such as compost berms (SE-13), temporary silt dikes (SE-12), fiber rolls (SE-5), silt fences (SE-1), sandbags (SE-8), gravel bags (SE-6), or biofilter bags (SE-14). Refer to the individual fact sheet for each of these controls for installation information.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.
- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.
- Place bagged materials on pallets and under cover.
- Ensure that stockpile coverings are installed securely to protect from wind and rain.
- Some plastic covers withstand weather and sunlight better than others. Select cover materials or methods based on anticipated duration of use.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials should be protected further as follows:

Soil stockpiles

- Soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- Temporary vegetation should be considered for topsoil piles that will be stockpiled for extended periods.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base

- Stockpiles should be covered and protected with a temporary perimeter sediment barrier at all times.

Stockpiles of "cold mix"

- Cold mix stockpiles should be placed on and covered with plastic sheeting or comparable material at all times and surrounded by a berm.

Stockpiles of fly ash, stucco, hydrated lime

- Stockpiles of materials that may raise the pH of runoff (i.e., basic materials) should be covered with plastic and surrounded by a berm.

Stockpiles/Storage of wood (Pressure treated with chromated copper arsenate or ammoniacal copper zinc arsenate

- Treated wood should be covered with plastic sheeting or comparable material at all times and surrounded by a berm.

Protection of Active Stockpiles

Active stockpiles of the identified materials should be protected as follows:

- All stockpiles should be covered and protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of "cold mix" and treated wood, and basic materials should be placed on and covered with plastic sheeting or comparable material and surrounded by a berm prior to the onset of precipitation.
- The downstream perimeter of an active stockpile should be protected with a linear sediment barrier or berm and runoff should be diverted around or away from the stockpile on the upstream perimeter.

Costs

For cost information associated with stockpile protection refer to the individual erosion or sediment control BMP fact sheet considered for implementation (For example, refer to SE-1 Silt Fence for installation of silt fence around the perimeter of a stockpile.)

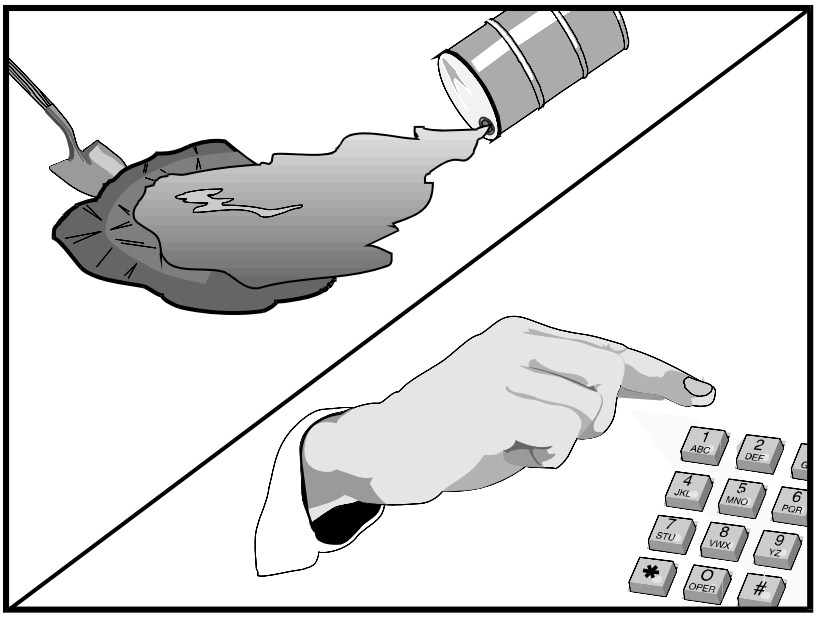
Inspection and Maintenance

- Stockpiles must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- It may be necessary to inspect stockpiles covered with plastic sheeting more frequently during certain conditions (for example, high winds or extreme heat).
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.
- Sediment shall be removed when it reaches one-third of the barrier height.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Spill Prevention and Control WM-4



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runon during rainfall to the extent that it doesn't compromise clean up activities.
- Do not bury or wash spills with water.

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
  - Contain the spread of the spill.
  - Recover spilled materials.
  - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

- Spills should be cleaned up immediately:
  - Contain spread of the spill.
  - Notify the project foreman immediately.
  - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
  - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
  - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
  - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
  - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
  - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
  - Notification should first be made by telephone and followed up with a written report.
  - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
  - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

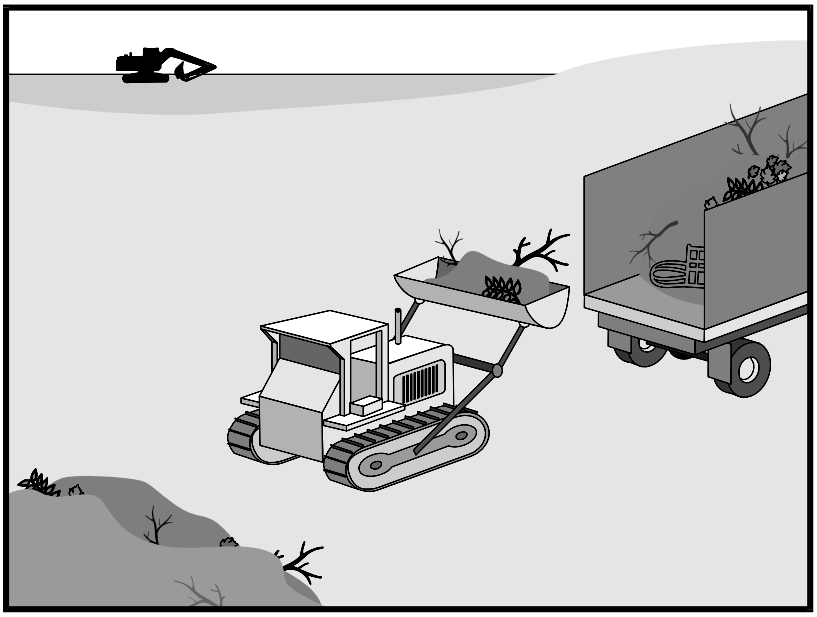
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Solid Waste Management WM-5



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
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WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials
- Highway planting wastes, including vegetative material,

plant containers, and packaging materials

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Implementation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight.
- Locate containers in a covered area or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- Clean up immediately if a container does spill.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, and Disposal

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Stormwater runon should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be located at least 50 ft from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- For disposal of hazardous waste, see WM-6, Hazardous Waste Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.

- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Inspect construction waste area regularly.
- Arrange for regular waste collection.

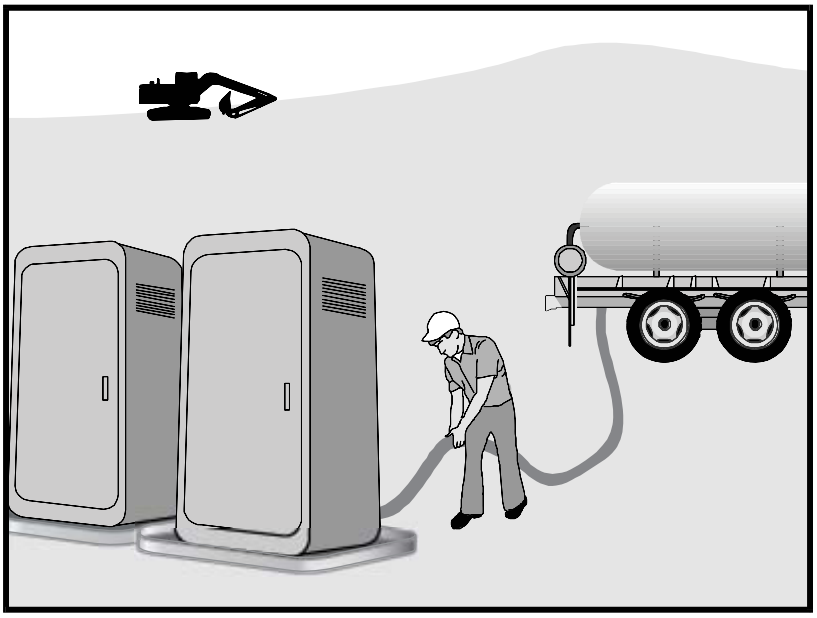
References

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Sanitary/Septic Waste Management WM-9



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	☑
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. If site conditions allow, place portable facilities a minimum of 50 feet from drainage conveyances and traffic areas. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.

- Temporary sanitary facilities must be equipped with containment to prevent discharge of pollutants to the stormwater drainage system of the receiving water.
- Consider safety as well as environmental implications before placing temporary sanitary facilities.
- Wastewater should not be discharged or buried within the project site.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.
- Only reputable, licensed sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- If using an onsite disposal system (OSDS), such as a septic system, local health agency requirements must be followed.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- Sanitary and septic facilities should be maintained in good working order by a licensed service.
- Regular waste collection by a licensed hauler should be arranged before facilities overflow.
- If a spill does occur from a temporary sanitary facility, follow federal, state and local regulations for containment and clean-up.

Education

- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.
- Hold regular meetings to discuss and reinforce the use of sanitary facilities (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for regular waste collection.
- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.
- If spills or leaks from sanitary or septic facilities occur that are not contained and discharge from the site, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

APPENDIX B

Visual Inspection Forms

BMP INSPECTION REPORT

Date and Time of Inspection:			Date Report Written:		
Inspection Type: (Circle one)	Weekly *Complete Parts I,II,III and VII*	Pre-Storm *Complete Parts I,II,III,IV and VII*	During Rain Event *Complete Parts I, II, III, V, and VII*	Post-Storm Complete *Parts I, II, III, VI, and VII*	Quarterly Complete *Parts I,II,III, and VII*

Part I. General Information

Site Information

Construction Site Name: Presidio BAPR, San Francisco, California			
Construction stage and completed activities:			Approximate area of site that is exposed:
Photos Taken: (Circle one)	Yes	No	Photo Reference IDs:

Weather

Estimate storm beginning: (date and time)	Estimate storm duration: (hours)
Estimate time since last storm: (days or hours)	Rain gauge reading and location: (in)

Is a "Qualifying Event" predicted or did one occur (i.e., 0.5" rain with 48-hrs or greater between events)? (Y/N)
If yes, summarize forecast:

Exemption Documentation (explanation required if inspection could not be conducted). Visual inspections are not required outside of business hours or during dangerous weather conditions such as flooding or electrical storms.

Inspector Information

Inspector Name:	Inspector Title:
Signature:	Date:

Part II. BMP Observations. **Describe any deficiencies in Part III.**			
Minimum BMPs for Risk Level 1 Sites	Adequately designed, implemented and effective (yes, no, N/A)	Action Required (yes/no)	Action Implemented (Date)
Good Housekeeping for Construction Materials			
Inventory of products (excluding materials designed to be outdoors)			
Stockpiled construction materials not actively in use (14 days of non-use) are covered and bermed			
All chemicals are stored in watertight containers with appropriate secondary containment, or in a completely enclosed storage shed			
Construction materials are minimally exposed to precipitation			
BMPs preventing the off-site tracking of materials are implemented and properly effective			
Good Housekeeping for Waste Management			
Wash/rinse water and materials are prevented from being disposed into the storm drain system			
Portable toilets are contained to prevent discharges of waste			
Sanitation facilities are clean and inspected regularly for leaks and spills			
Waste disposal containers are covered at the end of each business day and during rain events			
Discharges from waste disposal containers are prevented from discharging to the storm drain system / receiving water			
Stockpiled waste material is securely protected from wind and rain if not actively in use			
Procedures are in place for addressing hazardous and non-hazardous spills			
Appropriate spill response personnel are assigned and trained			
Equipment and materials for cleanup of spills is available on site			
Washout areas (e.g., concrete) are contained appropriately to prevent any discharge or infiltration into the underlying soil			
Good Housekeeping for Vehicle Storage and Maintenance			
Measures are in place to prevent oil, grease, or fuel from leaking into the ground, storm drains, or surface waters			
All equipment or vehicles are fueled, maintained, and stored in a designated area with appropriate BMPs			
Vehicle and equipment leaks are cleaned immediately and disposed of properly			

Part II. BMP Observations Continued. **Describe any deficiencies in Part III.**			
Minimum BMPs for Risk Level 1 Sites	Adequately designed, implemented and effective (yes, no, N/A)	Action Required (yes/no)	Action Implemented (Date)
Good Housekeeping for Landscape Materials			
Stockpiled landscape materials such as mulches and topsoil are contained and covered when not actively in use			
Erodible landscape material has not been applied 2 days before a forecasted rain event or during an event			
Erodible landscape materials are applied at quantities and rates in accordance with manufacturer recommendations			
Erodible landscape materials are stored on pallets and covered			
Good Housekeeping for Air Deposition of Site Materials			
Good housekeeping measures are implemented on site to control the air deposition of site materials and from site operations			
Non-Stormwater Management			
Non-storm water discharges are properly controlled			
Vehicles are washed in a manner to prevent non-storm water discharges to surface waters or drainage systems			
Streets are cleaned in a manner to prevent unauthorized non-storm water discharges to surface waters or drainage systems. Authorized discharges include fire hydrant flushing, irrigation, pipe flushing, and dust control.			
Erosion Controls			
Wind erosion controls are effectively implemented			
Effective soil cover is provided for disturbed areas inactive (i.e., not scheduled to be disturbed for 14 days) as well as finished slopes, open space, utility backfill, and completed lots			
The use of plastic materials is limited in cases when a more sustainable, environmentally friendly alternative exists.			
Sediment Controls			
Perimeter controls are established and effective at controlling erosion and sediment discharges from the site			
Entrances and exits are stabilized to control erosion and sediment discharges from the site			
Sediment basins are properly maintained			
Run-On and Run-Off Controls			
Run-on to the site is effectively managed and directed away from all disturbed areas.			

Other			
Are the project SWPPP and BMP plan up to date, available on-site and being properly implemented?			
Has the District Environmental Services been notified of any Reportable Quantity Discharges or discharges listed in Table 6?			

Part III. Descriptions of Any BMP Deficiencies

Deficiency	Repairs Implemented: Note - Repairs must begin within 72 hours of identification.	
	Start Date	Action
1.		
2.		
3.		
4.		

Part IV. Additional Pre-Storm Observations. Note the presence or absence of floating and suspended materials, sheen, discoloration, turbidity, odors, and source(s) of pollutants(s).

	Yes, No, N/A
Do storm water storage and containment areas have adequate freeboard? If no, complete Part III.	
Are drainage areas free of spills, leaks, or uncontrolled pollutant sources? If no, complete Part VII and describe below.	
Notes:	
Are storm water storage and containment areas free of leaks? If no, complete Parts III and/or VII and describe below.	
Notes:	

Part V. Additional During-Storm Observations. **If BMPs cannot be inspected during inclement weather, list the results of visual inspections at all relevant outfalls, discharge points, and downstream locations. Note odors or visible sheen on the surface of discharges. Complete Part VII (Corrective Actions) as needed.**	
Outfall, Discharge Point, or Other Downstream Location	
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description

Part VI. Additional Post-Storm Observations. **Visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event, and observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Complete Part VII (Corrective Actions) as needed.**	
Discharge Location, Storage or Containment Area	**Visual Observation**

Part VII. Additional Corrective Actions Required. **Identify any additional corrective actions not included with BMP Deficiencies (Part III) above. Note if SWPPP change is required.**	
Required Actions	**Implementation Date**

Prepared for

The Presidio Trust
103 Montgomery Street
San Francisco, California

DRAFT TRAFFIC CONTROL AND TRANSPORTATION PLAN Barnard Avenue Protected Range (BAPR)

PRESIDIO OF SAN FRANCISCO, CALIFORNIA

Prepared by

Geosyntec consultants

engineers | scientists | innovators

1111 Broadway, 6th Floor
Oakland, California 94607

Project Number: WR1512

January 2013

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Figure 1: Site Plan and Access/Haul Route

Figure 2: Site Staging and Access Control Plan

1. INTRODUCTION

Geosyntec Consultants (Geosyntec), on behalf of the Presidio Trust ("Trust"), has prepared this Traffic Control and Transportation Plan for the Barnard Avenue Protected Range (BAPR) Soil Removal Project, located in the Presidio of San Francisco, California (the "Project").

The Project includes the excavation and off-site disposal of soil containing metals, pesticides and petroleum hydrocarbons at concentrations exceeding cleanup levels for the protection of special status ecological receptors. Implementation of this project will require transportation of equipment and materials into the Presidio and transport of excavated soil out of the Presidio to an off-site permitted disposal facility. The purpose of the Traffic Control and Transportation Plan is to describe the general procedures and protocols to minimize potential health, safety, and environmental risks resulting from the transportation of materials to off-site disposal facilities during soil excavation activities at the BAPR Site. Excavation, transportation, and disposal activities will be conducted by the Trust with oversight from the California Department of Toxic Substances Control ("DTSC").

This Traffic Control and Transportation Plan is prepared in accordance with DTSC Guidance Document, *Transportation Plan - Preparation Guidance for Site Remediation* ("DTSC Guidance Document"; Cal-EPA, 2001).

The Contractor will be responsible for implementing the procedures documented in this Traffic Control and Transportation Plan. The Construction Manager and the Trust will be responsible for overseeing Contractor implementation of the Traffic Control and Transportation Plan.

2. BACKGROUND

The BAPR is a former small arms firing range located between Barnard Avenue and Quarry Road at the Presidio. As described in this RAW, assessments conducted to date indicate that shallow soil within the drainage swale is impacted with metals, pesticides and TPH-diesel range hydrocarbons that exceed remediation goals for ecological special-status species. The chemicals of concern (COCs) include:

- antimony, copper, lead, and zinc.
- chlordane, 4-4'-DDE and 4'-4-DDT.
- TPH-diesel.

None of these COCs occur at concentrations above levels required for the protection of human health.

To reduce concentrations of COCs in soil that pose an unacceptable risk to the BAPR ecosystem, shallow soil within the BAPR will excavated and disposed off-site. The proposed excavation covers an area of approximately 0.5 acre. The depth of the excavation is primarily surficial, ranging in depth from 0.5 to 1.5 feet throughout the drainage. The anticipated volume of soil is estimated at 1,305 cubic yards. Excavation activities at the site will require the use of vehicles to:

- Transport equipment and materials to a staging area at the south end of Barnard Avenue.
- Transport excavated soil out of the Presidio for disposal.
- Transport clean backfill soil from the "Dust Bowl" (located at Lincoln Boulevard and Presidio Avenue-Figure 1) to the Site.
- Transport equipment and materials out of the Presidio at the end of the Project.

In addition, implementation of the soil removal activities will require daily car traffic as the contractor's employees, Trust inspectors and other project personnel visit the site. To minimize traffic impacts during the Project, the transportation requirements presented in Section 3 will be implemented.

3. TRANSPORTATION PLAN

This section covers requirements for control of project-related traffic during the soil removal activities at the site. The Contractor's responsibility for traffic control shall cover all the Contractor's operations and shall be continuous (even outside of working hours) throughout the duration of the project.

3.1 Characteristics of Material to be Transported

Soil excavation for the BAPR will result in approximately 1,300 cubic yards of soil for off-site disposal. It is anticipated that excavated soil will be stockpiled and characterized prior to off-site disposal. Alternatively, soil may be characterized prior to excavation such that it may be loaded directly into trucks for off-site disposal. The Contractor will coordinate profiling and acceptance of the excavated soil with permitted land disposal facilities.

The soil will be characterized to confirm its appropriate disposal designation. Based on analytical testing results of shallow soil samples collected at the BAPR, the excavated soil is anticipated to be characterized as non-hazardous waste.

3.2 Destination of Material

Soil characterized as non-hazardous or hazardous waste will be disposed of at facilit(ies) approved by the Trust. Based on *in situ* data, the material will be disposed as non-hazardous Class II waste. For purposes of evaluating impacts, the assumed final destination is Hay Road landfill in Vacaville.

3.3 Transportation Mode

Excavated soil will be loaded into trucks (such as end dump trucks or large dump trucks), covered with tarpaulins, and transported to the appropriate off-site disposal facility via surface streets and highways. The Contractor will be required to submit proof of the transporter's valid hauler registration. All drivers shall be required to be able to provide proof of a valid driver's license.

Assuming 1,300 cubic yards of soil are anticipated to be excavated, and each truck carries approximately 13 cubic yards per load, an estimated 100 truckloads of soil will leave the BAPR Site. Depending on the hazard classification, destination, available trucks, loading rate, and traffic conditions, the project is anticipated to have

approximately 10 to 30 trucks per day leaving the BAPR Site over a period of 10 to 15 days.

Fill will be brought from nearby stockpile at the Trust's Dust Bowl, near Building 67, or other source identified by the Trust. Fill will be brought on-site in trucks such as end dump trucks or transfer trucks.

3.4 Transportation Routes

This section describes the routes that material generated during implementation of the shallow soil excavation at the BAPR Site will take during transportation from the BAPR Site to the off-site disposal locations.

The trucking around the BAPR Site will be conducted between the hours of 8:00 a.m. and 5:00 p.m. A list of emergency service organizations is included in the table below. The Park Police and Fire Departments will be notified of the project prior to the initiation of excavation activities.

Emergency Contact Agencies along Transportation Routes

Agency	Contact Phone Number
Presidio Park Emergency Dispatch	(415)-561-5656
California Highway Patrol	911
City of San Francisco Police	(415) 614-3400
California Department of Transportation	(510) 286-4444 District 4 (Bay Area)

Figures 1 and 2 illustrate the road and trail detours and closures designed to separate pedestrian, bicycle and visitor automobile traffic from heavy truck traffic related to the Project. Trucks will not drive through school or daycare zones in the Presidio. The closest schools or daycares to the truck route are Cow Hollow School and Bright Horizons. Cow Hollow School is approximately 325 feet away from the access and haul route and Bright Horizons is approximately 300 feet away from the truck route. These detours, closures and designated truck routes are summarized below:

- Pedestrians and bicycles: Barnard Avenue will be closed to through traffic at Fernandez Street. Pedestrians and cyclists approaching the Project area from the south will use a detour around the Contractor's staging area permitting free access to other trails.

- Automobiles and light trucks: Non-project traffic will be barred from Barnard Avenue beyond (southwest) a construction gate to be installed at Fernandez Street. Light vehicles on Project business are permitted to use all roads in the surrounding area. Project vehicles may not park in residential spaces that have been assigned to Presidio tenants.

- Heavy trucks: Heavy truck traffic must be strictly controlled within the Presidio. Trucks may only enter and exit the Presidio via the Lombard Gate or the Lincoln Boulevard entrance to the Golden Gate Bridge. Heavy trucks may not use the Presidio Gate, the Arguello Gate, the 15th Avenue Gate or the 25th Avenue Gate to enter or exit the Presidio. Trucks will enter and exit the work area by taking Presidio Boulevard to Barnard Avenue. The Contractor will post flaggers at the intersection of Barnard and Presidio Boulevard and other locations as needed on days when soil or other materials are being hauled into or out of the site. The Engineer and Trust staff will monitor the hauling operations and may direct the Contractor to supply more flaggers or rearrange traffic control devices as needed.

3.5 Traffic Control and Loading Procedures

This section describes the traffic control and loading procedures required for the Contractor during the soil removal activities at the BAPR.

3.5.1 Traffic Control On- and Off-Site

The Contractor will be required to provide a safe and convenient passage of public traffic in the vicinity of the BAPR Site during soil excavation activities. At a minimum, the Contractor must take the following steps before initiating the soil excavation:

- Determine the location and type of signage before work begins for the project;

- Determine methods and equipment the Contractor will use for closing lanes and for flagging and controlling one-way traffic, as necessary; and

- Ensure flaggers are trained in accordance with the Manual on Uniform Traffic Control Devices ("MUTCD") and MUTCD CA *Supplement* and the *Construction Safety Orders*.

Traffic control procedures that may be used during vehicle entrance to and exit from the BAPR Site include signs and a flag person.

Due to limited available area on-site, trucks will be staged off-site. The Contractor will call the trucks from the designated truck staging area as needed for loading.

3.5.2 Truck Staging and Loading

The contractor will be required to manage operations such that trucks to not stack up on Presidio roads outside of the work area. Trucks may be staged only in the following areas:

- The contractor's staging area at the south end of Barnard Avenue;
- On the closed portion of Barnard Avenue southwest of Fernandez Street;
- Within the source area of the backfill material; and
- Along the northwest side of Presidio Avenue between the Dust Bowl and Martinez Street.

Trucks may be loaded in the following areas only:

- Within the contractor's staging area at the south end of Barnard Avenue;
- On the closed portion of Barnard Avenue southwest of Fernandez Street; and
- Within the source area of the backfill material.

3.5.3 Parking

Contractor's personnel and other site visitors may park in the Contractor's staging area or in legal street-side spaces along Presidio Boulevard. No project vehicles may be parked in residential parking spaces at any time.

3.6 Record Keeping

Soil that is classified as non-hazardous waste will be accompanied by a bill of lading to track shipment.

All shipping documents will be carried in the truck cab within reach of the driver in accordance with DOT regulations. Other documents furnished to the driver with each load will include either a map or driving directions specifying the approved transportation routes.

The Contractor will maintain daily field logs. Daily field logs will be prepared by hand or on a laptop computer in the field at the time of performance, showing:

- Date;
- Truck Identification and Company;
- Driver;
- Time departed from the Site;
- Time scheduled in, or arrival upon return;
- Bill of lading;
- Waste type loaded; and
- Estimated waste quantity entered on bill of lading.

3.7 Health and Safety

As the excavated soil is not characterized as hazardous, no specific health and safety requirement beyond the contractor's site-specific health and safety plan ("HSP") is applicable.

Site personnel will be qualified and trained in accordance with the requirements of the Contractor's site-specific HSP. Personnel will receive a site-specific orientation on the physical and chemical hazards anticipated to be present in the wastes they may be potentially exposed to or work with in the course of assigned job duties.

3.8 Contingency Plan

This contingency plan is prepared for chemical spills and other accidents that may occur with transport vehicles on-site or in transport between the BAPR Site and off-site disposal facilities. It is also applicable for vehicles delivering construction material, outside services, and supplies. It addresses the steps to be followed for all accidents as well as several accident-specific steps. Notification procedures will identify key personnel who will be responsible for implementing the contingency plan.

Due to the different factors that can impact any off-site spill scenario, it is not appropriate to describe specific spill mitigation procedures in this document. The following is a list of steps that will be taken in the event of an off-site release:

- If possible, stop vehicle safely, move off roadway, and isolate vehicle and load (place traffic cones and keep observers from the area) to prevent additional accidents.
- Survey the situation, identify any injured parties, and determine immediate cause and potential implications (e.g., wind direction, potential receptors, etc.).
- Call for emergency assistance by dialing (415) 561-5656 within the Presidio and 911 outside the Presidio.
- Assist any injured personnel.
- If possible, contain spills of contaminated material.
- Contact Trust's construction manager.
- Complete incident report.
- Unless told to do so by proper authorities or in the event that there is an immediate danger that could affect life or result in uncontrolled release of cargo, trucks will not be abandoned and trailers will not be disconnected.

Steps Required For All Accidents

- Secure the area of vehicles and spill, if appropriate. If possible, stop vehicle safely off roadway to avoid additional accidents.
- Assist any injured personnel.
- Assess severity of accident and call (415) 561-5656 within the Presidio and 911 outside the Presidio for emergency assistance as appropriate.
- Pursuant to U.S. DOT Regulations 392.22 to 392.25, place traffic control device(s) at appropriate location. Flame-producing signals will not be used. Keep fire, flames, lighted cigarettes, cigars, and pipes away from the scene.
- Notify the Contractor and the transportation company's operations manager or designee. The transportation company's operations manager or designee will

communicate with the Contractor and coordinate response with appropriate agencies.

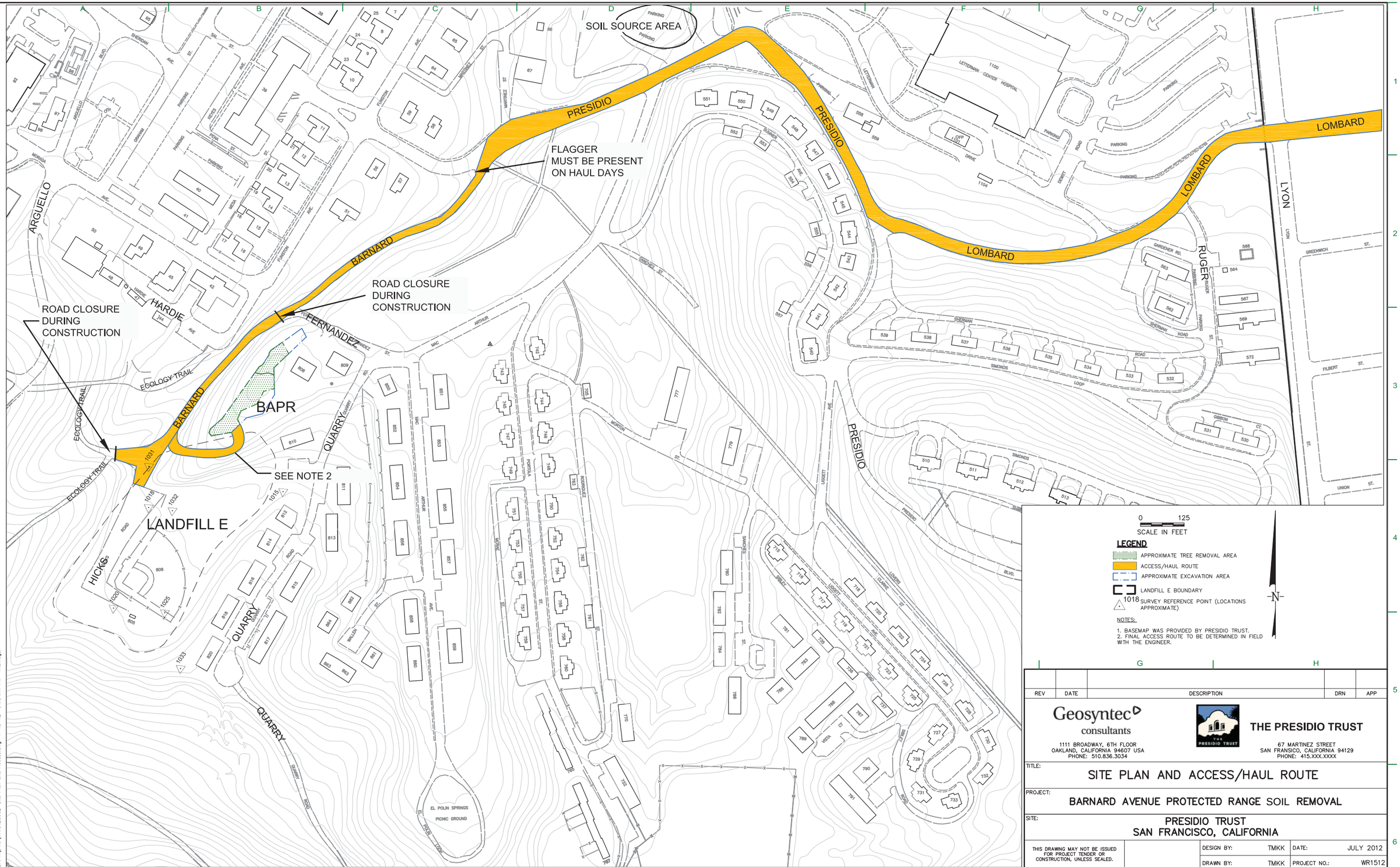
Steps for Spills of Diesel Fuel, Hydraulic Fluid, or Other Automotive Fluid(s)

- Contain the spill and prevent liquid from draining onto roadways, sewers, storm drain, or streams.
- If needed, add protection around drains and sewer inlets.
- Notify Contractor Site Superintendent and transportation company supervisors.
- The transportation company supervisor will provide guidance on the notification of:
    - Presidio Park Emergency Dispatch,
    - California Highway Patrol,
    - Local Police and Fire Departments,
    - Local Consolidated Unified Permitting Agency ("CUPA"), and
    - U.S. Coast Guard and other spill notification agencies, as appropriate.
- If on the work Site, Contractor will implement cleanup procedures; subcontractors and suppliers must follow their own procedures regarding conducting cleanup for spills on public roads and non-site private properties.
- Wear personal protective equipment as outlined in the Contractor's site-specific HSP.

4. REFERENCES

Cal-EPA, 2001. *Transportation Plan - Preparation Guidance for Site Remediation, Interim Final,* California Environmental Protection Agency, Department of Toxic Substance Control, December 2001, available at: *www.dtsc.ca.gov/HazardousWaste/Transporters/upload/SMB_Transportation-Plan.pdf.*

FIGURES



REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
1111 BROADWAY, 6TH FLOOR
OAKLAND, CALIFORNIA 94607 USA
PHONE: 510.836.3034

THE PRESIDIO TRUST
67 MARTINEZ STREET
SAN FRANSICO, CALIFORNIA 94129
PHONE: 415.XXX.XXXX

TITLE: SITE PLAN AND ACCESS/HAUL ROUTE

PROJECT: BARNARD AVENUE PROTECTED RANGE SOIL REMOVAL

SITE: PRESIDIO TRUST
SAN FRANCISCO, CALIFORNIA

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.

SIGNATURE

DATE

DESIGN BY:	TMKK	DATE:	JULY 2012
DRAWN BY:	TMKK	PROJECT NO.:	WR1512
CHECKED BY:	LVT	FILE:	WR1512 SITE PLAN
REVIEWED BY:	LVT	DRAWING NO.:	1
APPROVED BY:	LVT		

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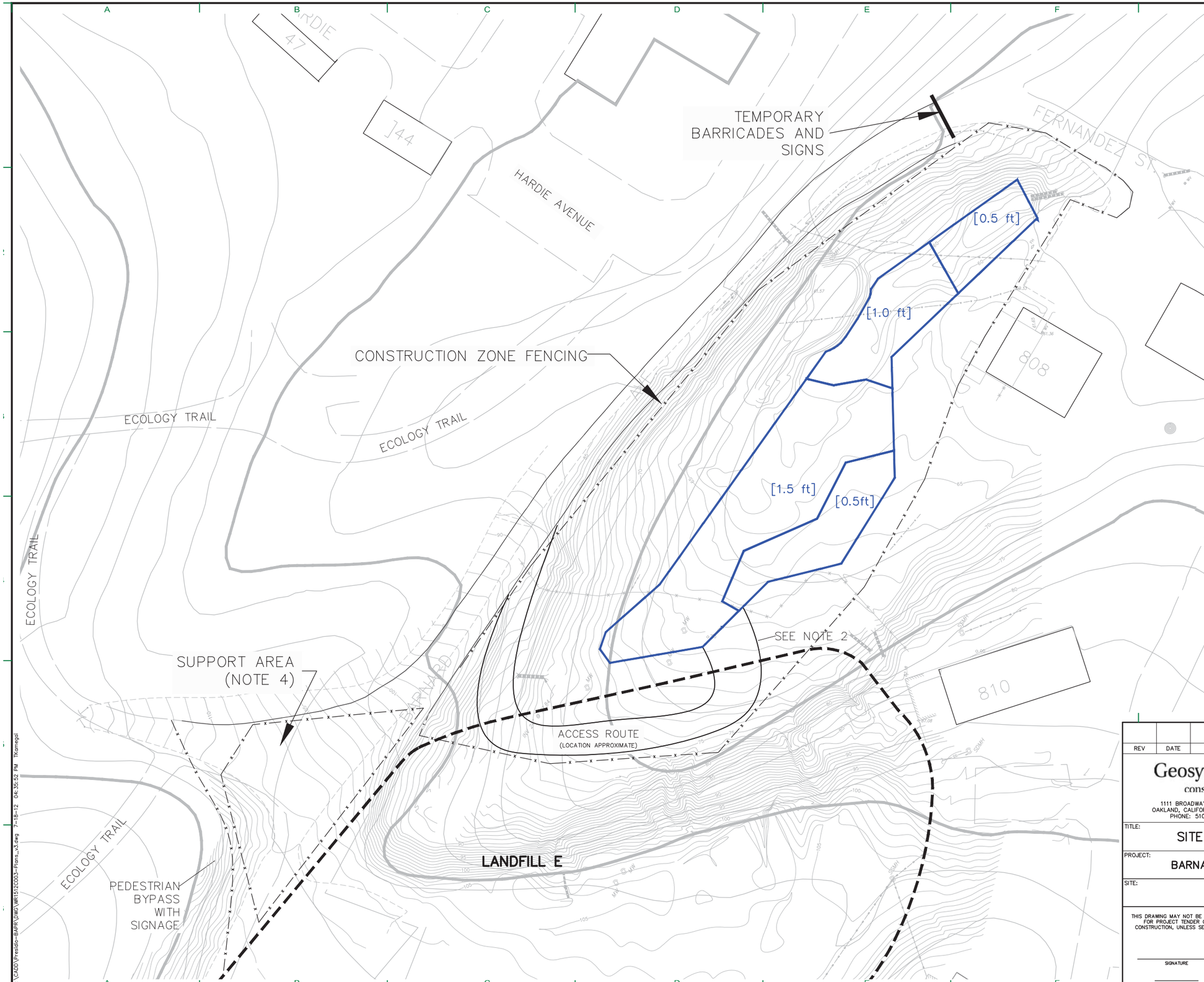

LEGEND

- APPROXIMATE EXCAVATION AREA
- TEMPORARY PERIMETER FENCE
- SITE CONTROL/WARNING SIGN
- LANDFILL E BOUNDARY
- [0.5 ft] APPROXIMATE EXCAVATION DEPTH

NOTES:

1. EXISTING TOPOGRAPHY BASED ON 29 FEBRUARY 2012 SURVEY BY CHAUDHARY & ASSOCIATES INC. OF NAPA, CALIFORNIA. BASIS OF BEARING: CALIFORNIA STATE PLANE 1927. VERTICAL DATUM: NAVD 88.
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TITLE: SITE STAGING AND ACCESS CONTROL PLAN

PROJECT: BARNARD AVENUE PROTECTED RANGE SOIL REMOVAL

SITE: PRESIDIO TRUST
SAN FRANCISCO, CALIFORNIA

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DATE

DESIGN BY:	TMKK	DATE:	JULY 2012
DRAWN BY:	TMKK	PROJECT NO.:	WR1512
CHECKED BY:	LVT	FILE:	WR1512C003-Plans_v3
REVIEWED BY:	LVT	DRAWING NO.:	2
APPROVED BY:	LVT		

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Prepared for

The Presidio Trust
103 Montgomery Street
San Francisco, California

DRAFT
DUST CONTROL PLAN
Barnard Avenue Protected Range (BAPR)

PRESIDIO OF SAN FRANCISCO, CALIFORNIA

Prepared by

Geosyntec consultants

engineers | scientists | innovators

1111 Broadway, 6th Floor
Oakland, California 94607

Project Number: WR1512

January 2013

TABLE OF CONTENTS

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1. INTRODUCTION

Geosyntec Consultants (Geosyntec), on behalf of the Presidio Trust ("Trust"), has prepared this Dust Control Plan for the Barnard Avenue Protected Range (BAPR) Soil Removal Project, located in the Presidio of San Francisco, California (the "Project"). The Project includes the excavation and off-site disposal of soil containing metals, pesticides and petroleum hydrocarbons at concentrations exceeding cleanup levels for the protection of special status ecological receptors. Excavation activities at the site may generate dust. The objective of this Dust Control Plan is to minimize the occurrence of visible dust at and downwind of the excavation area.

2. SITE DESCRIPTION

The BAPR is a former small arms firing range located between Barnard Avenue and Quarry Road at the Presidio. As described in this RAW, assessments conducted to date indicate that shallow soil within the drainage swale is impacted with metals, pesticides and TPH-diesel range hydrocarbons that exceed remediation goals for ecological special-status species. The chemicals of concern (COCs) include:

- antimony, copper, lead, and zinc.
- chlordane, 4-4'-DDE and 4'-4-DDT.
- TPH-diesel.

None of these COCs occur at concentrations above levels required for the protection of human health in soil. Therefore, it is expected that dust generated by soil removal activities will not contain COCs at concentrations exceeding human health protection levels.

To reduce concentrations of COCs in soil that pose an unacceptable risk to the BAPR ecosystem, shallow soil within the BAPR will excavated and disposed off-site. The proposed excavation covers an area of approximately 0.5 acre. The depth of the excavation is primarily surficial, ranging in depth from 0.5 to 1.5 feet throughout the drainage. The anticipated volume of soil is estimated to be approximately 1,300 cubic yards. The excavation area is currently heavily vegetated and in a drainage; shallow soils are anticipated to be moist and not likely to be dusty. Even so, excavation activities at the site may generate dust. The contractor is not permitted to generate visible dust. To mitigate potential fugitive emissions at the perimeter of the site during excavation activities, the dust control practices presented in Section 3 will be implemented, as needed.

3. DUST CONTROL

This section covers techniques for dust control during the implementation of the removal action at the site. Dust control activities will primarily be associated with excavation, grading operations, backfill and compaction, decontamination, and transport loading operations; however, the Contractor's responsibility for dust control shall cover all the Contractor's operations and shall be continuous (even outside of working hours) throughout the duration of the project.

The following basic construction mitigation measures will be required of the Prime Contractor as identified in the Bay Area Air Quality Monitoring District's Draft CEQA Air Quality Guidelines, Table 8-2:

- Exposed surfaces (e.g., parking areas, staging areas, stockpiles, graded areas, and unpaved access roads) shall be watered two times per day.
- Trucks hauling soil and other loose material shall be covered.
- All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once a day. The use of dry power sweeping is prohibited.
- The contractor shall keep vehicle speeds on unpaved roads below 15 miles per hour.
- All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible.
- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.
- All construction equipment shall be maintained and property tuned in accordance with manufacturer’s specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
- Post a publicly visible sign with the telephone number and person to contact at the DTSC regarding dust complaints. This person shall respond and take corrective action within 48 hours.

If either observations or complaints by air pollution control authorities or nearby residents indicate the need for more stringent dust control, the magnitude and frequency of the dust control measures may be increased.

It is not anticipated, but the excavation activities may involve exposing soil containing odorous compounds. Odor control measures such as application of vapor suppressant foams or other proprietary media that oxidize the odorous compounds will be utilized if significant odors are encountered during excavation.

4. DUST MONITORING

Dust monitoring is not anticipated because the dust control measures identified above are expected to prevent visible dust plumes. If the dust control measures outlined above cannot prevent visible dust plumes, dust monitoring at upwind and downwind locations of the construction zone will be conducted. An 8-hour time weighted average concentration of 110 micrograms per cubic meter ($\mu g/m^3$) for PM10 will be used as the action level. This action level was developed in June 2011 for the remediation of Landfill E which is adjacent to the BAPR and is believed to be the source of COCs to the BAPR drainage. If the action level is exceeded, dust-generating activities will be stopped until the PM10 concentration is below the action level.

Prepared for

The Presidio Trust
103 Montgomery Street
San Francisco, California

DRAFT
DECONTAMINATION PLAN
BARNARD AVENUE PROTECTED RANGE (BAPR)

PRESIDIO OF SAN FRANCISCO, CALIFORNIA

Prepared by

Geosyntec consultants

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Project Number WR1512

January 2013

TABLE OF CONTENTS

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LIST OF FIGURES

Figure 1: Site Staging and Access Control Plan

1. INTRODUCTION

This Decontamination Plan (Plan) describes the procedures to be used during implementation of the soil removal activities at the Barnard Avenue Protected Range (BAPR), a former small arms firing range located between Barnard Avenue and Quarry Road at the Presidio of San Francisco, California (Presidio).

2. SITE CHARACTERISTICS AND SCOPE OF WORK

2.1 Soil Characteristics

As described in this Removal Action Plan (RAW), shallow soil within the drainage area is impacted with metals, pesticides and TPH-diesel range hydrocarbons that exceed remediation goals for ecological special-status species. The COCs include:

- antimony, copper, lead, and zinc.
- chlordane, 4-4'-DDE and 4'-4-DDT.
- TPH-diesel.

Although these COCs occur at concentrations below levels required for the protection of human health, decontamination of equipment will be performed as a part of normal project housekeeping, and to avoid tracking or spreading contaminated soil to other potentially sensitive ecological receptors.

2.2 Excavation

The excavation covers an area of approximately 0.5 acre. The depth of the excavation is expected to range from 0.5 to approximately 1.5 feet below existing ground surface. In total, minimum 1,300 cubic yards of potentially impacted soil would be excavated from the area. Because there are a number of trees within the proposed excavation area that will remain in place, excavation of impacted soil will be completed using various removal methods. These methods could include using small backhoes, vac-truck, hand digging, or other appropriate means. Excavation equipment will be decontaminated at the edge of the excavation area (Figure 1).

2.3 Backfilling and Final Grading

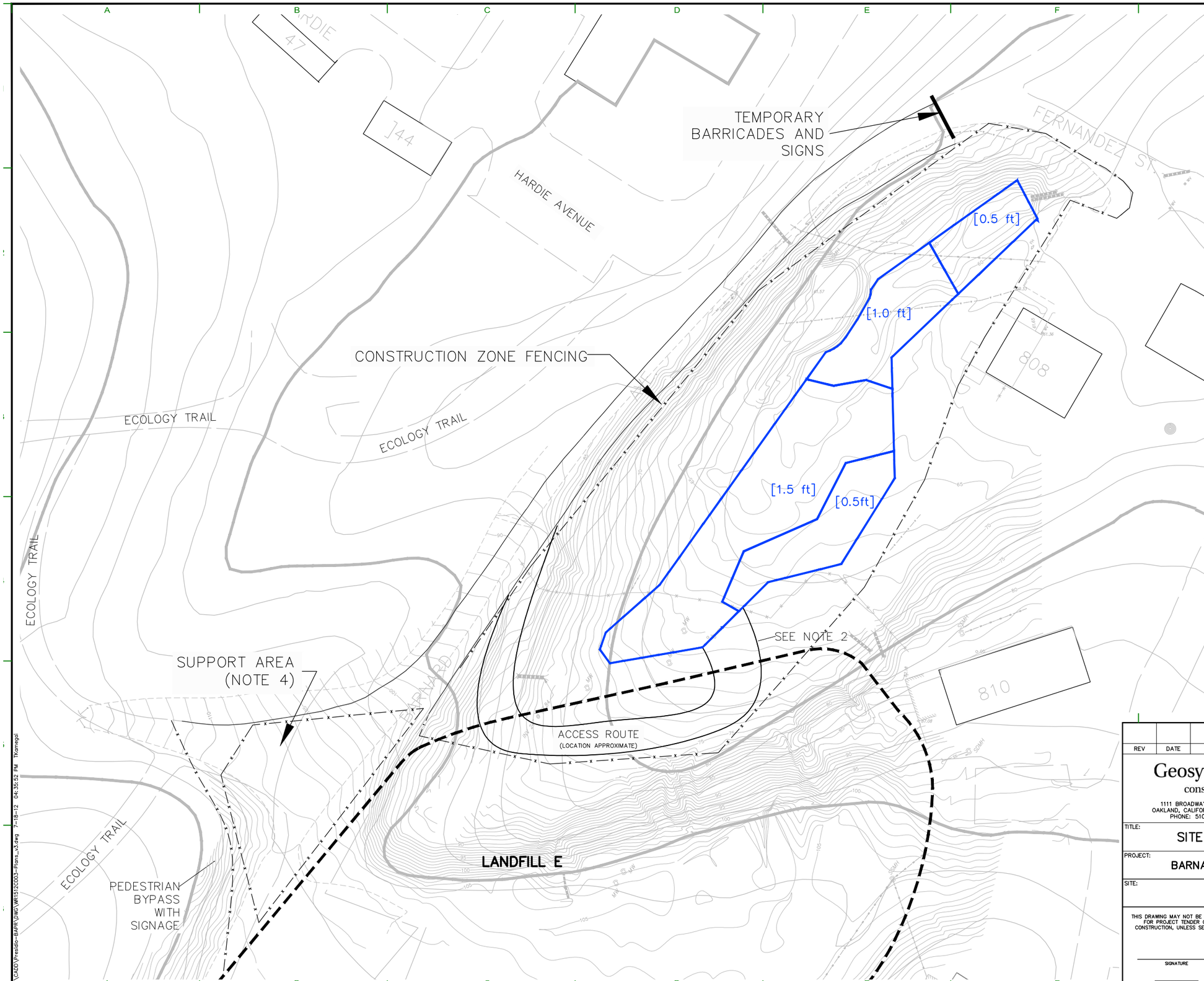
After the soil containing COCs above cleanup levels has been removed, the Contractor will load, transport, place and compact clean backfill soil to restore the excavation area to original grade. Equipment will be decontaminated at the edge of the excavation area to avoid cross-contamination of the clean backfill or tracking of excavation soil out into non-work areas.

3. DECONTAMINATION PROCEDURES

This section describes the procedures to be used during implementation of the soil removal activities to reduce the soil tracking offsite. Decontamination protocols are as follows:

- Rumble plates shall be placed at the end of the exclusion zone.
- Physical devices such as brushes, brooms, sponges, and rags to remove accumulated soil, dust, and other contamination from equipment, vehicles and personnel, while these items are physically located in the exclusion zone, shall be used. If necessary, rinse water may be used.
- The use of water for decontamination will be minimized to the extent reasonable.
- The use of solvents to decontaminate equipment or petroleum products to prevent soil from adhering to the excavation equipment will not be allowed.
- Every item mobilized to the Site that has been exposed to dust, soil, or debris generated during excavation activities will either be treated as contaminated material and disposed of in accordance with applicable laws or will be decontaminated prior to leaving the Site or prior to demobilization from the Site.

FIGURES



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PHONE: 415.XXX.XXXX

TITLE: SITE STAGING AND ACCESS CONTROL PLAN

PROJECT: BARNARD AVENUE PROTECTED RANGE SOIL REMOVAL

SITE: PRESIDIO TRUST
SAN FRANCISCO, CALIFORNIA

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DATE

DESIGN BY:	TMKK	DATE:	JULY 2012
DRAWN BY:	TMKK	PROJECT NO.:	WR1512
CHECKED BY:	LVT	FILE:	WR1512C003-Plans_v3
REVIEWED BY:	LVT	DRAWING NO.:	1
APPROVED BY:	LVT		

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APPENDIX E

Development of Zinc Background Levels for Colma Formation and Mixed Beach Dune and Colma Formation Soils

January 8, 2013

Project 4084113610.04.1

Genevieve Coyle
The Presidio Trust
67 Martinez Street
San Francisco, California 94129-0052

Subject: Development of Zinc Background Levels for Colma Formation and Mixed Beach Dune and Colma Formation Soils
Presidio of San Francisco, California

Dear Ms. Coyle:

This memorandum presents the development of a background level for zinc in two soil types at the Presidio of San Francisco (Presidio). The two soil types are Colma formation and soils representing a mixture of Colma formation and Beach Dune sand. The Colma formation consists of unconsolidated fine to medium-grained sand with moderate amounts of silt and clay. Dune sand consists of fine to medium-grained sand. At the Presidio, Colma formation underlies Beach Dune sand and differentiating between the two soil types can be difficult where the Colma formation has a higher percentage of sand. Additionally, grading activities at the Presidio have resulted in co-mingling of the two soil types.

Development of a background level for zinc followed the approach outlined in *Technical Memorandum, Approach to Development of Background Levels, for Selected Metals and Polynuclear Aromatic Hydrocarbons in Soil, Presidio of San Francisco, California*, dated May 11, 2011 (AMEC Environment & Infrastructure, Inc., 2011) and consisted of:

- Step 1: Develop a data set for results for soil samples collected from Presidio sites.
- Step 2: Conduct an outlier analysis of the data to facilitate distribution analyses.
- Step 3: Conduct distribution testing of the data sets using probability plots.
- Step 4: Identify breakpoints in probability plots that may represent distinct populations.
- Step 5: If more than one breakpoint is identified, further assess the characteristics of the identified sample populations.
- Step 6: Identify sample populations that represent background conditions.
- Step 7: Estimate upper prediction limits (UPLs) for identified background sample populations that may represent background levels following methods identified in U.S. Environmental Protection Agency (USEPA) guidance documents.

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Petaluma, California 94954
USA
Tel (707) 793-3800
Fax (707) 793-3900
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SUMMARY OF EVALUATION

Step 1: Data sets for zinc in Colma formation soil and mixed Colma formation and Beach Dune soils were developed by:

1) Identifying sites where surface deposits of Colma formation and Beach Dune sand had been mapped (Figure 6-1 of the *Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water, Presidio of San Francisco;* [Cleanup Level Document]; Erler & Kalinowski, Inc., 2002; Revised 2006). A copy of this figure is provided as Attachment 1.
2) Reviewing data extract files from the Presidio database to identify zinc soil data for these identified sites.

Zinc analytical data were available for the following four Colma sites and nine Beach Dune Sites:

Colma Sites with Zinc Data:

- Landfill E: site designation = DAE
- Fill Site 1: site designation = LF1
- Sewer Lift Station No 1: site designation = CLF
- Barnard Avenue Protected Range: site designation = BAP

Beach Dune Sites with Zinc Data:

- Building 1351: site designation = 1351
- Building 662: site designation = 662
- Baker Beach Disturbed Area (BBDA) 3: site designation = BB3
- BBDA 4: site designation = BB4
- Landfill 4: site designation = LF4
- Landfill 8: site designation = LF8
- Landfill 9: site designation = LF9
- Landfill 10: site designation = LF10
- Nike Swale: site designation = NS

Background Data Sets

Colma Formation Soils: The zinc data from the four identified Colma sites were combined with data from the Colma background data set from Table C-2 of the Cleanup Level Document.

Table 1 provides the compiled zinc data and Attachment 2 provides descriptive statistics for the data set. The Colma formation data set fails tests for normal and lognormal distribution and passes the test for gamma distribution.

Colma and Beach Dune Soils: The data set for Colma formation was combined with the data for Beach Dune sites and background data for Beach Dune sand from Table C-4 of the Cleanup Level Document. Table 2 provides the compiled zinc data and Attachment 3 provides descriptive statistics for the data set. The combined Colma and Beach Dune data set fails tests for normal, lognormal, and gamma distribution.

Step 2: An outlier analysis of the data was conducted using box and whisker plots (Attachments 2 and 3). From the box and whisker plots of log-transformed data for the Colma soil data set, it appears that log10(Zn) concentrations greater than approximately 2.4 (or 251 milligrams per kilogram [mg/kg]) may be representative of zinc derived from non-Colma soil or site contamination. For the combined Colma formation and Beach Dune data set, log10(Zn) concentrations greater than approximately 2.5 (or 316 mg/kg) appear to be non-representative.

Step 3: The zinc data were plotted on probability plots (QQ or quantile-quantile plots). Probability plots for the Colma formation data set and combined Colma formation and Beach Dune data set are presented in Attachments 2 and 3. Further analysis concentrated on the log10 QQ plot.

Step 4: The probability plots were reviewed to identify breakpoint(s) in the probability plots that may represent separations into distinct populations representative of Colma formation and mixed Colma formation and Beach Dune soil, assuming that the data representing the background population will be a single population that would plot as a straight line on a probability plot. Review of the log normal probability plots for both data sets shows two distinct breakpoints and one less distinct breakpoint as identified below:

Colma Formation Data Set

Distinct Breakpoints

- Log10(Zn) at approximately 1.9 (corresponding to a zinc concentration of 79 mg/kg).
- Log10(Zn) at approximately 2.4 (corresponding to a zinc concentration of 250 mg/kg). This corresponds to the value above which the data are considered non-representative.

Less Distinct Breakpoint

- Log10(Zn) at approximately 2.2 (corresponding to a zinc concentration of 158 mg/kg).

Mixed Colma Formation and Beach Dune Data Set

Distinct Breakpoints

- Log10(Zn) at approximately 2.0 (corresponding to a zinc concentration of 100 mg/kg).
- Log10(Zn) at approximately 2.5 (corresponding to a zinc concentration of 316 mg/kg). This corresponds to the value above which the data are considered non-representative.

Less Distinct Breakpoint

- Log10(Zn) at approximately 2.3 (corresponding to a zinc concentration of 200 mg/kg).

Step 5: As discussed previously, for the Colma formation soil, zinc concentrations above 251 mg/kg likely represent concentrations representative of non-Colma soil or site contaminants. Concentrations between 80 and 250 mg/kg may represent a different soil type or more clayey Colma formation as clay is more likely than silty sand to adsorb cations such as zinc. To confirm that the elevated zinc concentrations are not related to samples collected from Colma clay, logs for the borings and test pits for the soil samples for which zinc concentrations fell between 80 and 250 mg/kg were reviewed. Samples were those collected from Fill Site 1, Barnard Avenue Protected Range, and Landfill E. Table 3 presents a description of the lithology of these samples.[1] Review of the data indicates the following:

Fill Site 1 (sample designation LF1)

- Most of the samples from Fill Site 1 with zinc results between 80 and 250 mg/kg were fill samples.
- Of the samples with zinc concentrations between 80 and 250 mg/kg, there were three samples that were classified as native soil (one identified as Colma formation and two as Dune Sand).
- The zinc result of 100 mg/kg for the native Colma formation sample LF1EX132[3.0] was added to the Colma formation data set.

Barnard Avenue Protected Range (sample designation BAP)

- Based on the logs, the samples from the Barnard Avenue Protected Range with results between 80 and 250 mg/kg appear to be silty sand comprising Colma formation soil, but only one sample (BAPSB201[3]) was collected outside of the area with known contaminant impacts.

[1] Quantitative information concerning clay content was not available.

- There are no logs for samples BAPSB213 through BAPSB218.
- The zinc result of 180 mg/kg for BAPSB201[3] was added to the Colma formation data set.

Landfill E (sample designation DAE)

- Of the three samples from Landfill E with zinc results between 80 and 250 mg/kg, two were fill and one sample was Colma formation soil.
- The zinc result of 91 mg/kg for the Colma sample DAETP102-15 was added to the Colma formation data set.

Step 6: Based on analysis of the probability plots and review of logs for select soil samples, the background data sets were established as follows:

Colma Formation Data Set: Zinc results from Colma sites and the Presidio Colma background data set that were equal to or less than 79 mg/kg, plus zinc results for the following samples:

- DAETP102-15 - 91 mg/kg
- LF1EX132[3.0] - 100 mg
- BAPSB201[3] – 180 mg/kg

Mixed Colma Formation and Beach Dune Data Set: Zinc results from Colma and Beach Dune sites and the Presidio Colma and Beach Dune background data sets that were equal to or less than 100 mg/kg.[2]

Step 7: Background threshold limits (TLs) for Colma formation and mixed Colma formation and Beach Dune sand were estimated by calculating a 95% UPL using ProUCL version 4.1.01. ProUCL outputs are presented in Attachment 4. As indicated in the ProUCL calculation, not all sample results listed on Table 1 were used to calculate the UPL. Of the 285 samples in the original Colma data set, 244 were used in the UPL calculation because only results that were equal to or less than 79 mg/kg, plus zinc results for DAETP102-15, LF1EX132[3.0], and BAPSB201[3], were used in the calculation. Similarly for the mixed Colma Formation and Beach Dune UPL, only results below 100 mg/kg, plus results for BAPSB201[3], were used in the calculation (a subset of 597 results relative to the full dataset of 656 results).

Based on a gamma distribution for the Colma formation, the appropriate 95% UPL is 78 mg/kg. Based on a nonparametric distribution for the mixed Colma and Beach Dune sand data set, the

[2] Note that for the mixed Colma and Beach Dune data set, Step 5, further assessing characteristics of the population between the two breakpoints (i.e., concentrations between 100 and 316 mg/kg) was not conducted. Step 5 would have potentially added samples with zinc concentrations above 100 mg/kg to the data set. Thus, this analysis is a conservative representation of the mixed Colma and Beach Dune sand data set.

appropriate 95% UPL is 79 mg/kg. Based on this analysis, there is no practical difference between background 95% UPLs for Colma formation and mixed Colma formation and Beach Dune sand.

SUMMARY

Based on background populations created by identifying sites where Colma formation and Beach Dune Sand are present at the ground surface, plotting the data on probability plots, and identifying a representative population from analysis of breakpoints, the background TL for zinc in Colma and mixed Colma and Beach Dune soils is estimated to be 79 mg/kg.

We trust that this memorandum provides sufficient detail to describe the approach and results of the development of background levels for zinc in Colma formation and mixed Colma formation and Beach Dune soils. If you have further questions, please contact Mary Jo Heassler at (530) 271-2279.

Sincerely yours,
AMEC Environment & Infrastructure, Inc.

Mary Jo Heassler, P.G.
Associate Geologist

PROFESSIONAL GEOLOGIST
MARY JOSEPHINE HEASSLER
NO. 8072
EXP. 06/2013
STATE OF CALIFORNIA

Tim Glover
Senior Geochemist

Michael Murphy
Principal Risk Assessor

MJH/TG/MM:sac
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cc: Angela Liang Cutting, Roux Associates

REFERENCES CITED

AMEC Environment & Infrastructure, Inc. 2011. *Technical Memorandum, Approach to Development of Background Levels, for Selected Metals and Polynuclear Aromatic Hydrocarbons in Soil, Presidio of San Francisco, California*. May.

Erler & Kalinowski, Inc., 2002. *Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water, Presidio of San Francisco*. October. Revised May 16, 2006.

ATTACHMENTS:

Table 1	Zinc Soil Data for Select Presidio Sites, Surface Deposits Mapped as Colma and Colma Background
Table 2	Zinc Soil Data for Select Presidio Sites, Surface Deposits Mapped as Colma, Beach Dune, and Background
Table 3	Soil Descriptions for Samples from Colma Sites, Zinc Concentrations between 80 and 250 mg/kg
Attachment 1	Figure 6-1 from the Cleanup Level Document – Surface Deposits at the Presidio
Attachment 2	Colma Formation Data Set - Descriptive Statistics, Box and Whisker Plots, and Probability Plots
Attachment 3	Mixed Colma Formation and Beach Dune Data Set - Descriptive Statistics, Box and Whisker Plots, and Probability Plots
Attachment 4	Pro UCL Output

TABLES

Table 1. Zinc Soil Data for Select Presidio Sites Surface Deposits Mapped as Colma and Colma Background

Sample Location	Sample ID	Date	Depth (ft)	Zinc (mg/kg)	Notes
CFLSB100	CFLSB100(0.5)	12/3/2004	0.5	170	Colma site
CFLSB100	CFLSB100(4.0)	12/3/2004	4	21	Colma site
CFLSS100	CFLSS100(0.5)	12/3/2004	0.5	100	Colma site
CFLSS101	CFLSS101(0.5)	12/3/2004	0.5	50	Colma site
CFLSS102	CFLSS102(0.5)	12/3/2004	0.5	63	Colma site
DAEGW101	DAEGW101-38-39	11/12/2002	NA	27	Colma site
DAEGW102	DAEGW102-13-13.5	11/12/2002	NA	26	Colma site
DAEPZ101	DAEPZ101-10-11	11/15/2002	NA	390	Colma site
DAEPZ101	DAEPZ101-20-21	11/15/2002	NA	26	Colma site
DAEPZ101	DAEPZ101-25.5-26.5	11/15/2002	NA	30	Colma site
DAEPZ102	DAEPZ102-14.5-15.5	11/13/2002	NA	160	Colma site
DAEPZ102	DAEPZ102-23.5-24.5	11/13/2002	NA	23	Colma site
DAEPZ102	DAEPZ102-31-32	11/13/2002	NA	32	Colma site
DAESB209	DAESB209[2]	8/27/2010	2	25	Colma site
DAESB210	DAESB210[2]	8/27/2010	2	48	Colma site
DAESB212	DAESB212[2]	8/27/2010	2	57	Colma site
DAESB213	DAESB213[2]	8/27/2010	2	42	Colma site
DAESB214	DAESB214[2]	8/27/2010	2	36	Colma site
DAESB215	DAESB215[2]	8/27/2010	2	43	Colma site
DAESB216	DAESB216[2]	8/27/2010	2	28	Colma site
DAESB217	DAESB217[2]	8/27/2010	2	37	Colma site
DAESB218	DAESB218[2]	8/27/2010	2	47	Colma site
DAESB219	DAESB219[2]	8/27/2010	2	34	Colma site
DAESB220	DAESB220[2]	8/27/2010	2	36	Colma site
DAESB221	DAESB221[2]	8/27/2010	2	55	Colma site
DAESB222	DAESB222[2]	8/27/2010	2	76	Colma site
DAESB223	DAESB223[2]	8/27/2010	2	36	Colma site
DAETP101	DAETP101-12	11/22/2002	NA	52	Colma site
DAETP101	DAETP101-4-6	11/22/2002	NA	280	Colma site
DAETP102	DAETP102-15	11/22/2002	NA	91	Colma site
DAETP102	DAETP102-8	11/22/2002	NA	260	Colma site
DAETP103	DAETP103-15	11/21/2002	NA	27	Colma site
DAETP103	DAETP103-5	11/21/2002	NA	820	Colma site
DAETP104	DAETP104-1-4	11/21/2002	NA	230	Colma site
DAETP104	DAETP104-8	11/21/2002	NA	30	Colma site
DAETP105	DAETP105-15	11/21/2002	NA	1100	Colma site
DAETP105	DAETP105-3-5	11/21/2002	NA	80	Colma site
DAETP106	DAETP106-15	11/21/2002	NA	280	Colma site
DAETP106	DAETP106-5	11/21/2002	NA	36	Colma site
DAETP107	DAETP107-15	11/22/2002	NA	76	Colma site
DAETP107	DAETP107-5-7	11/22/2002	NA	2200	Colma site
LF1EX101	LF1EX101[0.0]	8/12/2010	NA	45	Colma site
LF1EX102	LF1EX102[0.0]	8/12/2010	NA	22	Colma site
LF1EX103	LF1EX103[0.0]	8/12/2010	NA	27	Colma site
LF1EX104	LF1EX104[0.0]	8/12/2010	NA	76	Colma site
LF1EX105	LF1EX105[0.0]	8/12/2010	NA	78	Colma site
LF1EX106	LF1EX106[0.0]	8/12/2010	NA	40	Colma site
LF1EX107	LF1EX107[0.0]	8/12/2010	NA	38	Colma site
LF1EX108	LF1EX108[0.0]	8/12/2010	NA	29	Colma site
LF1EX109	LF1EX109[0.0]	8/12/2010	NA	33	Colma site
LF1EX110	LF1EX110[0.0]	8/12/2010	NA	48	Colma site
LF1EX111	LF1EX111[0.0]	8/12/2010	NA	30	Colma site
LF1EX112	LF1EX112[0.0]	8/12/2010	NA	55	Colma site
LF1EX113	LF1EX113[0.0]	8/12/2010	NA	52	Colma site
LF1EX114	LF1EX114[0.0]	8/12/2010	NA	40	Colma site
LF1EX115	LF1EX115[0.0]	8/12/2010	NA	41	Colma site
LF1EX116	LF1EX116[0.0]	8/12/2010	NA	64	Colma site
LF1EX117	LF1EX117[0.0]	8/12/2010	NA	57	Colma site
LF1EX118	LF1EX118[0.0]	8/12/2010	NA	65	Colma site
LF1EX119	LF1EX119[0.0]	8/12/2010	NA	73	Colma site
LF1EX120	LF1EX120[0.0]	8/12/2010	NA	47	Colma site
LF1EX121	LF1EX121[0.0]	8/12/2010	NA	54	Colma site
LF1EX122	LF1EX122[0.0]	8/12/2010	NA	26	Colma site

Table 1. Zinc Soil Data for Select Presidio Sites Surface Deposits Mapped as Colma and Colma Background

Sample Location	Sample ID	Date	Depth (ft)	Zinc (mg/kg)	Notes
LF1EX122	LF1EX122[3.0]	8/16/2010	NA	52	Colma site
LF1EX123	LF1EX123[0.0]	8/13/2010	NA	19	Colma site
LF1EX123	LF1EX123[3.0]	8/16/2010	NA	25	Colma site
LF1EX124	LF1EX124[0.0]	8/13/2010	NA	48	Colma site
LF1EX124	LF1EX124[3.0]	8/16/2010	NA	42	Colma site
LF1EX125	LF1EX125[0.0]	8/13/2010	NA	53	Colma site
LF1EX125	LF1EX125[3.0]	8/16/2010	NA	65	Colma site
LF1EX126	LF1EX126[0.0]	8/13/2010	NA	48	Colma site
LF1EX126	LF1EX126[3.0]	8/16/2010	NA	47	Colma site
LF1EX127	LF1EX127[0.0]	8/13/2010	NA	37	Colma site
LF1EX127	LF1EX127[3.0]	8/16/2010	NA	51	Colma site
LF1EX128	LF1EX128[0.0]	8/13/2010	NA	27	Colma site
LF1EX128	LF1EX128[3.0]	8/16/2010	NA	53	Colma site
LF1EX129	LF1EX129[0.0]	8/13/2010	NA	58	Colma site
LF1EX129	LF1EX129[3.0]	8/16/2010	NA	33	Colma site
LF1EX130	LF1EX130[0.0]	8/13/2010	NA	51	Colma site
LF1EX130	LF1EX130[3.0]	8/16/2010	NA	33	Colma site
LF1EX131	LF1EX131[0.0]	8/13/2010	NA	91	Colma site
LF1EX131	LF1EX131[3.0]	8/16/2010	NA	52	Colma site
LF1EX132	LF1EX132[0.0]	8/13/2010	NA	78	Colma site
LF1EX132	LF1EX132[3.0]	8/16/2010	NA	100	Colma site
LF1EX133	LF1EX133[0.0]	8/13/2010	NA	64	Colma site
LF1EX133	LF1EX133[3.0]	8/16/2010	NA	67	Colma site
LF1EX134	LF1EX134[0.0]	8/13/2010	NA	73	Colma site
LF1EX134	LF1EX134[3.0]	8/16/2010	NA	75	Colma site
LF1EX135	LF1EX135[0.0]	8/13/2010	NA	58	Colma site
LF1EX135	LF1EX135[3.0]	8/16/2010	NA	45	Colma site
LF1EX136	LF1EX136[0.0]	8/13/2010	NA	67	Colma site
LF1EX136	LF1EX136[3.0]	8/16/2010	NA	51	Colma site
LF1EX137	LF1EX137[0.0]	8/13/2010	NA	120	Colma site
LF1EX137	LF1EX137[3.0]	8/16/2010	NA	160	Colma site
LF1EX138	LF1EX138[0.0]	8/16/2010	NA	46	Colma site
LF1EX138	LF1EX138[3.0]	8/16/2010	NA	40	Colma site
LF1EX139	LF1EX139[0.0]	8/16/2010	NA	51	Colma site
LF1EX139	LF1EX139[3.0]	8/16/2010	NA	43	Colma site
LF1EX140	LF1EX140[0.0]	8/17/2010	NA	110	Colma site
LF1EX141	LF1EX141[0.0]	8/17/2010	NA	68	Colma site
LF1EX142	LF1EX142[0.0]	8/17/2010	NA	250	Colma site
LF1EX142	LF1EX142[3.0]	8/17/2010	NA	57	Colma site
LF1EX142	LF1EX142[3.0_0.0]	8/17/2010	3	57	Colma site
LF1EX143	LF1EX143[0.0]	8/17/2010	NA	37	Colma site
LF1EX143	LF1EX143[3.0]	8/17/2010	NA	28	Colma site
LF1EX144	LF1EX144[0.0]	8/17/2010	NA	21	Colma site
LF1EX144	LF1EX144[3.0]	8/17/2010	NA	31	Colma site
LF1EX145	LF1EX145[0.0]	8/17/2010	NA	32	Colma site
LF1EX145	LF1EX145[3.0]	8/17/2010	NA	31	Colma site
LF1EX146	LF1EX146[0.0]	8/17/2010	NA	66	Colma site
LF1EX146	LF1EX146[3.0]	8/17/2010	NA	55	Colma site
LF1EX146	LF1EX146[3.0_0.0]	8/17/2010	3	55	Colma site
LF1EX147	LF1EX147[0.0]	8/18/2010	NA	69	Colma site
LF1EX147	LF1EX147[3.0]	8/18/2010	NA	62	Colma site
LF1EX147	LF1EX147[3.0_0.0]	8/18/2010	3	62	Colma site
LF1EX148	LF1EX148[0.0]	8/18/2010	NA	56	Colma site
LF1EX148	LF1EX148[3.0]	8/18/2010	NA	84	Colma site
LF1EX149	LF1EX149[0.0]	8/18/2010	NA	77	Colma site
LF1EX149	LF1EX149[3.0]	8/18/2010	NA	68	Colma site
LF1EX149	LF1EX149[3.0_0.0]	8/18/2010	3	68	Colma site
LF1EX150	LF1EX150[0.0]	8/18/2010	NA	74	Colma site
LF1EX150	LF1EX150[3.0]	8/18/2010	NA	74	Colma site
LF1EX150	LF1EX150[3.0_0.0]	8/18/2010	3	74	Colma site
LF1EX151	LF1EX151[0.0]	8/18/2010	NA	28	Colma site
LF1EX152	LF1EX152[0.0]	9/22/2010	NA	62	Colma site
LF1EX155	LF1EX155[3.0]	9/22/2010	NA	56	Colma site

Table 1. Zinc Soil Data for Select Presidio Sites Surface Deposits Mapped as Colma and Colma Background

Sample Location	Sample ID	Date	Depth (ft)	Zinc (mg/kg)	Notes
LF1EX156	LF1EX156[3.0]	9/22/2010	NA	70	Colma site
LF1EX157	LF1EX157[0.0]	9/22/2010	NA	42	Colma site
LF1EX158	LF1EX158[0.0]	9/22/2010	NA	16	Colma site
LF1EX159	LF1EX159[0.0]	9/22/2010	NA	23	Colma site
LF1EX160	LF1EX160[0.0]	9/22/2010	NA	32	Colma site
LF1EX161	LF1EX161[0.0]	9/22/2010	NA	20	Colma site
LF1EX162	LF1EX162[0.0]	9/22/2010	NA	33	Colma site
LF1EX163	LF1EX163[0.0]	9/22/2010	NA	53	Colma site
LF1P200	LF1TP200[1.0]	3/11/2009	NA	65	Colma site
LF1P200	LF1TP200[5.0]	3/11/2009	NA	110	Colma site
LF1P200	LF1TP200[9.0]	3/11/2009	NA	30	Colma site
LF1P201	LF1TP201[1.0]	3/11/2009	NA	30	Colma site
LF1P201	LF1TP201[8.0]	3/11/2009	NA	63	Colma site
LF1P202	LF1TP202[0.0]	3/11/2009	NA	150	Colma site
LF1P202	LF1TP202[4.0]	3/11/2009	NA	73	Colma site
LF1P204	LF1TP204[0.5]	3/12/2009	NA	77	Colma site
LF1P204	LF1TP204[11.5]	3/12/2009	NA	31	Colma site
LF1P204	LF1TP204[5.0]	3/12/2009	NA	77	Colma site
LF1P205	LF1TP205[1.5]	3/12/2009	NA	50	Colma site
LF1P205	LF1TP205[10.5]	3/12/2009	NA	52	Colma site
LF1P206	LF1TP206[0.5]	3/12/2009	NA	84	Colma site
LF1P206	LF1TP206[11.0]	3/12/2009	NA	23	Colma site
LF1P206	LF1TP206[5.0]	3/12/2009	NA	53	Colma site
LF1P207	LF1TP207[0.5]	3/12/2009	NA	41	Colma site
LF1P207	LF1TP207[5.0]	3/12/2009	NA	18	Colma site
LF1P207	LF1TP207[8.0]	3/12/2009	NA	26	Colma site
LF1P208	LF1TP208[0.5]	3/12/2009	NA	57	Colma site
LF1P208	LF1TP208[3.0]	3/12/2009	NA	37	Colma site
LF1P208	LF1TP208[9.5]	3/12/2009	NA	28	Colma site
LF1P209	LF1TP209[0.5]	3/12/2009	NA	37	Colma site
LF1P209	LF1TP209[10.0]	3/12/2009	NA	25	Colma site
LF1P209	LF1TP209[4.0]	3/12/2009	NA	35	Colma site
LF1P210	LF1TP210[0.5]	3/12/2009	NA	27	Colma site
LF1P210	LF1TP210[12.0]	3/12/2009	NA	12	Colma site
LF1P210	LF1TP210[4.5]	3/12/2009	NA	35	Colma site
LF1P211	LF1TP211[1.0]	3/13/2009	NA	22	Colma site
LF1P211	LF1TP211[9.0]	3/13/2009	NA	16	Colma site
LF1P212	LF1TP212[0.5]	3/13/2009	NA	17	Colma site
LF1P212	LF1TP212[9.0]	3/13/2009	NA	12	Colma site
LF1P213	LF1TP213[1.0]	3/13/2009	NA	16	Colma site
LF1P213	LF1TP213[7.0]	3/13/2009	NA	26	Colma site
LF1P214	LF1TP214[1.0]	3/13/2009	NA	35	Colma site
LF1P214	LF1TP214[10.5]	3/13/2009	NA	14	Colma site
LF1P214	LF1TP214[5.0]	3/13/2009	NA	14	Colma site
LF1P216	LF1TP216[0.0]	4/1/2009	NA	46	Colma site
LF1P216	LF1TP216[2.0]	4/1/2009	NA	85	Colma site
LF1P216	LF1TP216[8.0]	4/1/2009	NA	16	Colma site
LF1P217	LF1TP217[0.5]	4/1/2009	NA	22	Colma site
LF1P217	LF1TP217[7.5]	4/1/2009	NA	24	Colma site
LF1P218	LF1TP218[0.0]	4/1/2009	NA	28	Colma site
LF1P218	LF1TP218[7.0]	4/1/2009	NA	16	Colma site
LF1P219	LF1TP219[1.0]	4/1/2009	NA	41	Colma site
LF1P219	LF1TP219[6.5]	4/1/2009	NA	26	Colma site
LF1P220	LF1TP220[0.0]	4/1/2009	NA	110	Colma site
LF1P220	LF1TP220[4.5]	4/1/2009	NA	24	Colma site
LF1P220	LF1TP220[8.5]	4/1/2009	NA	21	Colma site
LF1P221	LF1TP221[1.0]	4/1/2009	NA	62	Colma site
LF1P221	LF1TP221[9.5]	4/1/2009	NA	21	Colma site
LF1P222	LF1TP222[0.5]	4/1/2009	NA	68	Colma site
LF1P222	LF1TP222[6.5]	4/1/2009	NA	19	Colma site
LF1P225	LF1TP225[0.0]	4/1/2009	NA	47	Colma site
LF1P225	LF1TP225[3.0]	4/1/2009	NA	23	Colma site
LF1P226	LF1TP226[1.0]	4/2/2009	NA	20	Colma site

Table 1. Zinc Soil Data for Select Presidio Sites Surface Deposits Mapped as Colma and Colma Background

Sample Location	Sample ID	Date	Depth (ft)	Zinc (mg/kg)	Notes
LF1P226	LF1TP226[4.0]	4/2/2009	NA	120	Colma site
LF1P226	LF1TP226[9.5]	4/2/2009	NA	48	Colma site
LF1P227	LF1TP227[0.0]	4/2/2009	NA	45	Colma site
LF1P227	LF1TP227[5.0]	4/2/2009	NA	33	Colma site
LF1P228	LF1TP228[0.5]	4/2/2009	NA	46	Colma site
LF1P228	LF1TP228[7.5]	4/2/2009	NA	37	Colma site
LF1P230	LF1TP230[0.0]	4/2/2009	NA	36	Colma site
LF1P230	LF1TP230[2.0]	4/2/2009	NA	21	Colma site
LF1P230	LF1TP230[6.0]	4/2/2009	NA	24	Colma site
LF1SB200	LF1SB200[1.0]	5/20/2009	NA	67	Colma site
LF1SB200	LF1SB200[13.5]	5/20/2009	NA	22	Colma site
LF1SB200	LF1SB200[41.5]	5/20/2009	NA	37	Colma site
LF1SB201	LF1SB201[2.0]	5/21/2009	NA	130	Colma site
LF1SB201	LF1SB201[28]	5/21/2009	NA	19	Colma site
LF1SB201	LF1SB201[40]	5/21/2009	NA	33	Colma site
LF1SB202	LF1SB202[2.0]	5/22/2009	NA	46	Colma site
LF1SB202	LF1SB202[25.0]	5/22/2009	NA	19	Colma site
LF1SB202	LF1SB202[36.5]	5/22/2009	NA	32	Colma site
LF1SB203	LF1SB203[12.5]	5/22/2009	NA	21	Colma site
LF1SB203	LF1SB203[2.0]	5/22/2009	NA	13	Colma site
LF1SB204	LF1SB204[2.5]	5/22/2009	NA	61	Colma site
LF1SB204	LF1SB204[9.0]	5/22/2009	NA	35	Colma site
LF1SS200	LF1SS200[0.0]	5/21/2009	NA	74	Colma site
BAPSB201	BAPSB201[3]	6/16/2010	3	180	Colma site
BAPSB201	BAPSB201[6]	6/16/2010	6	27	Colma site
BAPSB202	BAPSB202[5]	6/17/2010	5	29	Colma site
BAPSB202	BAPSB202[7]	6/17/2010	7	23	Colma site
BAPSB203	BAPSB203[1]	6/17/2010	1	29	Colma site
BAPSB203	BAPSB203[3]	6/17/2010	3	32	Colma site
BAPSB204	BAPSB204[0.3]	6/17/2010	0.3	170	Colma site
BAPSB204	BAPSB204[1]	6/17/2010	1	110	Colma site
BAPSB205	BAPSB205[0.3]	6/17/2010	0.3	110	Colma site
BAPSB205	BAPSB205[1]	6/17/2010	1	330	Colma site
BAPSB205	BAPSB205[3]	6/17/2010	3	87	Colma site
BAPSB206	BAPSB206[0.3]	6/17/2010	0.3	150	Colma site
BAPSB206	BAPSB206[1]	6/17/2010	1	80	Colma site
BAPSB206	BAPSB206[3]	6/17/2010	3	43	Colma site
BAPSB207	BAPSB207[0.3]	6/17/2010	0.3	150	Colma site
BAPSB207	BAPSB207[1]	6/17/2010	1	42	Colma site
BAPSB207	BAPSB207[3]	6/17/2010	3	120	Colma site
BAPSB208	BAPSB208[1]	6/17/2010	1	150	Colma site
BAPSB208	BAPSB208[5]	6/17/2010	5	68	Colma site
BAPSB209	BAPSB209[1]	6/17/2010	1	45	Colma site
BAPSB209	BAPSB209[5]	6/17/2010	5	31	Colma site
BAPSB210	BAPSB210[0.3]	8/26/2010	0.3	49	Colma site
BAPSB210	BAPSB210[1.3]	8/26/2010	1.3	30	Colma site
BAPSB211	BAPSB211[0.3]	8/26/2010	0.3	62	Colma site
BAPSB211	BAPSB211[1.3]	8/26/2010	1.3	32	Colma site
BAPSB212	BAPSB212[0.3]	8/26/2010	0.3	68	Colma site
BAPSB212	BAPSB212[2.3]	8/26/2010	2.3	47	Colma site
BAPSB213	BAPSB213[0.3]	8/26/2010	0.3	160	Colma site
BAPSB213	BAPSB213[4.5]	8/26/2010	4.5	180	Colma site
BAPSB214	BAPSB214[0.3]	8/26/2010	0.3	64	Colma site
BAPSB214	BAPSB214[1.25]	8/26/2010	1.25	54	Colma site
BAPSB215	BAPSB215[0.3]	8/26/2010	0.3	160	Colma site
BAPSB215	BAPSB215[3.3]	8/26/2010	3.3	96	Colma site
BAPSB216	BAPSB216[0.3]	8/26/2010	0.3	60	Colma site
BAPSB216	BAPSB216[1.3]	8/26/2010	1.3	58	Colma site
BAPSB217	BAPSB217[0.3]	8/26/2010	0.3	120	Colma site
BAPSB217	BAPSB217[2.3]	8/26/2010	2.3	35	Colma site
BAPSB218	BAPSB218[0.3]	8/26/2010	0.3	150	Colma site
BKGDSB01	BKGDSB01	8/21/1992	2	36.9	background
BKGDSB01	BKGDSB01	8/21/1992	5	33.9	background

Table 1. Zinc Soil Data for Select Presidio Sites Surface Deposits Mapped as Colma and Colma Background

Sample Location	Sample ID	Date	Depth (ft)	Zinc (mg/kg)	Notes
BKGDSB11	BKGDSB11	12/7/1994	5	47.3	background
BKGDSB12	BKGDSB12	12/7/1994	5	29.1	background
BKGDSB12	BKGDSB12	12/7/1994	9.5	61.6	background
BKGDSB13	BKGDSB13	12/7/1994	5	29.1	background
BKGDSB13	BKGDSB13	12/7/1994	9.5	40.8	background
CFLSSB01 (background)	CFLSSB01	11/18/1994	4	22.9	background
CFLSSB02 (background)	CFLSSB02	11/18/1994	3	25.2	background
DAEGW04 (background)	DAEGW04	10/19/1992	8	33.1	background
DAESB03 (background)	DAESB03	8/26/1992	28	40.6	background
LF10BK01 (background)	LF10BK01B(21.5)	9/6/1994	21.5	27.7	background
LF10BK03 (background)	LF10BK03B(57.5)	9/6/1994	57.5	50.4	background
LF6SB01 (Background)	LF6SB01	11/20/1994	20	16.8	background
LF6SB01 (Background)	LF6SB01	11/20/1994	9	21.3	background
LF6SB02 (background)	LF6SB02	11/20/1994	20	18.5	background
LF6SB02 (background)	LF6SB02	11/20/1994	3	22.6	background
LF6SB02 (background)	LF6SB02	11/20/1994	8	22	background
LF6SB03 (background)	LF6SB03	11/20/1994	20	26.4	background
LF6SB03 (background)	LF6SB03	11/20/1994	3	31.1	background
LF6SB03 (background)	LF6SB03	11/20/1994	8	21.8	background
LF6SB04 (background)	LF6SB04	11/20/1994	20.5	17.4	background
LF6SB04 (background)	LF6SB04	11/20/1994	8	18.7	background
LF6SB05 (background)	LF6SB05	11/20/1994	20	16.8	background
LF6SB05 (background)	LF6SB05	11/20/1994	3.5	22.4	background
LF6SB05 (background)	LF6SB05	11/20/1994	8.5	20.5	background
LF6SB06 (background)	LF6SB06	11/20/1994	20	20.2	background
LF6SB06 (background)	LF6SB06	11/20/1994	3	31.4	background
LF6SB06 (background)	LF6SB06	11/20/1994	8	20.7	background
LF6SO03B (background)	LF6SO03B	11/8/1990	7.5	37.2	background
LF8SO02B (background)	LF8SO02B		19	49.2	background
LF8SO03B (background)	LF8SO03B		19	35.9	background
NKSB13 (background)	NKSB13	12/5/1994	10	15.5	background
NKSB14 (background)	NKSB14	12/7/1994	9.5	39.7	background
NKSB15 (background)	NKSB15	12/7/1994	5	39.5	background

Abbreviations
ft = Feet below ground surface
mg/kg = Milligrams per kilogram.
NA = Not available.

Notes:
Background = data from Colma background data set hand entered from Table C-2 of Cleanup Level Document.
Surface deposits identified from Figure 6-1 of the Cleanup Level Document (EKI, 2002, revised 2006)
Site Designations are as follows:
CFL = Sewer Lift Station No. 1.
DAE = Landfill E.
LF1 = Fill Site 1.
BAP= Barnard Avenue Protected Range.
LF6 = Fill Site 6.
NK = Nike Facility.
LF8 = Landfill 8
BCGD = Background sample.

Table 2. Zinc Soil Data for Select Presidio Sites Surface Deposits Mapped as Colma, Beach Dune, and Colma Background

Sample Location	Sample ID	Date	Depth (ft)	Zinc (mg/kg)	Notes
CFLSB100	CFLSB100(0.5)	12/3/2004	0.5	170	Colma site
CFLSB100	CFLSB100(4.0)	12/3/2004	4	21	Colma site
CFLSS100	CFLSS100(0.5)	12/3/2004	0.5	100	Colma site
CFLSS101	CFLSS101(0.5)	12/3/2004	0.5	50	Colma site
CFLSS102	CFLSS102(0.5)	12/3/2004	0.5	63	Colma site
DAEGW101	DAEGW101-38-39	11/12/2002	NA	27	Colma site
DAEGW102	DAEGW102-13-13.5	11/12/2002	NA	26	Colma site
DAEPZ101	DAEPZ101-10-11	11/15/2002	NA	390	Colma site
DAEPZ101	DAEPZ101-20-21	11/15/2002	NA	26	Colma site
DAEPZ101	DAEPZ101-25.5-26.5	11/15/2002	NA	30	Colma site
DAEPZ102	DAEPZ102-14.5-15.5	11/13/2002	NA	160	Colma site
DAEPZ102	DAEPZ102-23.5-24.5	11/13/2002	NA	23	Colma site
DAEPZ102	DAEPZ102-31-32	11/13/2002	NA	32	Colma site
DAESB209	DAESB209[2]	8/27/2010	2	25	Colma site
DAESB210	DAESB210[2]	8/27/2010	2	48	Colma site
DAESB212	DAESB212[2]	8/27/2010	2	57	Colma site
DAESB213	DAESB213[2]	8/27/2010	2	42	Colma site
DAESB214	DAESB214[2]	8/27/2010	2	36	Colma site
DAESB215	DAESB215[2]	8/27/2010	2	43	Colma site
DAESB216	DAESB216[2]	8/27/2010	2	28	Colma site
DAESB217	DAESB217[2]	8/27/2010	2	37	Colma site
DAESB218	DAESB218[2]	8/27/2010	2	47	Colma site
DAESB219	DAESB219[2]	8/27/2010	2	34	Colma site
DAESB220	DAESB220[2]	8/27/2010	2	36	Colma site
DAESB221	DAESB221[2]	8/27/2010	2	55	Colma site
DAESB222	DAESB222[2]	8/27/2010	2	76	Colma site
DAESB223	DAESB223[2]	8/27/2010	2	36	Colma site
DAETP101	DAETP101-12	11/22/2002	NA	52	Colma site
DAETP101	DAETP101-4-6	11/22/2002	NA	280	Colma site
DAETP102	DAETP102-15	11/22/2002	NA	91	Colma site
DAETP102	DAETP102-8	11/22/2002	NA	260	Colma site
DAETP103	DAETP103-15	11/21/2002	NA	27	Colma site
DAETP103	DAETP103-5	11/21/2002	NA	820	Colma site
DAETP104	DAETP104-1-4	11/21/2002	NA	230	Colma site
DAETP104	DAETP104-8	11/21/2002	NA	30	Colma site
DAETP105	DAETP105-15	11/21/2002	NA	1100	Colma site
DAETP105	DAETP105-3-5	11/21/2002	NA	80	Colma site
DAETP106	DAETP106-15	11/21/2002	NA	280	Colma site
DAETP106	DAETP106-5	11/21/2002	NA	36	Colma site
DAETP107	DAETP107-15	11/22/2002	NA	76	Colma site
DAETP107	DAETP107-5-7	11/22/2002	NA	2200	Colma site
LF1EX101	LF1EX101[0.0]	8/12/2010	NA	45	Colma site
LF1EX102	LF1EX102[0.0]	8/12/2010	NA	22	Colma site
LF1EX103	LF1EX103[0.0]	8/12/2010	NA	27	Colma site
LF1EX104	LF1EX104[0.0]	8/12/2010	NA	76	Colma site
LF1EX105	LF1EX105[0.0]	8/12/2010	NA	78	Colma site
LF1EX106	LF1EX106[0.0]	8/12/2010	NA	40	Colma site
LF1EX107	LF1EX107[0.0]	8/12/2010	NA	38	Colma site
LF1EX108	LF1EX108[0.0]	8/12/2010	NA	29	Colma site
LF1EX109	LF1EX109[0.0]	8/12/2010	NA	33	Colma site
LF1EX110	LF1EX110[0.0]	8/12/2010	NA	48	Colma site
LF1EX111	LF1EX111[0.0]	8/12/2010	NA	30	Colma site
LF1EX112	LF1EX112[0.0]	8/12/2010	NA	55	Colma site
LF1EX113	LF1EX113[0.0]	8/12/2010	NA	52	Colma site
LF1EX114	LF1EX114[0.0]	8/12/2010	NA	40	Colma site
LF1EX115	LF1EX115[0.0]	8/12/2010	NA	41	Colma site
LF1EX116	LF1EX116[0.0]	8/12/2010	NA	64	Colma site
LF1EX117	LF1EX117[0.0]	8/12/2010	NA	57	Colma site
LF1EX118	LF1EX118[0.0]	8/12/2010	NA	65	Colma site
LF1EX119	LF1EX119[0.0]	8/12/2010	NA	73	Colma site
LF1EX120	LF1EX120[0.0]	8/12/2010	NA	47	Colma site
LF1EX121	LF1EX121[0.0]	8/12/2010	NA	54	Colma site
LF1EX122	LF1EX122[0.0]	8/12/2010	NA	26	Colma site

Table 2. Zinc Soil Data for Select Presidio Sites Surface Deposits Mapped as Colma, Beach Dune, and Colma Background

Sample Location	Sample ID	Date	Depth (ft)	Zinc (mg/kg)	Notes
LF1EX122	LF1EX122[3.0]	8/16/2010	NA	52	Colma site
LF1EX123	LF1EX123[0.0]	8/13/2010	NA	19	Colma site
LF1EX123	LF1EX123[3.0]	8/16/2010	NA	25	Colma site
LF1EX124	LF1EX124[0.0]	8/13/2010	NA	48	Colma site
LF1EX124	LF1EX124[3.0]	8/16/2010	NA	42	Colma site
LF1EX125	LF1EX125[0.0]	8/13/2010	NA	53	Colma site
LF1EX125	LF1EX125[3.0]	8/16/2010	NA	65	Colma site
LF1EX126	LF1EX126[0.0]	8/13/2010	NA	48	Colma site
LF1EX126	LF1EX126[3.0]	8/16/2010	NA	47	Colma site
LF1EX127	LF1EX127[0.0]	8/13/2010	NA	37	Colma site
LF1EX127	LF1EX127[3.0]	8/16/2010	NA	51	Colma site
LF1EX128	LF1EX128[0.0]	8/13/2010	NA	27	Colma site
LF1EX128	LF1EX128[3.0]	8/16/2010	NA	53	Colma site
LF1EX129	LF1EX129[0.0]	8/13/2010	NA	58	Colma site
LF1EX129	LF1EX129[3.0]	8/16/2010	NA	33	Colma site
LF1EX130	LF1EX130[0.0]	8/13/2010	NA	51	Colma site
LF1EX130	LF1EX130[3.0]	8/16/2010	NA	33	Colma site
LF1EX131	LF1EX131[0.0]	8/13/2010	NA	91	Colma site
LF1EX131	LF1EX131[3.0]	8/16/2010	NA	52	Colma site
LF1EX132	LF1EX132[0.0]	8/13/2010	NA	78	Colma site
LF1EX132	LF1EX132[3.0]	8/16/2010	NA	100	Colma site
LF1EX133	LF1EX133[0.0]	8/13/2010	NA	64	Colma site
LF1EX133	LF1EX133[3.0]	8/16/2010	NA	67	Colma site
LF1EX134	LF1EX134[0.0]	8/13/2010	NA	73	Colma site
LF1EX134	LF1EX134[3.0]	8/16/2010	NA	75	Colma site
LF1EX135	LF1EX135[0.0]	8/13/2010	NA	58	Colma site
LF1EX135	LF1EX135[3.0]	8/16/2010	NA	45	Colma site
LF1EX136	LF1EX136[0.0]	8/13/2010	NA	67	Colma site
LF1EX136	LF1EX136[3.0]	8/16/2010	NA	51	Colma site
LF1EX137	LF1EX137[0.0]	8/13/2010	NA	120	Colma site
LF1EX137	LF1EX137[3.0]	8/16/2010	NA	160	Colma site
LF1EX138	LF1EX138[0.0]	8/16/2010	NA	46	Colma site
LF1EX138	LF1EX138[3.0]	8/16/2010	NA	40	Colma site
LF1EX139	LF1EX139[0.0]	8/16/2010	NA	51	Colma site
LF1EX139	LF1EX139[3.0]	8/16/2010	NA	43	Colma site
LF1EX140	LF1EX140[0.0]	8/17/2010	NA	110	Colma site
LF1EX141	LF1EX141[0.0]	8/17/2010	NA	68	Colma site
LF1EX142	LF1EX142[0.0]	8/17/2010	NA	250	Colma site
LF1EX142	LF1EX142[3.0]	8/17/2010	NA	57	Colma site
LF1EX142	LF1EX142[3.0_0.0]	8/17/2010	3	57	Colma site
LF1EX143	LF1EX143[0.0]	8/17/2010	NA	37	Colma site
LF1EX143	LF1EX143[3.0]	8/17/2010	NA	28	Colma site
LF1EX144	LF1EX144[0.0]	8/17/2010	NA	21	Colma site
LF1EX144	LF1EX144[3.0]	8/17/2010	NA	31	Colma site
LF1EX145	LF1EX145[0.0]	8/17/2010	NA	32	Colma site
LF1EX145	LF1EX145[3.0]	8/17/2010	NA	31	Colma site
LF1EX146	LF1EX146[0.0]	8/17/2010	NA	66	Colma site
LF1EX146	LF1EX146[3.0]	8/17/2010	NA	55	Colma site
LF1EX146	LF1EX146[3.0_0.0]	8/17/2010	3	55	Colma site
LF1EX147	LF1EX147[0.0]	8/18/2010	NA	69	Colma site
LF1EX147	LF1EX147[3.0]	8/18/2010	NA	62	Colma site
LF1EX147	LF1EX147[3.0_0.0]	8/18/2010	3	62	Colma site
LF1EX148	LF1EX148[0.0]	8/18/2010	NA	56	Colma site
LF1EX148	LF1EX148[3.0]	8/18/2010	NA	84	Colma site
LF1EX149	LF1EX149[0.0]	8/18/2010	NA	77	Colma site
LF1EX149	LF1EX149[3.0]	8/18/2010	NA	68	Colma site
LF1EX149	LF1EX149[3.0_0.0]	8/18/2010	3	68	Colma site
LF1EX150	LF1EX150[0.0]	8/18/2010	NA	74	Colma site
LF1EX150	LF1EX150[3.0]	8/18/2010	NA	74	Colma site
LF1EX150	LF1EX150[3.0_0.0]	8/18/2010	3	74	Colma site
LF1EX151	LF1EX151[0.0]	8/18/2010	NA	28	Colma site
LF1EX152	LF1EX152[0.0]	9/22/2010	NA	62	Colma site
LF1EX155	LF1EX155[3.0]	9/22/2010	NA	56	Colma site

Table 2. Zinc Soil Data for Select Presidio Sites Surface Deposits Mapped as Colma, Beach Dune, and Colma Background

Sample Location	Sample ID	Date	Depth (ft)	Zinc (mg/kg)	Notes
LF1EX156	LF1EX156[3.0]	9/22/2010	NA	70	Colma site
LF1EX157	LF1EX157[0.0]	9/22/2010	NA	42	Colma site
LF1EX158	LF1EX158[0.0]	9/22/2010	NA	16	Colma site
LF1EX159	LF1EX159[0.0]	9/22/2010	NA	23	Colma site
LF1EX160	LF1EX160[0.0]	9/22/2010	NA	32	Colma site
LF1EX161	LF1EX161[0.0]	9/22/2010	NA	20	Colma site
LF1EX162	LF1EX162[0.0]	9/22/2010	NA	33	Colma site
LF1EX163	LF1EX163[0.0]	9/22/2010	NA	53	Colma site
LF1P200	LF1TP200[1.0]	3/11/2009	NA	65	Colma site
LF1P200	LF1TP200[5.0]	3/11/2009	NA	110	Colma site
LF1P200	LF1TP200[9.0]	3/11/2009	NA	30	Colma site
LF1P201	LF1TP201[1.0]	3/11/2009	NA	30	Colma site
LF1P201	LF1TP201[8.0]	3/11/2009	NA	63	Colma site
LF1P202	LF1TP202[0.0]	3/11/2009	NA	150	Colma site
LF1P202	LF1TP202[4.0]	3/11/2009	NA	73	Colma site
LF1P204	LF1TP204[0.5]	3/12/2009	NA	77	Colma site
LF1P204	LF1TP204[11.5]	3/12/2009	NA	31	Colma site
LF1P204	LF1TP204[5.0]	3/12/2009	NA	77	Colma site
LF1P205	LF1TP205[1.5]	3/12/2009	NA	50	Colma site
LF1P205	LF1TP205[10.5]	3/12/2009	NA	52	Colma site
LF1P206	LF1TP206[0.5]	3/12/2009	NA	84	Colma site
LF1P206	LF1TP206[11.0]	3/12/2009	NA	23	Colma site
LF1P206	LF1TP206[5.0]	3/12/2009	NA	53	Colma site
LF1P207	LF1TP207[0.5]	3/12/2009	NA	41	Colma site
LF1P207	LF1TP207[5.0]	3/12/2009	NA	18	Colma site
LF1P207	LF1TP207[8.0]	3/12/2009	NA	26	Colma site
LF1P208	LF1TP208[0.5]	3/12/2009	NA	57	Colma site
LF1P208	LF1TP208[3.0]	3/12/2009	NA	37	Colma site
LF1P208	LF1TP208[9.5]	3/12/2009	NA	28	Colma site
LF1P209	LF1TP209[0.5]	3/12/2009	NA	37	Colma site
LF1P209	LF1TP209[10.0]	3/12/2009	NA	25	Colma site
LF1P209	LF1TP209[4.0]	3/12/2009	NA	35	Colma site
LF1P210	LF1TP210[0.5]	3/12/2009	NA	27	Colma site
LF1P210	LF1TP210[12.0]	3/12/2009	NA	12	Colma site
LF1P210	LF1TP210[4.5]	3/12/2009	NA	35	Colma site
LF1P211	LF1TP211[1.0]	3/13/2009	NA	22	Colma site
LF1P211	LF1TP211[9.0]	3/13/2009	NA	16	Colma site
LF1P212	LF1TP212[0.5]	3/13/2009	NA	17	Colma site
LF1P212	LF1TP212[9.0]	3/13/2009	NA	12	Colma site
LF1P213	LF1TP213[1.0]	3/13/2009	NA	16	Colma site
LF1P213	LF1TP213[7.0]	3/13/2009	NA	26	Colma site
LF1P214	LF1TP214[1.0]	3/13/2009	NA	35	Colma site
LF1P214	LF1TP214[10.5]	3/13/2009	NA	14	Colma site
LF1P214	LF1TP214[5.0]	3/13/2009	NA	14	Colma site
LF1P216	LF1TP216[0.0]	4/1/2009	NA	46	Colma site
LF1P216	LF1TP216[2.0]	4/1/2009	NA	85	Colma site
LF1P216	LF1TP216[8.0]	4/1/2009	NA	16	Colma site
LF1P217	LF1TP217[0.5]	4/1/2009	NA	22	Colma site
LF1P217	LF1TP217[7.5]	4/1/2009	NA	24	Colma site
LF1P218	LF1TP218[0.0]	4/1/2009	NA	28	Colma site
LF1P218	LF1TP218[7.0]	4/1/2009	NA	16	Colma site
LF1P219	LF1TP219[1.0]	4/1/2009	NA	41	Colma site
LF1P219	LF1TP219[6.5]	4/1/2009	NA	26	Colma site
LF1P220	LF1TP220[0.0]	4/1/2009	NA	110	Colma site
LF1P220	LF1TP220[4.5]	4/1/2009	NA	24	Colma site
LF1P220	LF1TP220[8.5]	4/1/2009	NA	21	Colma site
LF1P221	LF1TP221[1.0]	4/1/2009	NA	62	Colma site
LF1P221	LF1TP221[9.5]	4/1/2009	NA	21	Colma site
LF1P222	LF1TP222[0.5]	4/1/2009	NA	68	Colma site
LF1P222	LF1TP222[6.5]	4/1/2009	NA	19	Colma site
LF1P225	LF1TP225[0.0]	4/1/2009	NA	47	Colma site
LF1P225	LF1TP225[3.0]	4/1/2009	NA	23	Colma site
LF1P226	LF1TP226[1.0]	4/2/2009	NA	20	Colma site

Table 2. Zinc Soil Data for Select Presidio Sites Surface Deposits Mapped as Colma, Beach Dune, and Colma Background

Sample Location	Sample ID	Date	Depth (ft)	Zinc (mg/kg)	Notes
LF1P226	LF1TP226[4.0]	4/2/2009	NA	120	Colma site
LF1P226	LF1TP226[9.5]	4/2/2009	NA	48	Colma site
LF1P227	LF1TP227[0.0]	4/2/2009	NA	45	Colma site
LF1P227	LF1TP227[5.0]	4/2/2009	NA	33	Colma site
LF1P228	LF1TP228[0.5]	4/2/2009	NA	46	Colma site
LF1P228	LF1TP228[7.5]	4/2/2009	NA	37	Colma site
LF1P230	LF1TP230[0.0]	4/2/2009	NA	36	Colma site
LF1P230	LF1TP230[2.0]	4/2/2009	NA	21	Colma site
LF1P230	LF1TP230[6.0]	4/2/2009	NA	24	Colma site
LF1SB200	LF1SB200[1.0]	5/20/2009	NA	67	Colma site
LF1SB200	LF1SB200[13.5]	5/20/2009	NA	22	Colma site
LF1SB200	LF1SB200[41.5]	5/20/2009	NA	37	Colma site
LF1SB201	LF1SB201[2.0]	5/21/2009	NA	130	Colma site
LF1SB201	LF1SB201[28]	5/21/2009	NA	19	Colma site
LF1SB201	LF1SB201[40]	5/21/2009	NA	33	Colma site
LF1SB202	LF1SB202[2.0]	5/22/2009	NA	46	Colma site
LF1SB202	LF1SB202[25.0]	5/22/2009	NA	19	Colma site
LF1SB202	LF1SB202[36.5]	5/22/2009	NA	32	Colma site
LF1SB203	LF1SB203[12.5]	5/22/2009	NA	21	Colma site
LF1SB203	LF1SB203[2.0]	5/22/2009	NA	13	Colma site
LF1SB204	LF1SB204[2.5]	5/22/2009	NA	61	Colma site
LF1SB204	LF1SB204[9.0]	5/22/2009	NA	35	Colma site
LF1SS200	LF1SS200[0.0]	5/21/2009	NA	74	Colma site
BAPSB201	BAPSB201[3]	6/16/2010	3	180	Colma site
BAPSB201	BAPSB201[6]	6/16/2010	6	27	Colma site
BAPSB202	BAPSB202[5]	6/17/2010	5	29	Colma site
BAPSB202	BAPSB202[7]	6/17/2010	7	23	Colma site
BAPSB203	BAPSB203[1]	6/17/2010	1	29	Colma site
BAPSB203	BAPSB203[3]	6/17/2010	3	32	Colma site
BAPSB204	BAPSB204[0.3]	6/17/2010	0.3	170	Colma site
BAPSB204	BAPSB204[1]	6/17/2010	1	110	Colma site
BAPSB205	BAPSB205[0.3]	6/17/2010	0.3	110	Colma site
BAPSB205	BAPSB205[1]	6/17/2010	1	330	Colma site
BAPSB205	BAPSB205[3]	6/17/2010	3	87	Colma site
BAPSB206	BAPSB206[0.3]	6/17/2010	0.3	150	Colma site
BAPSB206	BAPSB206[1]	6/17/2010	1	80	Colma site
BAPSB206	BAPSB206[3]	6/17/2010	3	43	Colma site
BAPSB207	BAPSB207[0.3]	6/17/2010	0.3	150	Colma site
BAPSB207	BAPSB207[1]	6/17/2010	1	42	Colma site
BAPSB207	BAPSB207[3]	6/17/2010	3	120	Colma site
BAPSB208	BAPSB208[1]	6/17/2010	1	150	Colma site
BAPSB208	BAPSB208[5]	6/17/2010	5	68	Colma site
BAPSB209	BAPSB209[1]	6/17/2010	1	45	Colma site
BAPSB209	BAPSB209[5]	6/17/2010	5	31	Colma site
BAPSB210	BAPSB210[0.3]	8/26/2010	0.3	49	Colma site
BAPSB210	BAPSB210[1.3]	8/26/2010	1.3	30	Colma site
BAPSB211	BAPSB211[0.3]	8/26/2010	0.3	62	Colma site
BAPSB211	BAPSB211[1.3]	8/26/2010	1.3	32	Colma site
BAPSB212	BAPSB212[0.3]	8/26/2010	0.3	68	Colma site
BAPSB212	BAPSB212[2.3]	8/26/2010	2.3	47	Colma site
BAPSB213	BAPSB213[0.3]	8/26/2010	0.3	160	Colma site
BAPSB213	BAPSB213[4.5]	8/26/2010	4.5	180	Colma site
BAPSB214	BAPSB214[0.3]	8/26/2010	0.3	64	Colma site
BAPSB214	BAPSB214[1.25]	8/26/2010	1.25	54	Colma site
BAPSB215	BAPSB215[0.3]	8/26/2010	0.3	160	Colma site
BAPSB215	BAPSB215[3.3]	8/26/2010	3.3	96	Colma site
BAPSB216	BAPSB216[0.3]	8/26/2010	0.3	60	Colma site
BAPSB216	BAPSB216[1.3]	8/26/2010	1.3	58	Colma site
BAPSB217	BAPSB217[0.3]	8/26/2010	0.3	120	Colma site
BAPSB217	BAPSB217[2.3]	8/26/2010	2.3	35	Colma site
BAPSB218	BAPSB218[0.3]	8/26/2010	0.3	150	Colma site
BKGDSB01	BKGDSB01	8/21/1992	2	36.9	Colma background
BKGDSB01	BKGDSB01	8/21/1992	5	33.9	Colma background

Table 2. Zinc Soil Data for Select Presidio Sites Surface Deposits Mapped as Colma, Beach Dune, and Colma Background

Sample Location	Sample ID	Date	Depth (ft)	Zinc (mg/kg)	Notes
BKGDSB11	BKGDSB11	12/7/1994	5	47.3	Colma background
BKGDSB12	BKGDSB12	12/7/1994	5	29.1	Colma background
BKGDSB12	BKGDSB12	12/7/1994	9.5	61.6	Colma background
BKGDSB13	BKGDSB13	12/7/1994	5	29.1	Colma background
BKGDSB13	BKGDSB13	12/7/1994	9.5	40.8	Colma background
CFLSSB01 (background)	CFLSSB01	11/18/1994	4	22.9	Colma background
CFLSSB02 (background)	CFLSSB02	11/18/1994	3	25.2	Colma background
DAEGW04 (background)	DAEGW04	10/19/1992	8	33.1	Colma background
DAESB03 (background)	DAESB03	8/26/1992	28	40.6	Colma background
LF10BK01 (background)	LF10BK01B(21.5)	9/6/1994	21.5	27.7	Colma background
LF10BK03 (background)	LF10BK03B(57.5)	9/6/1994	57.5	50.4	Colma background
LF6SB01 (Background)	LF6SB01	11/20/1994	20	16.8	Colma background
LF6SB01 (Background)	LF6SB01	11/20/1994	9	21.3	Colma background
LF6SB02 (background)	LF6SB02	11/20/1994	20	18.5	Colma background
LF6SB02 (background)	LF6SB02	11/20/1994	3	22.6	Colma background
LF6SB02 (background)	LF6SB02	11/20/1994	8	22	Colma background
LF6SB03 (background)	LF6SB03	11/20/1994	20	26.4	Colma background
LF6SB03 (background)	LF6SB03	11/20/1994	3	31.1	Colma background
LF6SB03 (background)	LF6SB03	11/20/1994	8	21.8	Colma background
LF6SB04 (background)	LF6SB04	11/20/1994	20.5	17.4	Colma background
LF6SB04 (background)	LF6SB04	11/20/1994	8	18.7	Colma background
LF6SB05 (background)	LF6SB05	11/20/1994	20	16.8	Colma background
LF6SB05 (background)	LF6SB05	11/20/1994	3.5	22.4	Colma background
LF6SB05 (background)	LF6SB05	11/20/1994	8.5	20.5	Colma background
LF6SB06 (background)	LF6SB06	11/20/1994	20	20.2	Colma background
LF6SB06 (background)	LF6SB06	11/20/1994	3	31.4	Colma background
LF6SB06 (background)	LF6SB06	11/20/1994	8	20.7	Colma background
LF6SO03B (background)	LF6SO03B	11/8/1990	7.5	37.2	Colma background
LF8SO02B (background)	LF8SO02B		19	49.2	Colma background
LF8SO03B (background)	LF8SO03B		19	35.9	Colma background
NKSB13 (background)	NKSB13	12/5/1994	10	15.5	Colma background
NKSB14 (background)	NKSB14	12/7/1994	9.5	39.7	Colma background
NKSB15 (background)	NKSB15	12/7/1994	5	39.5	Colma background
1351SB112	1351SB112(1.5)	12/2/2004	1.5	65	Beach Dune
1351SB112	1351SB112(4.5)	12/2/2004	4.5	49	Beach Dune
1351SB113	1351SB113(1.5)	12/2/2004	1.5	65	Beach Dune
1351SB113	1351SB113(4.5)	12/2/2004	4.5	25	Beach Dune
1351SB115	1351SB115(6.0)	12/2/2004	6	82	Beach Dune
1351SB116	1351SB116(6.0)	12/2/2004	6	70	Beach Dune
1351SB117	1351SB117(0.5)	12/2/2004	0.5	67	Beach Dune
1351SB117	1351SB117(3.0)	12/2/2004	3	53	Beach Dune
1351SB118	1351SB118(0.5)	12/2/2004	0.5	37	Beach Dune
1351SB118	1351SB118(3.0)	12/2/2004	3	40	Beach Dune
1351SB119	1351SB119(0.5)	12/2/2004	0.5	24	Beach Dune
1351SB119	1351SB119(2.5)	12/2/2004	2.5	52	Beach Dune
1351SB120	1351SB120(0.5)	12/7/2004	0.5	150	Beach Dune
1351SB120	1351SB120(3.0)	12/6/2004	3	57	Beach Dune
1351SB121	1351SB121(0.5)	12/6/2004	0.5	110	Beach Dune
1351SB121	1351SB121(3.0)	12/6/2004	3	28	Beach Dune
1351SB122	1351SB122(0.5)	12/6/2004	0.5	79	Beach Dune
1351SB122	1351SB122(3.0)	12/6/2004	3	24	Beach Dune
1351SS100	1351SS100(0.5)	12/7/2004	0.5	65	Beach Dune
1351SS101	1351SS101(0.5)	12/7/2004	0.5	56	Beach Dune
662SB100	662SB100(1.0)	12/6/2004	1	18	Beach Dune
662SB100	662SB100(10.0)	12/6/2004	10	15	Beach Dune
662SB100	662SB100(5.0)	12/6/2004	5	20	Beach Dune
662SB101	662SB101(1.0)	12/6/2004	1	28	Beach Dune
662SB101	662SB101(10.0)	12/6/2004	10	8	Beach Dune
662SB101	662SB101(5.0)	12/6/2004	5	12	Beach Dune
BB3SB100	BB3SB100-0.5	7/17/2000	0.5	65	Beach Dune
BB3SB100	BB3SB100-1.5	7/17/2000	1.5	38	Beach Dune
BB3SB101	BB3SB101-0.5	7/17/2000	0.5	18	Beach Dune
BB3SB101	BB3SB101-2	7/17/2000	2	14	Beach Dune

Table 2. Zinc Soil Data for Select Presidio Sites Surface Deposits Mapped as Colma, Beach Dune, and Colma Background

Sample Location	Sample ID	Date	Depth (ft)	Zinc (mg/kg)	Notes
BB3SB102	BB3SB102-0.5	7/17/2000	0.5	18	Beach Dune
BB3SB102	BB3SB102-2	7/17/2000	2	15	Beach Dune
BB4EX100	BB4EX100[0.5]	10/7/2004		20	Beach Dune
BB4EX101	BB4EX101[0.5]	10/7/2004		24	Beach Dune
BB4EX102	BB4EX102[0.5]	10/7/2004		16	Beach Dune
BB4EX103	BB4EX103[0.5]	10/7/2004		17	Beach Dune
BB4EX104	BB4EX104[0.5]	10/7/2004		35	Beach Dune
BB4EX105	BB4EX105[0.5]	10/7/2004		23	Beach Dune
BB4EX106	BB4EX106[0.5]	10/7/2004		28	Beach Dune
BB4EX107	BB4EX107[0.5]	10/7/2004		21	Beach Dune
BB4SB100	BB4SB100	7/17/2000	0	51	Beach Dune
BB4SB100	BB4SB100	7/17/2000	1.5	37	Beach Dune
BB4SB100	BB4SB100-0.5	7/17/2000	0.5	51	Beach Dune
BB4SB100	BB4SB100-2	7/17/2000	2	37	Beach Dune
BB4SB101	BB4SB101	7/17/2000	0	29	Beach Dune
BB4SB101	BB4SB101	7/17/2000	1.5	14	Beach Dune
BB4SB101	BB4SB101-0.5	7/17/2000	0.5	29	Beach Dune
BB4SB101	BB4SB101-2	7/17/2000	2	14	Beach Dune
BB4SB102	BB4SB102	7/17/2000	0	31	Beach Dune
BB4SB102	BB4SB102	7/17/2000	1.5	29	Beach Dune
BB4SB102	BB4SB102-0.5	7/17/2000	0.5	31	Beach Dune
BB4SB102	BB4SB102-2	7/17/2000	2	29	Beach Dune
LF10GW208	LF10GW208(17)	12/17/2007	NA	62	Beach Dune
LF10GW208	LF10GW208(2)	12/17/2007	NA	31	Beach Dune
LF10GW208	LF10GW208(24.5)	12/17/2007	NA	59	Beach Dune
LF10GW208	LF10GW208(34.5)	12/17/2007	NA	30	Beach Dune
LF10GW208	LF10GW208(42)	12/17/2007	NA	16	Beach Dune
LF10GW208	LF10GW208(8.5)	12/17/2007	NA	67	Beach Dune
LF10P200	LF10TP200(7.0)	12/12/2007	NA	63	Beach Dune
LF10P202	LF10TP202(6.0)	12/6/2007	NA	79	Beach Dune
LF10P204	LF10TP204(2.5)	12/6/2007	NA	21	Beach Dune
LF10P205	LF10TP205(3.0)	12/10/2007	NA	77	Beach Dune
LF10P206	LF10TP206(2.0)	12/10/2007	NA	56	Beach Dune
LF10P207	LF10TP207(3.0)	12/6/2007	NA	54	Beach Dune
LF10P208	LF10TP208(3.0)	12/11/2007	NA	90	Beach Dune
LF10P209	LF10TP209(3.0)	12/11/2007	NA	20	Beach Dune
LF10P210	LF10TP210(3.0)	12/11/2007	NA	48	Beach Dune
LF10P211	LF10TP211(3.0)	12/11/2007	NA	65	Beach Dune
LF10P211	LF10TP211(5.0)	12/11/2007	NA	34	Beach Dune
LF10P214	LF10TP214(10)	12/12/2007	NA	24	Beach Dune
LF10P215	LF10TP215(2.0)	12/12/2007	NA	50	Beach Dune
LF10P215	LF10TP215(5.0)	12/12/2007	NA	31	Beach Dune
LF10P216	LF10TP216(1.0)	3/19/2008	NA	40	Beach Dune
LF10P216	LF10TP216(11.0)	3/19/2008	NA	24	Beach Dune
LF10P216	LF10TP216(3.0)	3/19/2008	NA	17	Beach Dune
LF10P217	LF10TP217(1.0)	3/19/2008	NA	29	Beach Dune
LF10P217	LF10TP217(3.0)	3/19/2008	NA	50	Beach Dune
LF10P217	LF10TP217(7.0)	3/19/2008	NA	25	Beach Dune
LF10P218	LF10TP218(1.0)	3/18/2008	NA	160	Beach Dune
LF10P218	LF10TP218(4.0)	3/18/2008	NA	30	Beach Dune
LF10P218	LF10TP218(8.5)	3/18/2008	NA	25	Beach Dune
LF10P219	LF10TP219(1.0)	3/18/2008	NA	63	Beach Dune
LF10P219	LF10TP219(3.0)	3/18/2008	NA	110	Beach Dune
LF10P219	LF10TP219(4.5)	3/18/2008	NA	30	Beach Dune
LF10P220A	LF10TP220A(2.0)	3/17/2008	NA	54	Beach Dune
LF10P220B	LF10TP220B(13.5)	3/17/2008	NA	50	Beach Dune
LF10P220B	LF10TP220B(14.0)	3/17/2008	NA	42	Beach Dune
LF10P220B	LF10TP220B(2.0)	3/17/2008	NA	82	Beach Dune
LF10P220B	LF10TP220B(5.5)	3/17/2008	NA	990	Beach Dune
LF10P221	LF10TP221(1.0)	3/18/2008	NA	71	Beach Dune
LF10P221	LF10TP221(3.0)	3/18/2008	NA	23	Beach Dune
LF10P221	LF10TP221(5.0)	3/18/2008	NA	89	Beach Dune
LF10P222	LF10TP222(1.0)	3/18/2008	NA	64	Beach Dune

Table 2. Zinc Soil Data for Select Presidio Sites Surface Deposits Mapped as Colma, Beach Dune, and Colma Background

Sample Location	Sample ID	Date	Depth (ft)	Zinc (mg/kg)	Notes
LF10P222	LF10TP222(2.5)	3/18/2008	NA	28	Beach Dune
LF10P222	LF10TP222(4.0)	3/18/2008	NA	21	Beach Dune
LF10P223	LF10TP223(10.5)	3/17/2008	NA	94	Beach Dune
LF10P223	LF10TP223(2.0)	3/17/2008	NA	36	Beach Dune
LF10P223	LF10TP223(6.0)	3/17/2008	NA	55	Beach Dune
LF10P224	LF10TP224(1.0)	3/18/2008	NA	39	Beach Dune
LF10P224	LF10TP224(1.5)	3/18/2008	NA	45	Beach Dune
LF10P224	LF10TP224(2.0)	3/18/2008	NA	66	Beach Dune
LF10P224	LF10TP224(3.5)	3/18/2008	NA	56	Beach Dune
LF10P225	LF10TP225(1.0)	3/17/2008	NA	46	Beach Dune
LF10P225	LF10TP225(11.0)	3/17/2008	NA	38	Beach Dune
LF10P225	LF10TP225(6.0)	3/17/2008	NA	46	Beach Dune
LF10P226	LF10TP226(10.0)	3/17/2008	NA	39	Beach Dune
LF10P226	LF10TP226(2.0)	3/17/2008	NA	81	Beach Dune
LF10P226	LF10TP226(4.0)	3/17/2008	NA	32	Beach Dune
LF10P226	LF10TP226(6.5)	3/17/2008	NA	50	Beach Dune
LF10P227	LF10TP227(1.0)	3/20/2008	NA	58	Beach Dune
LF10P227	LF10TP227(3.0)	3/20/2008	NA	58	Beach Dune
LF10P228	LF10TP228(1.0)	3/20/2008	NA	57	Beach Dune
LF10P228	LF10TP228(3.0)	3/20/2008	NA	19	Beach Dune
LF10P229	LF10TP229(1.0)	3/19/2008	NA	51	Beach Dune
LF10P229	LF10TP229(4.0)	3/19/2008	NA	38	Beach Dune
LF10P230	LF10TP230(1.0)	3/19/2008	NA	230	Beach Dune
LF10P230	LF10TP230(2.0)	3/19/2008	NA	55	Beach Dune
LF10P230	LF10TP230(5.0)	3/19/2008	NA	24	Beach Dune
LF10P231	LF10TP231(1.0)	3/20/2008	NA	88	Beach Dune
LF10P231	LF10TP231(3.0)	3/20/2008	NA	58	Beach Dune
LF10P231	LF10TP231(5.0)	3/20/2008	NA	42	Beach Dune
LF10S01	LF10SC01	12/28/2007	NA	22	Beach Dune
LF10SB205	LF10SB205(0.5)	3/20/2008	NA	49	Beach Dune
LF10SB205	LF10SB205(2.0)	3/20/2008	NA	53	Beach Dune
LF10SB206	LF10SB206(0.5)	3/20/2008	NA	79	Beach Dune
LF10SB206	LF10SB206(2.0)	3/20/2008	NA	92	Beach Dune
LF10SB207	LF10SB207(0.5)	3/21/2008	NA	75	Beach Dune
LF10SB207	LF10SB207(2.0)	3/21/2008	NA	93	Beach Dune
LF10SB208	LF10SB208(0.5)	3/20/2008	NA	100	Beach Dune
LF10SB208	LF10SB208(2.0)	3/20/2008	NA	150	Beach Dune
LF10SB209	LF10SB209(0.5)	3/21/2008	NA	74	Beach Dune
LF10SB209	LF10SB209(2.0)	3/21/2008	NA	45	Beach Dune
LF10SB210	LF10SB210(0.5)	3/20/2008	NA	170	Beach Dune
LF10SB210	LF10SB210(2.0)	3/20/2008	NA	180	Beach Dune
LF10SB211	LF10SB211(0.5)	3/21/2008	NA	45	Beach Dune
LF10SB211	LF10SB211(2.0)	3/21/2008	NA	39	Beach Dune
LF10SB212	LF10SB212(0.5)	3/21/2008	NA	54	Beach Dune
LF10SB212	LF10SB212(2.0)	3/21/2008	NA	32	Beach Dune
LF10SB213	LF10SB213(0.5)	3/21/2008	NA	25	Beach Dune
LF10SB213	LF10SB213(2.0)	3/21/2008	NA	17	Beach Dune
LF10SB214	LF10SB214(0.5)	3/21/2008	NA	120	Beach Dune
LF10SB214	LF10SB214(2.0)	3/21/2008	NA	93	Beach Dune
LF10SB215	LF10SB215(0.5)	3/21/2008	NA	36	Beach Dune
LF10SB215	LF10SB215(2.0)	3/21/2008	NA	41	Beach Dune
LF10SB216	LF10SB216(0.5)	3/21/2008	NA	72	Beach Dune
LF10SB216	LF10SB216(2.0)	3/21/2008	NA	55	Beach Dune
LF4EX101	LF4EX101 [10.5]	1/8/2003	NA	16	Beach Dune
LF4EX102	LF4EX102 [4]	1/8/2003	NA	16	Beach Dune
LF4EX103	LF4EX103 [5.5]	1/8/2003	NA	13	Beach Dune
LF4EX104	LF4EX104 [9.5]	1/8/2003	NA	14	Beach Dune
LF4EX105	LF4EX105 [10.5]	1/8/2003	NA	16	Beach Dune
LF4EX106	LF4EX106 [10.5]	1/8/2003	NA	12	Beach Dune
LF4EX107	LF4EX107 [0.5]	1/16/2003		23	Beach Dune
LF4EX108	LF4EX108 [0.5]	1/16/2003		75	Beach Dune
LF4EX109	LF4EX109 [0.5]	1/16/2003		16	Beach Dune
LF4EX110	LF4EX110 [1.0]	1/16/2003		20	Beach Dune

Table 2. Zinc Soil Data for Select Presidio Sites Surface Deposits Mapped as Colma, Beach Dune, and Colma Background

Sample Location	Sample ID	Date	Depth (ft)	Zinc (mg/kg)	Notes
LF4EX111	LF4EX111 [0.5]	1/16/2003		27	Beach Dune
LF4EX112	LF4EX112[0.5]	1/27/2003		13	Beach Dune
LF4EX113	LF4EX113[0.5]	1/27/2003		12	Beach Dune
LF4EX114	LF4EX114[0.5]	1/27/2003		16	Beach Dune
LF4EX115	LF4EX115[0.5]	1/27/2003		16	Beach Dune
LF4EX116	LF4EX116[0.5]	1/27/2003		11	Beach Dune
LF4EX117	LF4EX117[0.5]	1/27/2003		11	Beach Dune
LF4EX118	LF4EX118[0.5]	1/27/2003		14	Beach Dune
LF4EX119	LF4EX119[0.5]	2/3/2003		12	Beach Dune
LF4EX120	LF4EX120[0.5]	2/3/2003		13	Beach Dune
LF4EX121	LF4EX121[0.5]	2/3/2003		18	Beach Dune
LF4EX122	LF4EX122 [0.5]	2/5/2003	NA	25	Beach Dune
LF4EX123	LF4EX123 [0.5]	2/5/2003	NA	16	Beach Dune
LF4EX124	LF4EX124 [0.5]	2/5/2003	NA	14	Beach Dune
LF4EX125	LF4EX125 [0.5]	2/5/2003	NA	22	Beach Dune
LF4EX126	LF4EX126 [0.5]	2/5/2003	NA	18	Beach Dune
LF4EX127	LF4EX127 [0.5]	2/5/2003	NA	21	Beach Dune
LF4EX128	LF4EX128 [0.5]	2/5/2003	NA	17	Beach Dune
LF4EX129	LF4EX129 [0.5]	2/5/2003	NA	12	Beach Dune
LF4EX130	LF4EX130 [0.5]	2/5/2003	NA	14	Beach Dune
LF4EX131	LF4EX131 [0.5]	2/6/2003		13	Beach Dune
LF4EX132	LF4EX132 [0.5]	2/6/2003		13	Beach Dune
LF4EX133	LF4EX133 [0.5]	2/6/2003		14	Beach Dune
LF4EX134	LF4EX134 [0.5]	2/6/2003		12	Beach Dune
LF4EX135	LF4EX135 [0.5]	2/6/2003		14	Beach Dune
LF4EX136	LF4EX136 [0.5]	2/6/2003		59	Beach Dune
LF4EX137	LF4EX137 [0.5]	2/6/2003		14	Beach Dune
LF4EX138	LF4EX138 [0.5]	2/6/2003		21	Beach Dune
LF4TP100	LF4TP100-6.5	7/19/2000	6.5	12	Beach Dune
LF4TP101	LF4TP101-4	7/19/2000	4	9.9	Beach Dune
LF4TP102	LF4TP102-5	7/19/2000	5	11	Beach Dune
LF4TP103	LF4TP103-8	7/19/2000	8	11	Beach Dune
LF4TP104	LF4TP104-12	7/19/2000	12	9.4	Beach Dune
LF4TP105	LF4TP105-4	7/19/2000	4	53	Beach Dune
LF8P200	LF8TP200(3.0)	12/10/2007	NA	15	Beach Dune
LF8P202	LF8TP202(2.0)	12/4/2007	NA	15	Beach Dune
LF8P203	LF8TP203(3.0)	12/7/2007	NA	18	Beach Dune
LF8P204	LF8TP204(3.0)	12/7/2007	NA	21	Beach Dune
LF8P205	LF8TP205(3.0)	12/7/2007	NA	27	Beach Dune
LF8P206	LF8TP206(2.0)	12/5/2007	NA	46	Beach Dune
LF8P208	LF8TP208(3.0)	12/10/2007	NA	18	Beach Dune
LF8P209	LF8TP209(3.0)	12/7/2007	NA	16	Beach Dune
LF8P210	LF8TP210(2.0)	12/5/2007	NA	21	Beach Dune
LF8P211	LF8TP211(2.0)	12/5/2007	NA	18	Beach Dune
LF8P213	LF8TP213(2.0)	12/5/2007	NA	30	Beach Dune
LF8P214	LF8TP214(1.0)	12/5/2007	NA	28	Beach Dune
LF8P214	LF8TP214(2.0)	12/5/2007	NA	28	Beach Dune
LF8P216	LF8TP216(1.0)	12/4/2007	NA	20	Beach Dune
LF8P217	LF8TP217(2.0)	12/5/2007	NA	51	Beach Dune
LF8P218	LF8TP218(2.5)	12/5/2007	NA	22	Beach Dune
LF8P219	LF8TP219(2.0)	12/4/2007	NA	16	Beach Dune
LF8SB201	LF8SB201(0.25)	8/22/2008	NA	62	Beach Dune
LF8SB201	LF8SB201(1.25)	8/22/2008	NA	100	Beach Dune
LF8SB201	LF8SB201(2.25)	8/22/2008	NA	21	Beach Dune
LF8SB202	LF8SB202(0.25)	8/22/2008	NA	140	Beach Dune
LF8SB202	LF8SB202(1.25)	8/22/2008	NA	150	Beach Dune
LF8SB202	LF8SB202(2.25)	8/22/2008	NA	46	Beach Dune
LF8SB203	LF8SB203(0.25)	8/22/2008	NA	45	Beach Dune
LF8SB203	LF8SB203(1.25)	8/22/2008	NA	28	Beach Dune
LF8SB203	LF8SB203(2.25)	8/22/2008	NA	36	Beach Dune
LF8SB204	LF8SB204(0.25)	8/22/2008	NA	49	Beach Dune
LF8SB204	LF8SB204(1.25)	8/22/2008	NA	26	Beach Dune
LF8SB204	LF8SB204(2.25)	8/22/2008	NA	310	Beach Dune

Table 2. Zinc Soil Data for Select Presidio Sites Surface Deposits Mapped as Colma, Beach Dune, and Colma Background

Sample Location	Sample ID	Date	Depth (ft)	Zinc (mg/kg)	Notes
LF8SB205	LF8SB205(0.25)	8/22/2008	NA	36	Beach Dune
LF8SB205	LF8SB205(1.25)	8/22/2008	NA	17	Beach Dune
LF8SB205	LF8SB205(2.25)	8/22/2008	NA	17	Beach Dune
LF8SB206	LF8SB206(0.25)	8/22/2008	NA	28	Beach Dune
LF8SB206	LF8SB206(1.25)	8/22/2008	NA	20	Beach Dune
LF8SB206	LF8SB206(2.25)	8/22/2008	NA	34	Beach Dune
LF8SB207	LF8SB207(0.25)	8/22/2008	NA	34	Beach Dune
LF8SB207	LF8SB207(1.25)	8/22/2008	NA	22	Beach Dune
LF8SB207	LF8SB207(2.25)	8/22/2008	NA	23	Beach Dune
LF8SB208	LF8SB208(0.25)	8/22/2008	NA	30	Beach Dune
LF8SB208	LF8SB208(1.25)	8/22/2008	NA	21	Beach Dune
LF8SB208	LF8SB208(1.6)	8/22/2008	NA	43	Beach Dune
LF8SB209	LF8SB209(0.25)	8/22/2008	NA	93	Beach Dune
LF8SB209	LF8SB209(1.25)	8/22/2008	NA	260	Beach Dune
LF8SB209	LF8SB209(2.25)	8/22/2008	NA	80	Beach Dune
LF8SB210	LF8SB210(0.25)	8/22/2008	NA	280	Beach Dune
LF8SB210	LF8SB210(1.25)	8/22/2008	NA	290	Beach Dune
LF8SB210	LF8SB210(2.25)	8/22/2008	NA	23	Beach Dune
LF8SB211	LF8SB211(0.25)	8/22/2008	NA	380	Beach Dune
LF8SB211	LF8SB211(1.25)	8/22/2008	NA	130	Beach Dune
LF8SB211	LF8SB211(2.25)	8/22/2008	NA	59	Beach Dune
LF8TP103	LF8TP103(1.5)	10/29/2002	NA	16	Beach Dune
LF8TP103	LF8TP103(6)	10/29/2002	NA	12	Beach Dune
LF8TP103A	LF8TP103A(0.25)	10/29/2002	NA	25	Beach Dune
LF8TP103B	LF8TP103B(0.25)	10/29/2002	NA	38	Beach Dune
LF8TP104	LF8TP104(6.5)	10/29/2002	NA	12	Beach Dune
LF8TP104	LF8TP104(7)	10/29/2002	NA	16	Beach Dune
LF8TP104A	LF8TP104A(0.25)	10/29/2002	NA	77	Beach Dune
LF8TP104B	LF8TP104B(0.25)	10/29/2002	NA	93	Beach Dune
LF8TP106	LF8TP106(10)	10/28/2002	NA	13	Beach Dune
LF8TP106	LF8TP106(8)	10/28/2002	NA	12	Beach Dune
LF8TP106A	LF8TP106A(0.25)	10/28/2002	NA	13	Beach Dune
LF8TP106B	LF8TP106B(0.25)	10/28/2002	NA	15	Beach Dune
LF8TP107	LF8TP107(6)	10/28/2002	NA	25	Beach Dune
LF8TP107	LF8TP107(6.5)	10/28/2002	NA	15	Beach Dune
LF8TP107A	LF8TP107A(0.25)	10/28/2002	NA	140	Beach Dune
LF8TP107B	LF8TP107B(0.25)	10/28/2002	NA	86	Beach Dune
LF8TP108	LF8TP108(0.25)	10/31/2002	NA	130	Beach Dune
LF8TP108	LF8TP108(13.5)	10/31/2002	NA	17	Beach Dune
LF8TP108	LF8TP108(4.5)	10/31/2002	NA	66	Beach Dune
LF8TP108	LF8TP108(8)	10/31/2002	NA	76	Beach Dune
LF8TP109	LF8TP109(0.25)	10/31/2002	NA	65	Beach Dune
LF8TP109	LF8TP109(1.5)	10/31/2002	NA	930	Beach Dune
LF8TP109	LF8TP109(10.5)	10/31/2002	NA	18	Beach Dune
LF8TP109	LF8TP109(5)	10/31/2002	NA	59	Beach Dune
LF8TP110	LF8TP110(10)	10/30/2002	NA	47	Beach Dune
LF8TP110	LF8TP110(14)	10/31/2002	NA	34	Beach Dune
LF8TP110A	LF8TP110A(0.25)	10/30/2002	NA	140	Beach Dune
LF8TP110B	LF8TP110B(0.25)	10/31/2002	NA	79	Beach Dune
LF8TP111	LF8TP111(4)	10/31/2002	NA	88	Beach Dune
LF8TP111	LF8TP111(6)	10/31/2002	NA	38	Beach Dune
LF8TP111	LF8TP111(7)	10/31/2002	NA	17	Beach Dune
LF8TP111A	LF8TP111A(0.25)	10/31/2002	NA	1100	Beach Dune
LF8TP114	LF8TP114(3)	10/29/2002	NA	59	Beach Dune
LF8TP114	LF8TP114(4.5)	10/29/2002	NA	13	Beach Dune
LF8TP114	LF8TP114(5.5)	10/29/2002	NA	72	Beach Dune
LF8TP114B	LF8TP114B(0.25)	10/29/2002	NA	180	Beach Dune
LF8TP115	LF8TP115(10.5)	10/28/2002	NA	13	Beach Dune
LF8TP115	LF8TP115(4.0)	10/28/2002	NA	20	Beach Dune
LF8TP115A	LF8TP115A(0.25)	10/28/2002	NA	23	Beach Dune
LF8TP115B	LF8TP115B(0.25)	10/28/2002	NA	26	Beach Dune
LF9TP100	LF9TP100(1.5)	6/20/2000	1.5	15	Beach Dune
LF9TP100	LF9TP100(2.5)	6/20/2000	2.5	18	Beach Dune

Table 2. Zinc Soil Data for Select Presidio Sites Surface Deposits Mapped as Colma, Beach Dune, and Colma Background

Sample Location	Sample ID	Date	Depth (ft)	Zinc (mg/kg)	Notes
LF9TP101	LF9TP101(1)	6/20/2000	1	55	Beach Dune
LF9TP101	LF9TP101(2)	6/20/2000	2	13	Beach Dune
LF9TP102	LF9TP102(1)	6/20/2000	1	36	Beach Dune
LF9TP103	LF9TP103(1)	6/20/2000	1	35	Beach Dune
LF9TP103	LF9TP103(4.5)	6/20/2000	4.5	54	Beach Dune
LF9TP104	LF9TP104(1)	6/20/2000	1	39	Beach Dune
LF9TP104	LF9TP104(6.5)	6/20/2000	6.5	21	Beach Dune
LF9TP105	LF9TP105(1)	6/20/2000	1	38	Beach Dune
LF9TP105	LF9TP105(4)	6/20/2000	4	35	Beach Dune
NSSB100	NSSB100-0.5	7/25/2000	0.5	110	Beach Dune
NSSB100	NSSB100-1.5	7/25/2000	1.5	26	Beach Dune
NSSB101	NSSB101-0.5	7/25/2000	0.5	27	Beach Dune
NSSB101	NSSB101-1.5	7/25/2000	1.5	18	Beach Dune
NSSB102	NSSB102-0.5	7/25/2000	0.5	16	Beach Dune
NSSB102	NSSB102-1.5	7/25/2000	1.5	29	Beach Dune
NSSB103	NSSB103-0.5	7/25/2000	0.5	24	Beach Dune
NSSB103	NSSB103-1.5	7/25/2000	1.5	18	Beach Dune
NSSB104	NSSB104-0.5	7/25/2000	0.5	120	Beach Dune
NSSB104	NSSB104-1.5	7/25/2000	1.5	69	Beach Dune
NSSB105	NSSB105-0.5	7/25/2000	0.5	27	Beach Dune
NSSB105	NSSB105-1.5	7/25/2000	1.5	24	Beach Dune
BKGDSB05	BKGDSB05	12/7/1994	5	19.2	BD Background
BKGDSB05	BKGDSB05	12/7/1994	9.5	27.5	BD Background
BKGDSB06	BKGDSB06	12/7/1994	2	25.4	BD Background
BKGDSB06	BKGDSB06	12/7/1994	9.5	22.9	BD Background
BKGDSB07	BKGDSB07	12/8/1994	5	26.5	BD Background
BKGDSB07	BKGDSB07	12/8/1994	9.5	35.6	BD Background
BKGDSB08	BKGDSB08	12/8/1994	5.5	32	BD Background
BKGDSB08	BKGDSB08	12/8/1994	9.5	40.3	BD Background
BKGDSB10	BKGDSB10	12/7/1994	3.5	19.6	BD Background
BKGDSB10	BKGDSB10	12/7/1994	7.5	16.2	BD Background
BKGSO01B	BKGSO01B	11/26/1990	4.5	17.2	BD Background
BKGSO02A	BKGSO02A	11/27/1990	0.8	25.4	BD Background
BKGSO02B	BKGSO02B	11/27/1990	3.5	19.7	BD Background
1167SB02	1167SB02	11/19/1994	6.5	47.5	BD Background
1167SB03	1167SB03	11/19/1994	10	38	BD Background
1351SO03B	1351SO03B	11/29/1990	5	51.7	BD Background
1351SO04B	1351SO04B	11/29/1990	4.5	38.1	BD Background
1351SO05B	1351SO05B	11/29/1990	4.5	36	BD Background
1351SO06B	1351SO06B	11/29/1990	4.5	39.2	BD Background
231GW04B	231GW04B	10/22/1990	6	62.3	BD Background
231GW05B	231GW05B	10/23/1990	5.5	49.6	BD Background
231GW06B	231GW06B	10/24/1990	12	38.6	BD Background
231GW07B	231GW07B	10/25/1990	7	74.3	BD Background
268SO02	268SO02	12/11/1990	3	92.6	BD Background
268SO05	268SO05	12/12/1990	3.5	36.8	BD Background
269SB01	269SB01	11/19/1994	0.5	32.2	BD Background
283SO01B	283SO01B	12/10/1990	5	18.5	BD Background
283SO02B	283SO02B	12/11/1990	5	18.9	BD Background
286SB06	286SB06	12/1/1994	5	18.6	BD Background
286SB07	286SB07	12/1/1994	5	27.5	BD Background
BBSB11	BBSB11	8/5/1992	2	45.4	BD Background
BBSB20	BBSB20	8/5/1992	2	31.8	BD Background
BBSB21	BBSB21	8/30/1992	2	44.4	BD Background
BBSB22	BBSB22	8/30/1992	2	10.4	BD Background
CGGW02	CGGW02	8/12/1992	2	9.75	BD Background
CGGW02	CGGW02	8/12/1992	3.5	11.05	BD Background
CGSO01A	CGSO01A	11/8/1990	2	21.1	BD Background
CGSO02A	CGSO02A	11/8/1990	1	18	BD Background
CGSO02B	CGSO02B	11/8/1990	2	19.8	BD Background
CGSO03A	CGSO03A	11/9/1990	2	16.9	BD Background
CGSO03B	CGSO03B	11/9/1990	3	17.2	BD Background
CGSO04A	CGSO04A	11/14/1990	1	20.4	BD Background

Table 2. Zinc Soil Data for Select Presidio Sites Surface Deposits Mapped as Colma, Beach Dune, and Colma Background

Sample Location	Sample ID	Date	Depth (ft)	Zinc (mg/kg)	Notes
CGSO04B	CGSO04B	11/14/1990	5	22.4	BD Background
DEHGW02	DEHGW02	8/24/1992	5	42	BD Background
DEHSB01	DEHSB01	8/7/1992	3	11.4	BD Background
DEHSB01	DEHSB01	8/7/1992	5	12.25	BD Background
EOMSB01	EOMSB01	11/15/1994	4.5	12.7	BD Background
EOMSB02	EOMSB02	11/15/1994	4.5	15	BD Background
EOMSB03	EOMSB03	11/15/1994	4.9	20.3	BD Background
EOMSB04	EOMSB04	11/16/1994	4.5	26.3	BD Background
HWSB04	HWSB04	8/5/1992	22	7.45	BD Background
LF10BK04	LF10BK04(3)	7/19/1994	3	26.5	BD Background
LF10BK05	LF10BK05(3.5)	7/19/1994	3.5	28.7	BD Background
LF10SB02	LF10SB02B(35)	9/2/1994	35	23.4	BD Background
LF10SB03	LF10SB03R(29.5)	8/27/1996	29.5	20.2	BD Background
LF10SB04	LF10SB04BR(20)	8/27/1996	20	30.7	BD Background
LF10SB04	LF10SB04BR(25)	8/27/1996	25	11.9	BD Background
LF3SB03	LF3SB03	8/25/1992	5	11.65	BD Background
LF3SB04	LF3SB04	8/25/1992	5	29.8	BD Background
LF4SB03	LF4SB03	8/19/1992	13	25.5	BD Background
LF8SO01B	LF8SO01B	10/1/1990	19	16.984	BD Background
LF9SB01	LF9SB01	8/19/1992	4	12.5	BD Background
LF9TP102	LF9TP102(6)	6/20/2000	6	21	BD Background
NKSB11	NKSB11	11/20/1994	4.5	13.5	BD Background
NKSB12	NKSB12	11/20/1994	4.5	21.2	BD Background
NKSB12	NKSB12	11/20/1994	9	38.6	BD Background
NKSB13	NKSB13	12/5/1994	5	17.1	BD Background
NKSB14	NKSB14	12/7/1994	5	25.8	BD Background

Abbreviations
ft = Feet below ground surface
mg/kg = Milligrams per kilogram
NA = Not available

Notes:
Surface deposits identified from Figure 6-1 of the Cleanup Level Document (EKI, 2002, revised 2006)
Colma Background = data from Colma background data set hand entered from Table C-2 of Cleanup Level Document.
BD Background = data from Beach Dune background data set hand entered from Table C-4 of Cleanup Level Document.

Site Designations are as follows:
CFL = Sewer Lift Station No. 1.
DAE = Landfill E.
LF1 = Fill Site 1.
BAP= Barnard Avenue Protected Range.
LF6 = Fill Site 6.
NK = Nike Facility.
LF8 = Landfill 8.
BCGD = Background sample.
LF4 = Landfill 4.
1167 = Building 1167.
231 = Building 231.
268 = Building 268.
BB = Baker Beach.
DEH =Dept of Engineering and Housing.
EOM = East of Mason.
CG = Coast Guard.
HW = Battery Howe Wagner

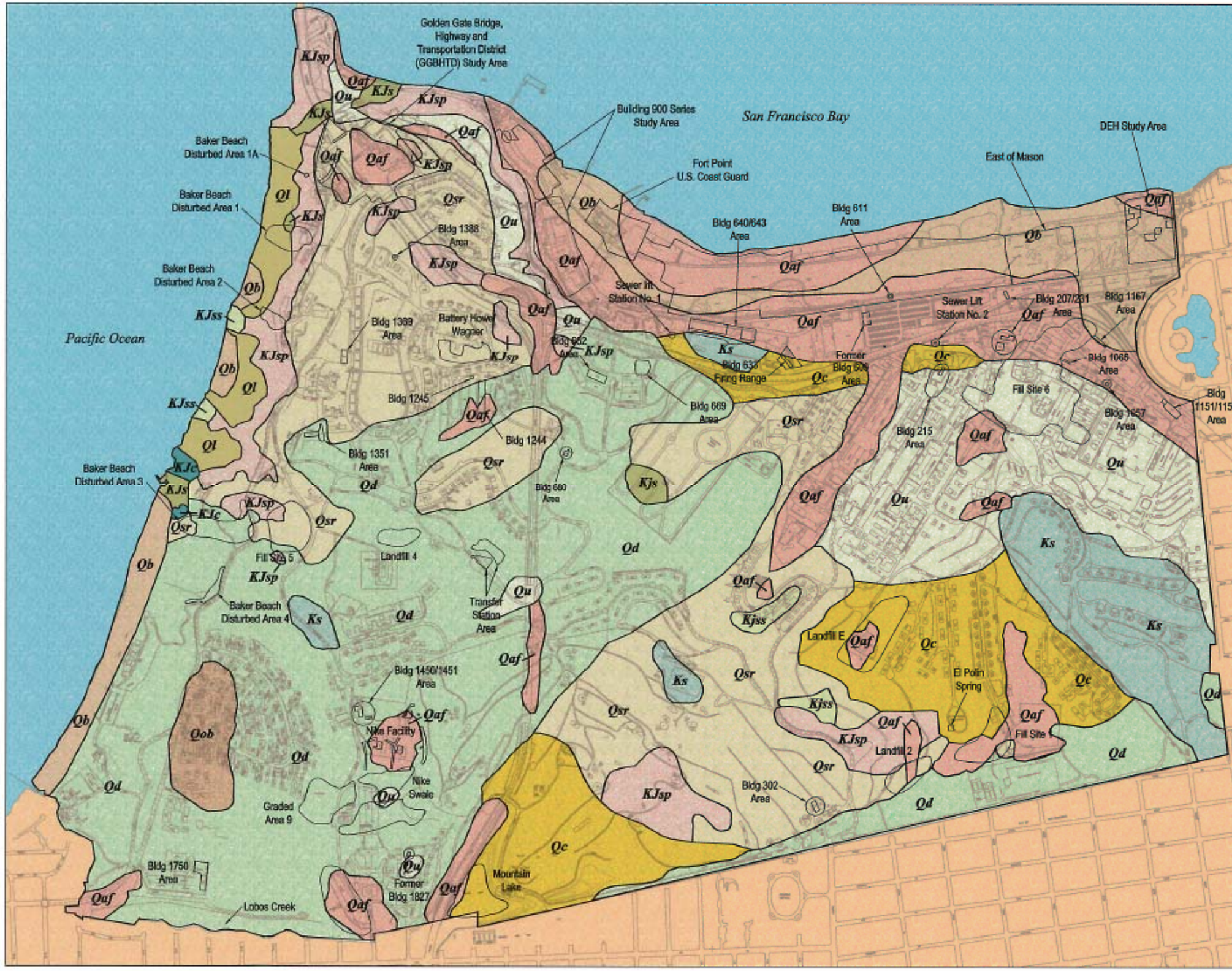
Table 3. Soil Descriptions for Samples from Colma Sites
Zinc Concentrations between 80 and 250 mg/kg

Sample Location	Sample ID	Date	Depth (ft)	Zinc (mg/kg)	Notes	Description	Interpretation	Add to Colma data set
BAPSB201	BAPSB201[3]	6/16/2010	3	180	Colma site	Silty sand; dark brown, fine to medium sand	No interpretation on log; appears to be Colma;outside of remediation area	Yes
BAPSB204	BAPSB204[1]	6/17/2010	1	110	Colma site	Silty sand; dark brown, fine to medium sand	No interpretation on log; appears to be Colma; inside remediation area; firing range fan	No
BAPSB204	BAPSB204[0.3]	6/17/2010	0.3	170	Colma site	Silty sand dark brown, fine to medium sand	No interpretation on log; appears to be Colma; inside remediation area; firing range fan	No
BAPSB205	BAPSB205[3]	6/17/2010	3	87	Colma site	Silty sand; dark brown, fine to medium sand	No interpretation on log; appears to be Colma; inside remediation area; firing range fan	No
BAPSB205	BAPSB205[0.3]	6/17/2010	0.3	110	Colma site	Silty sand; dark brown, fine to medium sand	No interpretation on log; appears to be Colma; inside remediation area; firing range fan	No
BAPSB206	BAPSB206[1]	6/17/2010	1	80	Colma site	Silty sand; dark brown, fine to medium sand	No interpretation on log; appears to be Colma; inside remediation area; firing range fan	No
BAPSB206	BAPSB206[0.3]	6/17/2010	0.3	150	Colma site	Silty sand; dark brown, fine to medium sand	No interpretation on log; appears to be Colma; inside remediation area; firing range fan	No
BAPSB207	BAPSB207[3]	6/17/2010	3	120	Colma site	Silty sand; dark brown fine to coarse sand	No interpretation on log; appears to be Colma; inside remediation area; firing range fan	No
BAPSB207	BAPSB207[0.3]	6/17/2010	0.3	150	Colma site	Silty sand; dark brown fine to coarse sand	No interpretation on log; appears to be Colma; inside remediation area; firing range fan	No
BAPSB208	BAPSB208[1]	6/17/2010	1	150	Colma site	Silty sand dark brown, fine to medium sand	No interpretation on log; appears to be Colma; inside remediation area; firing range fan	No
BAPSB213	BAPSB213[0.3]	8/26/2010	0.3	160	Colma site		inside remediation area; firing range fan	No
BAPSB213	BAPSB213[4.5]	8/26/2010	4.5	180	Colma site		inside remediation area; firing range fan	No
BAPSB215	BAPSB215[3.3]	8/26/2010	3.3	96	Colma site		in drainage	No
BAPSB215	BAPSB215[0.3]	8/26/2010	0.3	160	Colma site		in drainage	No
BAPSB217	BAPSB217[0.3]	8/26/2010	0.3	120	Colma site		outside of remediation area	No
BAPSB218	BAPSB218[0.3]	8/26/2010	0.3	150	Colma site		inside remediation area; firing range fan	No
CFLSB100	CFLSB100(0.5)	12/3/2004	0.5	170	Colma site	Olive brown silty sand; some gravel in top 6 inches	No interpretation on log appears to be disturbed Colma. Sample also contains lead above the CUL	No
CFLSS100	CFLSS100(0.5)	12/3/2004	0.5	100	Colma site	no log		No
DAEPZ102	DAEPZ102-14.5-15.5	11/13/2002	NA	160	Colma site	Fill (sand with silt); greenish black, debris (glass pieces, wood fragments)	Fill	No
DAETP102	DAETP102-15	11/22/2002	NA	91	Colma site	Clayey sand (Native) gray, no debris	Colma	Yes
DAETP104	DAETP104-1-4	11/21/2002	NA	230	Colma site	Fill	Fill	No
LF1EX131	LF1EX131[0.0]	8/13/2010	NA	91	Colma site	Dark brown well graded sand; native (Dune Sand)	Dune sand	No
LF1EX132	LF1EX132[3.0]	8/16/2010	NA	100	Colma site	Dark yellowish brown silty sand; native (Colma)	Colma	Yes
LF1EX137	LF1EX137[0.0]	8/13/2010	NA	120	Colma site	Dark brown poorly graded sand, trace gravel (Fill)	Fill	No
LF1EX137	LF1EX137[3.0]	8/16/2010	NA	160	Colma site	Brown well graded sand with sit and gravel; 10% chert and serpentinite gravel; 15% debris (Debris fill)	Fill	No
LF1EX140	LF1EX140[0.0]	8/17/2010	NA	110	Colma site	Brown well graded sand with gravel (fill)	Fill	No
LF1EX142	LF1EX142[0.0]	8/17/2010	NA	250	Colma site	Brown clayey sand; 5% gravel (fill)	Fill	No
LF1EX148	LF1EX148[3.0]	8/18/2010	NA	84	Colma site	Dark grayish brown clayey gravle with sand; granitic and serpentinite gravel (fill)	Fill	No
LF1TP200	LF1TP200[5.0]	3/11/2009	NA	110	Colma site	Dark yelowish brown sandy silt 20% debris (Fill with debris)	Fill	No
LF1TP202	LF1TP202[0.0]	3/11/2009	NA	150	Colma site	Very dark brown sandy silt; 20% debris (Fill with debris)	Fill	No
LF1TP206	LF1TP206[0.5]	3/12/2009	NA	84	Colma site	Dark brown sandy silt (fill)	Fill	No
LF1TP216	LF1TP216[2.0]	4/1/2009	NA	85	Colma site	Dark olive grey clayey gravel (fill)	Fill	No
LF1TP220	LF1TP220[0.0]	4/1/2009	NA	110	Colma site	Very dark brown silty sand (top soil over Dune sand)	Dune sand	No
LF1TP226	LF1TP226[4.0]	4/2/2009	NA	120	Colma site	Olive grey gravel and broken serpentinite (fill)	Fill	No
LF1SB201	LF1SB201[2.0]	5/21/2009	NA	130	Colma site	Dark grayish brown poorly graded sand with clay, 10% gravel up to 0.5 inches in diameter (Fill)	Fill	No

	Colma fm
	Dune Sand
	Fill or no interpretation

ATTACHMENT 1

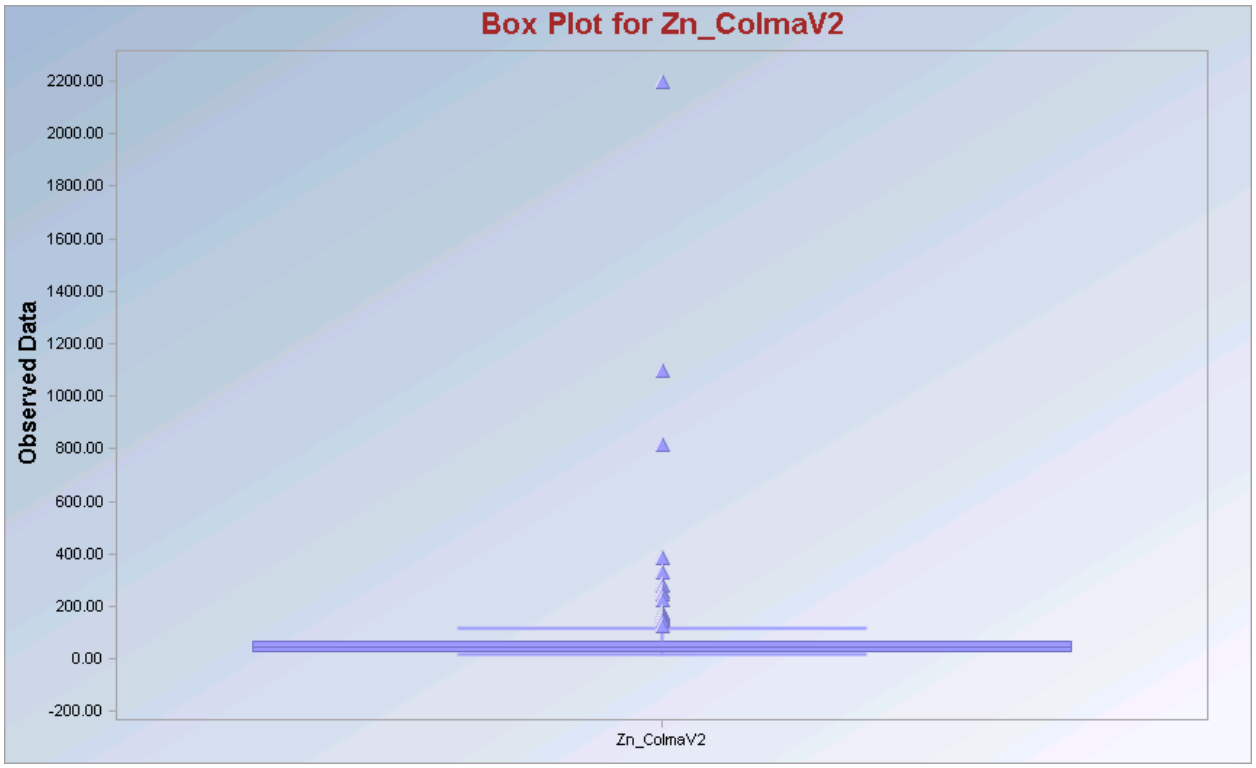
Figure 6-1 from the Cleanup Level Document – Surface Deposits at the Presidio


Golden Gate Bridge, Highway and Transportation District (GGBHTD) Study Area
Building 900 Series Study Area
San Francisco Bay
DEH Study Area
East of Mason
Fort Point U.S. Coast Guard
Baker Beach Disturbed Area 1A
Baker Beach Disturbed Area 1
Baker Beach Disturbed Area 2
Baker Beach Disturbed Area 3
Baker Beach Disturbed Area 4
Pacific Ocean
Bldg 1388 Area
Bldg 640/643 Area
Bldg 611 Area
Sewer Lift Station No. 1
Sewer Lift Station No. 2
Bldg 207/231 Area
Bldg 1167 Area
Bldg 1069 Area
Bldg 1369 Area
Battery Howe Wagner
Bldg 652 Area
Bldg 633 Firing Range
Former Bldg 608 Area
Bldg 669 Area
Fill Site 6
Bldg 1151/1153 Area
Bldg 1657 Area
Bldg 215 Area
Bldg 1245
Bldg 1244
Bldg 1351 Area
Bldg 680 Area
Fill Site 5
Landfill 4
Transfer Station Area
Bldg 1450/1451 Area
Nike Facility
Nike Swale
Graded Area 9
Bldg 1750 Area
Lobos Creek
Former Bldg 1827
Mountain Lake
Landfill E
El Polin Spring
Fill Site 1
Landfill 2
Bldg 302 Area
N
0 800 1600
(Approximate Scale in Feet)
LEGEND
Quarternary Surficial Deposits
Qaf Artificial Fill
Qb Modern Beach Deposits
Qsr Slope Debris & Ravine Fill
Qd Dune Sand
Ql Landslide Deposits
Qu Undivided Surficial Deposits
Qob Older Beach Deposits
Qc Colma Formation
Mesozoic Franciscan Formation Bedrock
Ks Undifferentiated Sheared Rocks
KJsp Serpentinite
KJc Radiolarian Chert & Shale
KJss Sandstone
KJs Undifferentiated Sandstone & Shale
Notes:
1. All locations are approximate.
2. Figure modified from Montgomery Watson, Draft Basewide Groundwater Monitoring Plan, July 1996.
Erler & Kalinowski, Inc.
Surface Deposits at the Presidio
Presidio Trust
San Francisco, CA
October 2002
EKI A000003.04
Figure 6-1

ATTACHMENT 2

Colma Formation Data Set - Descriptive Statistics, Box and Whisker Plots, and Probability Plots

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	From File: C:\Projects\Presidio\2012\2012_08_07_Zn_ColmaV2\ProUCLDataFile.wst												
2													
3	Summary Statistics for Log-Transformed Full Data Sets												
4													
5	Variable		NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
6	Zn_ColmaV2		285	2.485	7.696	3.836	3.761	0.536	0.732	0.636	1.349	3.916	0.191
7													
8	Percentiles for Log-Transformed Full Data Sets												
9													
10	Variable		NumObs	5%ile	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
11	Zn_ColmaV2		285	2.863	3.045	3.258	3.332	3.761	4.19	4.293	4.7	5.075	6.085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Observed Data
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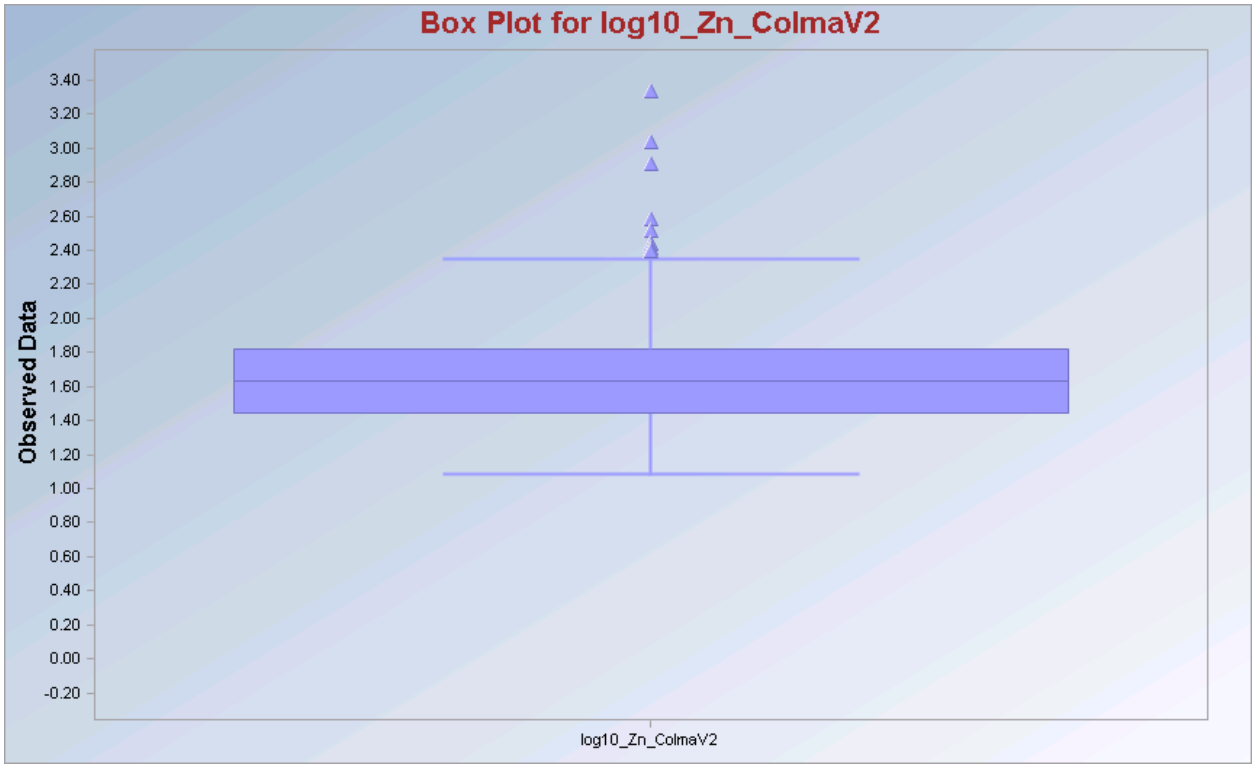
1800.00
1600.00
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
-200.00
Zn_ColmaV2


Box Plot for log10_Zn_ColmaV2
Observed Data
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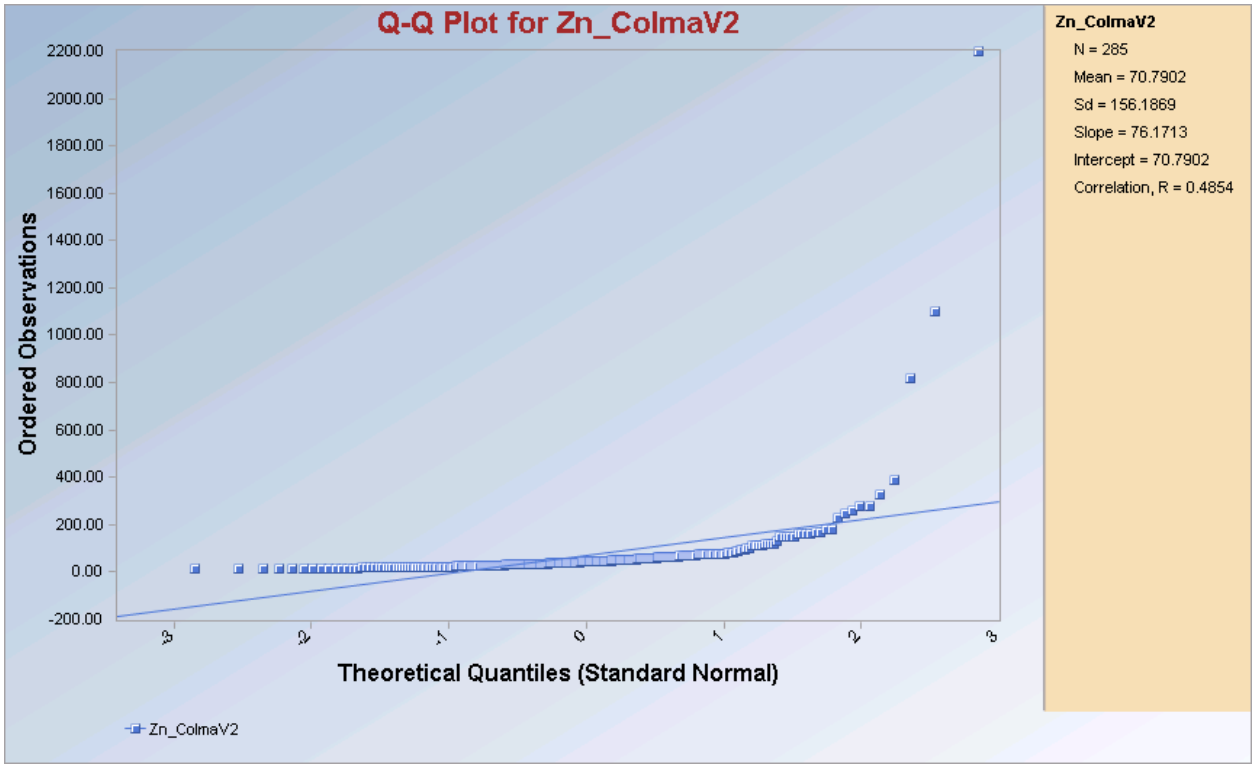
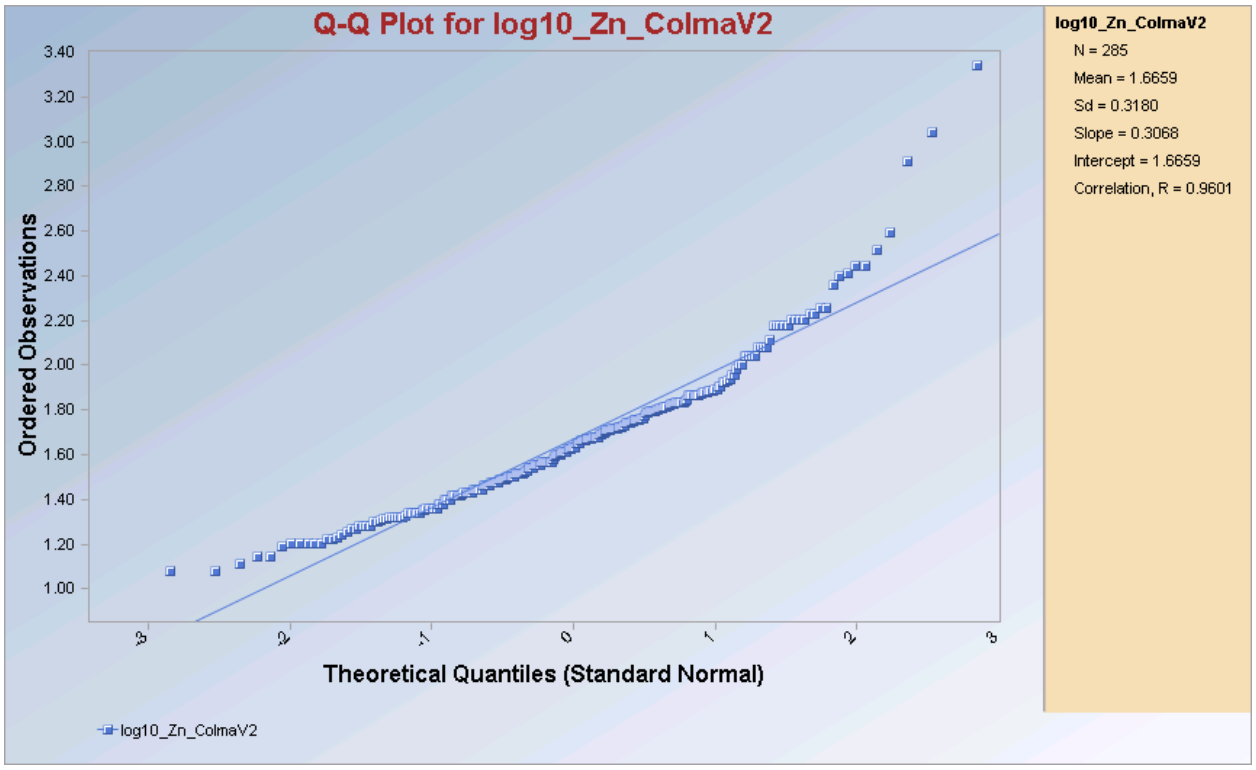
3.20
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
log10_Zn_ColmaV2


Q-Q Plot for Zn_ColmaV2
Ordered Observations
2200.00
2000.00
1800.00
1600.00
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
-200.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Zn_ColmaV2
Zn_ColmaV2
N = 285
Mean = 70.7902
Sd = 156.1869
Slope = 76.1713
Intercept = 70.7902
Correlation, R = 0.4854


Q-Q Plot for log10_Zn_ColmaV2
Ordered Observations
3.40
3.20
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
log10_Zn_ColmaV2
log10_Zn_ColmaV2
N = 285
Mean = 1.6659
Sd = 0.3180
Slope = 0.3068
Intercept = 1.6659
Correlation, R = 0.9601

ATTACHMENT 3

Mixed Colma Formation and Beach Dune Data Set - Descriptive Statistics, Box and Whisker Plots, and Probability Plots

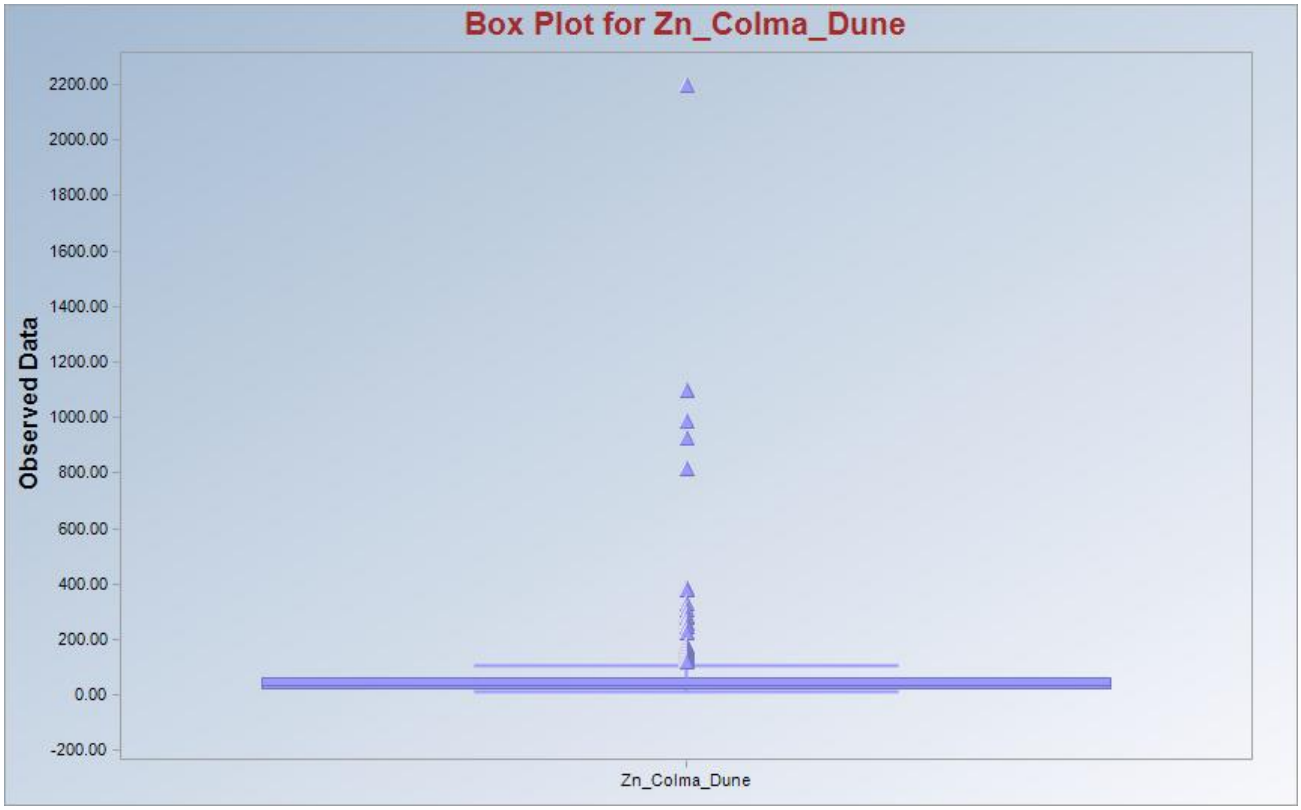
From File: C:\Projects\Presidio\2012\2012_08_15_Zn_Colma_Dune_V3\Zn_Colma_Dune.wst

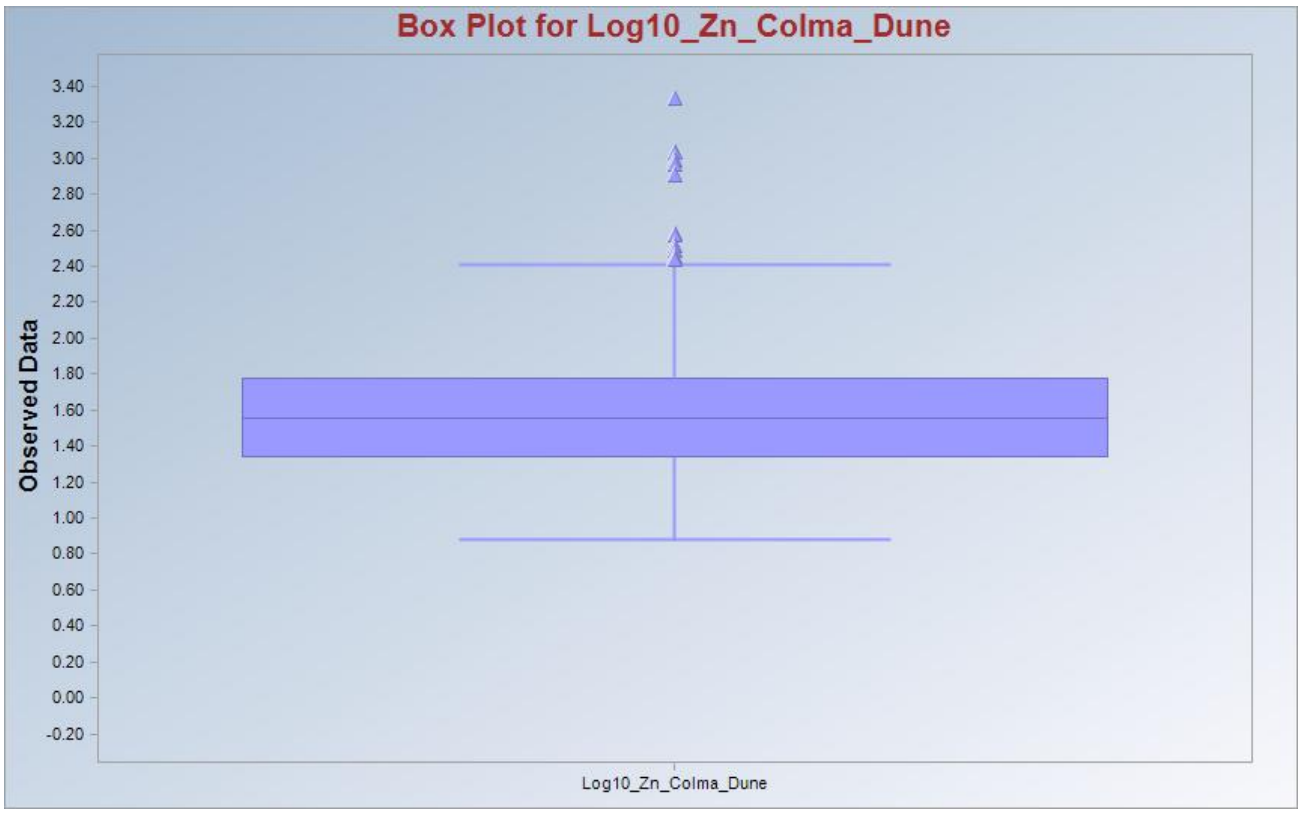
Summary Statistics for Combined Colma Formation and Dune Sand

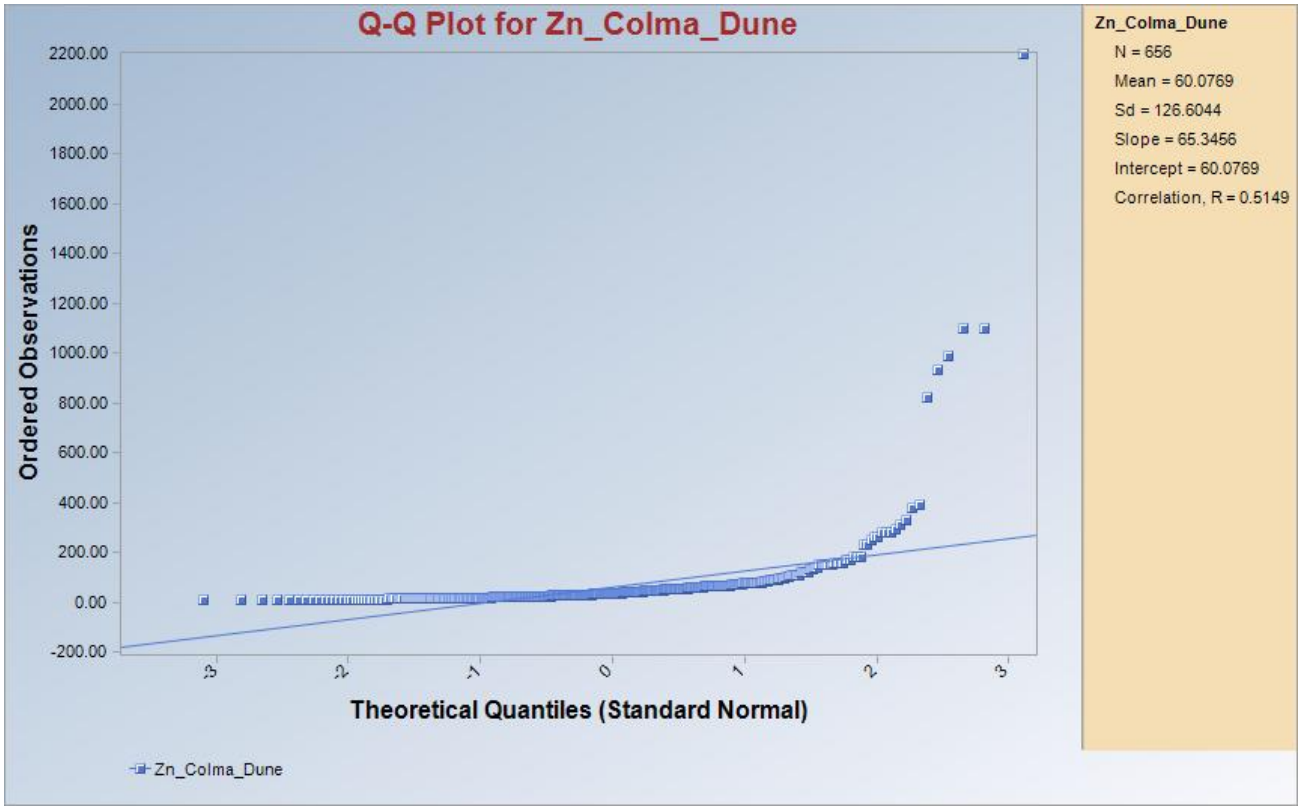
Variable	NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
Zn_Colma_Dune	656	7.45	2200	60.08	36	16029	126.6	25.2	10.67	147	2.107
Log10_Zn_Colma_Dune	656	0.872	3.342	1.586	1.556	0.115	0.339	0.318	1.045	2.482	0.214

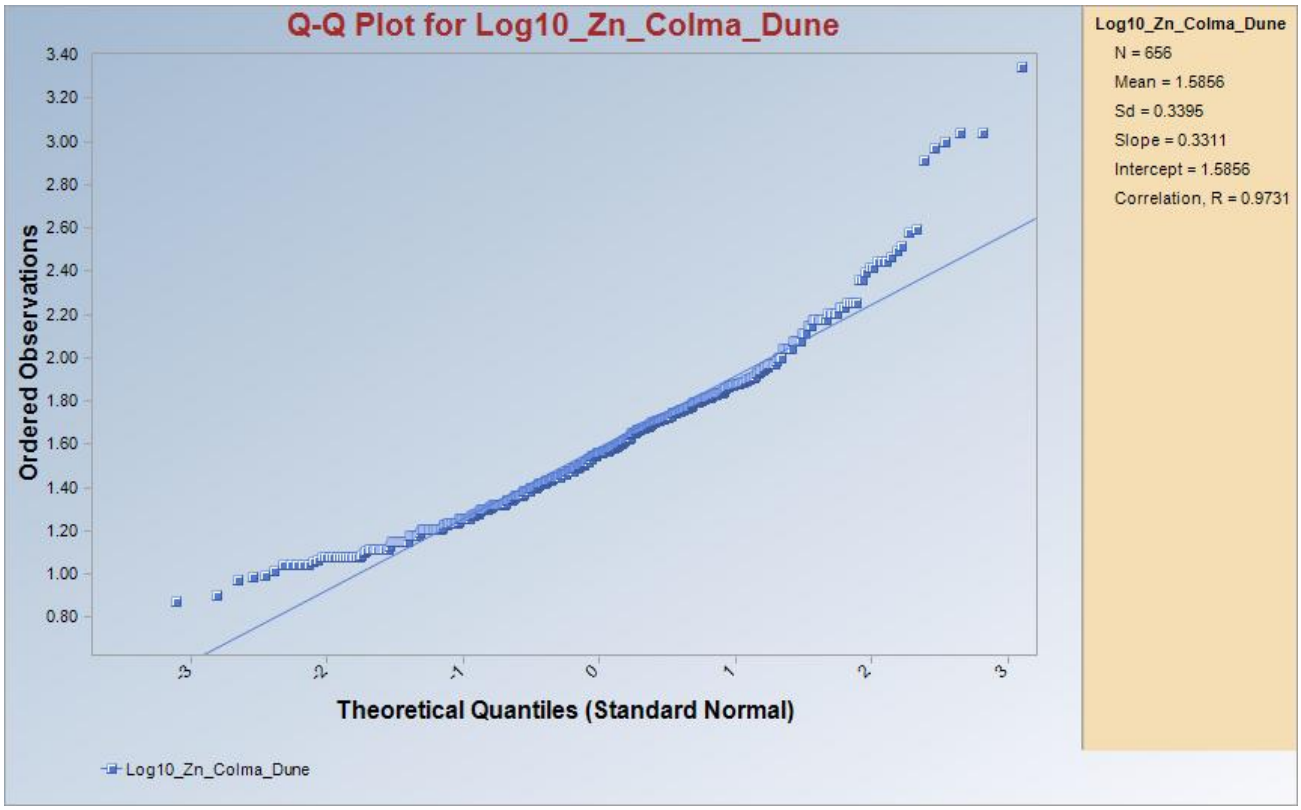
Percentiles for Raw Full Data Sets

Variable	NumObs	5%ile	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
Zn_Colma_Dune	656	13	16	20	22	36	59.25	67	93	150	384.5
Log10_Zn_Colma_Dune	656	1.114	1.204	1.301	1.342	1.556	1.773	1.826	1.968	2.176	2.585


Box Plot for Zn_Colma_Dune
Observed Data
2200.00
2000.00
1800.00
1600.00
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
-200.00
Zn_Colma_Dune


Box Plot for Log10_Zn_Colma_Dune
Observed Data
3.40
3.20
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
Log10_Zn_Colma_Dune


Q-Q Plot for Zn_Colma_Dune
Ordered Observations
Theoretical Quantiles (Standard Normal)
Zn_Colma_Dune
Zn_Colma_Dune
N = 656
Mean = 60.0769
Sd = 126.6044
Slope = 65.3456
Intercept = 60.0769
Correlation, R = 0.5149


Q-Q Plot for Log10_Zn_Colma_Dune
Ordered Observations
Theoretical Quantiles (Standard Normal)
Log10_Zn_Colma_Dune
Log10_Zn_Colma_Dune
N = 656
Mean = 1.5856
Sd = 0.3395
Slope = 0.3311
Intercept = 1.5856
Correlation, R = 0.9731

ATTACHMENT 4

Pro UCL Output

	A	B	C	D	E	F	G	H	I	J	K	L
1				General Background Statistics - Colma formation								
2			User Selected Options									
3			From File	C:\Projects\Presidio\2012\2012_08_15_Zn_Colma_Dune_V3\Zn_Colma_BK_LE_79_plus.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Coverage	90%								
7			Different or Future K Values	1								
8			Number of Bootstrap Operations	2000								
9												
10												
11	Zn_Colma_BK_LE_79_plus											
12												
13						General Statistics						
14						Total Number of Observations	244			Number of Distinct Observations	96	
15						Tolerance Factor	1.432					
16												
17						Raw Statistics				Log-Transformed Statistics		
18						Minimum	12			Minimum	2.485	
19						Maximum	180			Maximum	5.193	
20						Second Largest	100			Second Largest	4.605	
21						First Quartile	26.3			First Quartile	3.27	
22						Median	37			Median	3.611	
23						Third Quartile	54.25			Third Quartile	3.994	
24						Mean	41.71			Mean	3.622	
25						Geometric Mean	37.4			SD	0.473	
26						SD	20.2					
27						Coefficient of Variation	0.484					
28						Skewness	1.659					
29												
30						Background Statistics						
31						Normal Distribution Test				Lognormal Distribution Test		
32						Lilliefors Test Statistic	0.105			Lilliefors Test Statistic	0.0627	
33						Lilliefors Critical Value	0.0567			Lilliefors Critical Value	0.0567	
34						Data not Normal at 5% Significance Level				Data not Lognormal at 5% Significance Level		
35												
36						Assuming Normal Distribution				Assuming Lognormal Distribution		
37						95% UTL with 90% Coverage	70.63			95% UTL with 90% Coverage	73.59	
38						95% UPL (t)	75.13			95% UPL (t)	81.77	
39						90% Percentile (z)	67.6			90% Percentile (z)	68.55	
40						95% Percentile (z)	74.94			95% Percentile (z)	81.39	
41						99% Percentile (z)	88.7			99% Percentile (z)	112.3	
42												
43						Gamma Distribution Test				Data Distribution Test		
44						k star	4.684			Data Follow Appr. Gamma Distribution at 5% Significance Level		
45						Theta Star	8.905					
46						MLE of Mean	41.71					
47						MLE of Standard Deviation	19.27					
48						nu star	2286					
49												

	A	B	C	D	E	F	G	H	I	J	K	L
50					A-D Test Statistic	1.095				**Nonparametric Statistics**		
51					5% A-D Critical Value	0.757					90% Percentile	68
52					K-S Test Statistic	0.0549					95% Percentile	74
53					5% K-S Critical Value	0.0587					99% Percentile	85.41
54	**Data follow Appx. Gamma Distribution at 5% Significance Level**											
55												
56				**Assuming Gamma Distribution**						95% UTL with	90% Coverage	73
57					90% Percentile	67.53			95% Percentile Bootstrap UTL with		90% Coverage	73
58					95% Percentile	77.62			95% BCA Bootstrap UTL with		90% Coverage	69.7
59					99% Percentile	99.02					95% UPL	74.75
60											95% Chebyshev UPL	129.9
61					95% WH Approx. Gamma UPL	77.61					Upper Threshold Limit Based upon IQR	96.18
62					95% HW Approx. Gamma UPL	78.4						
63				95% WH Approx. Gamma UTL with	90% Coverage	71.32						
64				95% HW Approx. Gamma UTL with	90% Coverage	71.73						
65												
66												

	A	B	C	D	E	F	G	H	I	J	K	L
1				General Background Statistics for Combined Colma Formation and Dune Sand								
2			User Selected Options									
3			From File	C:\Projects\Presidio\2012\2012_08_15_Zn_Colma_Dune_V3\Zn_Colma_Dune.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Coverage	90%								
7			Different or Future K Values	1								
8			Number of Bootstrap Operations	2000								
9												
10												
11	Zn_Colma_Beach_LE100											
12												
13						General Statistics						
14						Total Number of Observations	597			Number of Distinct Observations	171	
15						Tolerance Factor	1.375					
16												
17						Raw Statistics				Log-Transformed Statistics		
18						Minimum	7.45			Minimum	2.008	
19						Maximum	100			Maximum	4.605	
20						Second Largest	100			Second Largest	4.605	
21						First Quartile	21			First Quartile	3.045	
22						Median	32			Median	3.466	
23						Third Quartile	52			Third Quartile	3.951	
24						Mean	38.29			Mean	3.487	
25						Geometric Mean	32.7			SD	0.573	
26						SD	21.38					
27						Coefficient of Variation	0.558					
28						Skewness	0.817					
29												
30						Background Statistics						
31						Normal Distribution Test				Lognormal Distribution Test		
32						Lilliefors Test Statistic	0.117			Lilliefors Test Statistic	0.0598	
33						Lilliefors Critical Value	0.0363			Lilliefors Critical Value	0.0363	
34						Data not Normal at 5% Significance Level				Data not Lognormal at 5% Significance Level		
35												
36						Assuming Normal Distribution				Assuming Lognormal Distribution		
37						95% UTL with 90% Coverage	67.7			95% UTL with 90% Coverage	71.92	
38						95% UPL (t)	73.54			95% UPL (t)	84.11	
39						90% Percentile (z)	65.69			90% Percentile (z)	68.15	
40						95% Percentile (z)	73.45			95% Percentile (z)	83.92	
41						99% Percentile (z)	88.02			99% Percentile (z)	124	
42												
43						Gamma Distribution Test				Data Distribution Test		
44						k star	3.307			Data do not follow a Discernable Distribution (0.05)		
45						Theta Star	11.58					
46						MLE of Mean	38.29					
47						MLE of Standard Deviation	21.06					
48						nu star	3948					
49												

	A	B	C	D	E	F	G	H	I	J	K	L
50					A-D Test Statistic	4.042				**Nonparametric Statistics**		
51					5% A-D Critical Value	0.761					90% Percentile	70
52					K-S Test Statistic	0.0638					95% Percentile	79
53					5% K-S Critical Value	0.0384					99% Percentile	93.04
54		**Data not Gamma Distributed at 5% Significance Level**										
55												
56			**Assuming Gamma Distribution**								95% UTL with 90% Coverage	74
57					90% Percentile	66.53					95% Percentile Bootstrap UTL with 90% Coverage	74
58					95% Percentile	78.17					95% BCA Bootstrap UTL with 90% Coverage	74
59					99% Percentile	103.3					95% UPL	79.1
60											95% Chebyshev UPL	131.6
61					95% WH Approx. Gamma UPL	78.08					Upper Threshold Limit Based upon IQR	98.5
62					95% HW Approx. Gamma UPL	79.22						
63					95% WH Approx. Gamma UTL with 90% Coverage	69.19						
64					95% HW Approx. Gamma UTL with 90% Coverage	69.69						
65												
66												

APPENDIX F

CEQA Notice of Exemption

CALIFORNIA ENVIRONMENTAL QUALITY ACT
NOTICE OF EXEMPTION

To: Office of Planning and Research
State Clearinghouse
P.O. Box 3044, 1400 Tenth Street, Room 212
Sacramento, CA 95812-3044

From: Department of Toxic Substances Control
Brownfields and Environmental Restoration Program
700 Heinz Avenue
Berkeley, CA 94710

Project Title: Barnard Avenue Protected Range

Project Location: Barnard Avenue and Fernandez Street
Presidio of San Francisco
San Francisco, CA 94129

County: San Francisco

Project Description:

The Project involves the approval of a Remedial Action Workplan (RAW) by the Department of Toxic Substances Control (DTSC) pursuant to Health and Safety Code, Chapter 6.8 as submitted on May 25, 2010 by Geosyntec on behalf of The Presidio Trust. The RAW was prepared in accordance with Health & Safety Code sections 25323.1 and 25356.1 (h).

Background:

The Barnard Avenue Protected Range (BAPR) is a former small arms firing range within the western drainage of the Tennessee Hollow area of the Presidio of San Francisco (Presidio). It is believed to have been constructed prior to 1907. It is located in the northernmost area bounded by Barnard Avenue, Quarry Road, and Fernandez Street (Site).

Over 85 soil samples have been collected from the BAPR during remedial investigations conducted between 2003 and 2012. Metals, pesticides, and total petroleum hydrocarbons as diesel (TPH-d) were identified as the potential chemicals of concern (PCOCs) for soil. Based on the conceptual site model, the only potential exposure risk from PCOCs are to ecological species in the drainage swale. Concentrations of PCOCs are not considered a threat to human health. Risks to ecological receptors were evaluated in the RAW through a health risk assessment and antimony, copper, lead, zinc, TPH-d, chlordane, 4,4'-DDE, and 4,4'-DDT in soil were identified as constituents of concern (COCs) that pose a potential risk to ecological receptors within the drainage swale at the BAPR.

The eastern side of the Site is mapped as an ecological buffer zone in the Presidio Cleanup Level Document (2002). The western side of the Site is mapped as an ecological special status zone. The Tennessee Hollow Drainage Area of the BAPR is designated as a freshwater ecological protection zone. Across these three zones, soil cleanup levels for COCs vary. The cleanup levels for every COC in each zone of the BAPR are summarized in Attachment 1.

Project Activities:

Excavation and Disposal is the most protective and cost-effective remedy for the Site. The proposed excavation covers an area of approximately 20,900 square feet or 0.5 acre. The depth of the excavation is primarily surficial, ranging from 0.5 to 15 feet throughout the drainage swale. The volume of excavated soil is estimated at 1,305 cubic yards. Confirmation sampling will be conducted following excavation to confirm that the remaining COC concentrations meet the remedial action objectives. Soil will not be excavated deeper than 1.5 feet below ground surface in certain areas to protect trees that are to be preserved. Within the excavation area, the highest detected soil concentrations were 7 milligrams per kilogram (mg/kg) for antimony, 38 mg/kg for copper, 110 mg/kg for lead, 210 mg/kg for zinc, 280 mg/kg for TPH-d, 32 micrograms per kilogram (µg/kg) for chlordane, 27 µg/kg for 4,4'-DDE, and 46 µg/kg for 4,4'-DDT. Following waste characterization, the excavated soil will be properly disposed of offsite.

Prior to the start of excavation activities, perimeter fencing will be installed around the project work area. The staging area will be at the south end of Barnard Avenue. Neighbors and nearby residents will be notified of the commencement of the project activities, roadway detours, hours of operation, and expected length of time that the project will take. The closest school or daycare to the project site is Cow Hollow School, which is approximately 1150 feet away from the project site. The removal action is scheduled to commence in Spring/Summer 2013 and will last approximately four weeks. The estimated cost of the removal action is $449,400.

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Name of Public Agency Approving Project: Department of Toxic Substances Control

Name of Person or Agency Carrying Out Project: The Presidio Trust

Exemption Status: (check one)

☐ Ministerial [PRC, Sec. 21080(b)(1); CCR, Sec. 15268]
☐ Declared Emergency [PRC, Sec. 21080(b)(3); CCR, Sec.15269(a)]
☐ Emergency Project [PRC, Sec. 21080(b)(4); CCR, Sec.15269(b)(c)]
☒ Categorical Exemption: [Class 30, T14 CCR §15330]
☐ Statutory Exemptions: [State code section number]
☐ General Rule [CCR, Sec. 15061(b)(3)]

Exemption Title: Minor Actions, to Prevent, Minimize, Stabilize, Mitigate, or Eliminate the Release or Threat of Release of Hazardous Waste or Hazardous Substances.

Reasons Why Project is Exempt:

1. This project serves to prevent, minimize, stabilize, mitigate, or eliminate the release or threat of release of hazardous substances. The project does not exceed $1 million in cost. The project does not involve the onsite use of a hazardous waste incinerator or thermal treatment unit or the relocation or residences or businesses. The action does not involve the potential release into the air of volatile organic compounds. The project is not part of a succession of projects of the same type in the same place and, therefore would not over time lead to a significant cumulative impact. There are no unusual circumstances associated with the project; therefore, a reasonable possibility does not exist that the project would have a significant effect on the environment. The project is not located within a scenic highway and therefore would not result in damage to scenic resources. No substantial adverse change in the significance of a historical resource will occur as a result of this project. All actions are consistent with applicable state and local environmental permitting requirements.
2. The Presidio is a federally owned property and should not be listed on the Cortese List (CCR Title 22, Section 67400.1).
3. The project's estimated cost is $449,400. Actual excavation activities will be of short duration, lasting approximately 4 weeks. The removal is limited to approximately 1,305 cubic yards of soil that covers approximately 0.5 acre. The deepest excavation depth is 1.5 feet below ground surface. The soil cleanup levels are based on protection of ecological and human health receptors at the Site.
4. The staging area for remedial activities will be at the south end of Barnard Avenue.
5. Neighbors and nearby residents will be notified of the commencement of the project activities, roadway detours, hours of operation, and expected length of time that the project will take. Project activities will not endanger any sensitive receptors in schools or daycares. The closest school or daycare to the project site is Cow Hollow School, which is approximately 1150 feet away from the project site. Trucks will not be driving through school zones. The closest school or daycare to the truck route is Bright Horizons, at a distance of approximately 300 feet.
6. Air Quality and Greenhouse Gasses (GHG):
   A Dust Control Plan is included in the Removal Action Workplan to ensure that no significant dust impacts will result from project activities. If the dust control measures outlined in the Dust Control Plan cannot prevent visible dust plumes, dust monitoring will be conducted at upwind and downwind locations of the construction zone. An 8 hour time weighted average concentration of 100 $\mu g/m^3$ for particulate matter up to 10 micrometers in diameter (PM_{10}) will be used as the action level. This action level was developed in June 2011 for the remediation of Landfill E which is adjacent to the BAPR and is believed to be the source of COCs in the BAPR drainage. If the action level is exceeded, dust generating activities will be stopped until the PM_{10} concentration is below the action level.

   The Bay Area Air Quality Management District's (BAAQMD) Basic Construction Mitigation Measures will be implemented for the duration of the project. The Basic Construction Mitigation Measures are a list of 8 basic mitigation measures that the BAAQMD recommends for all proposed construction projects. This project meets all of the BAAQMD's screening criteria for construction-related impacts. Therefore, this project would result in a less than significant impact from criteria air pollutant and precursor emission.

   The California Emissions Estimator Model (CalEEMod 2011.1.1) estimated that GHG emissions for this project would be 37 metric tons (MT) of CO_2 equivalent annually. While the BAAQMD does not have threshold criteria for construction-related GHG emissions, the operational-related threshold of significance is 10,000 MT per year for stationary sources, and 1,100 MT per year for projects other than stationary sources. Because 37 MT is

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significantly lower than both of these numbers, the GHG emissions from this project are considered less than significant.

7. Biological Resources:
There are no known special-status biological resources at the Site. A search of the California Department of Fish and Game's Natural Diversity Database revealed no special-status species at the Site. The project protects onsite redwood trees and removes current non-native low-lying vegetation. Following the completion of the project, the area will be replanted with native plant species. A seasonal drainage swale identified as Lower Landfill E, was previously in the footprint of the BAPR. The swale was identified as having U.S. Fish and Wildlife Service wetland habitat. This swale was largely disturbed during the Landfill E remediation in 2011. As required by the Landfill E Feasibility Study/Remedial Action Plan, the drainage swale will be reestablished and enhanced at the conclusion of the BAPR remediation activities.
8. Cultural Resources: The excavation associated with the project is generally within native soil and shallow sedimentation within the drainage. Excavation will be completed by hand and small mechanical equipment. The potential to encounter significant historical archeological materials during project activities is considered low to moderate. However, all excavation within the predicted extents of *El Presidio de San Francisco* will be monitored by a qualified archeologist. The Archeological Management Assessment included in the Removal Action Workplan outlines the protocols that will be followed in the event of inadvertent discoveries.
9. Noise: Noise generated by remediation Project activities would be intermittent, dispersed, and limited to the duration of construction. Noise impacts would be generally limited to nearby sensitive receptors (residents), intermittent users, such as trail hikers, and other transitory visitors during daylight hours. Trucks traveling along Barnard Avenue could result in indoor sound levels of up to approximately 60 A-weighted decibels (dBA). Construction activities could result in indoor sound levels of up to approximately 70 dBA. During construction, contractors and other equipment operators would comply with the San Francisco noise ordinance, which requires that each piece of powered equipment, other than impact tools, emit noise levels no higher than 80 dBA measured at 100 feet from the equipment during daytime hours (7 A.M. to 8 P.M.). Control measures will be implemented to manage construction noise. The control measures will include, but will not be limited to, proper maintenance and tuning of equipment, placement of noisy equipment away from sensitive receptors as practicable, noise-control mufflers, and scheduling noisier operations during periods of low visitor use, to the extent feasible.
10. Transportation: A Transportation Plan is included in the Removal Action Workplan outlining all transportation-related procedures including detours, road closures, truck routes, truck staging and loading, and health and safety requirements. An estimated 100 truckloads will leave the BAPR Site. The project is anticipated to have up to 30 trucks per day leaving the BAPR Site over a period of 10 to 15 days between 8AM and 5PM. Soils will be transported by registered hazardous waste haulers and all trucks transporting hazardous material will be covered. Traffic control procedures that may be used during vehicle entry and exit include signs and a flag person. All vehicles will follow the access and haul routes designated in the Transportation Plan. Trucks will not drive through school or daycare zones in the Presidio, the closest school or daycares to the truck routes are Cow Hollow School and Bright Horizons. Cow Hollow School is approximately 325 feet away from the truck route and Bright Horizons is approximately 300 feet away from the truck route. All roadway closures and detours associated with this project have been specified in the Transportation Plan.

    a. Pedestrians and bicycles: Barnard Avenue will be closed to through traffic at Fernandez Street. Pedestrians and cyclists approaching the Project area from the south will use a detour around the Contractor's staging area permitting free access to other trails.
    b. Automobiles and light trucks: Non-project traffic will be barred from Barnard Avenue beyond (southwest) by a construction gate to be installed at Fernandez Street. Light vehicles on Project business are permitted to use all roads in the surrounding area. Project vehicles will not park in residential spaces that have been assigned to Presidio tenants without advance notice to residents and alternate designated parking nearby.
    c. Heavy Trucks: Heavy truck traffic will be strictly controlled within the Presidio. Trucks will only enter and exit the Presidio via the Lombard Gate or the Lincoln Boulevard entrance to the Golden Gate Bridge. Heavy trucks may not use the Presidio Gate, the Arguello Gate, the 15th Avenue Gate or the 25th Avenue Gate to enter or exit the Presidio. Trucks will enter and exit the work area by taking Presidio Boulevard to Barnard Avenue. The Contractor will post flaggers at the intersection of Barnard and Presidio Boulevard and other locations as needed on days when soil or other materials are being hauled into or out of the site. The Engineer and Trust staff will monitor the hauling operations and may direct the Contractor to supply more flaggers or rearrange traffic control devices as needed. Once out of the Presidio, trucks will follow major thoroughfares and signed routes approved for truck traffic. The contractor will repair any damage caused to roadways by trucking operations.

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Evidence to support the above reasons is documented in the project file record, available at:

Department of Toxic Substances Control
Brownfields Environmental Restoration Program
700 Heinz Avenue
Berkeley, California 94710

George Chow	Hazardous Substances Scientist	510 540 3879
Project Manager Name	Project Manager Title	Phone #

Branch Chief Signature	Date

Denise Tsuji	Supervising Hazardous Substances Scientist I	510 540 3824
Branch Chief Name	Branch Chief Title	Phone #

TO BE COMPLETED BY OPR ONLY

Date Received For Filing and Posting at OPR:

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Table 6
Applicable Cleanup Levels for PCOCs in Soil and Sediment at BAPR
Draft Removal Action Work Plan, Barnard Avenue Protected Range
The Presidio of San Francisco, California

	Cleanup Levels Applicable to Area Mapped as Ecological Buffer Zone[1]		Cleanup Levels Applicable to Area Mapped as Ecological Special Status Zone[2]		Cleanup Levels Applicable to Tennessee Hollow Drainage Area Designated as Freshwater Ecological Protection Zone[3]		
	Soil Cleanup Level: Ecological Buffer Zone, Human Health-Residential, Colma Lithology (mg/kg)[4]	Protection of Groundwater (mg/kg)[5]	Soil Cleanup Level: Ecological Special Status Zone, Human Health-Residential, Colma Lithology (mg/kg)[6]	Protection of Groundwater (mg/kg)[5]	Soil Cleanup Level: Ecological Special Status Zone, Human Health-Residential, Colma Lithology (mg/kg)[6]	Sediment Ecological Special Status (mg/kg)[7]	Protection of Groundwater (mg/kg)[5]
METALS							
Antimony	5	--	5	--	5	3	--
Copper	120	--	49	--	49	114	--
Lead	300	--	160	--	160	82	--
Selenium	1.1	--	0.5	--	0.5	1.6	--
Zinc	79	--	79	--	79	230	--
PETROLEUM HYDROCARBONS							
TPH Diesel C12-C24	700	15,000	700	15,000	700	144	15,000
ORGANOCHLORINE PESTICIDES							
4,4'-DDE	0.61	--	0.098	--	0.098	0.016	--
4,4'-DDD	0.53	--	0.049	--	0.049	0.016	--
4,4'-DDT	0.53	--	0.0082	--	0.0082	0.032	--
alpha-Chlordane [8]	0.04	--	0.009	--	0.009	0.01	--
gamma-Chlordane [8]	0.04	--	0.009	--	0.009	0.01	--

Notes:

1. Ecological Buffer Zone cleanup levels apply to the east side of the site in the area mapped as an ecological buffer zone in the Cleanup Level Document (EKI, 2002).

2. Ecological Special Status Zone cleanup levels apply to the west side of the site (outside of the drainage area) in the area mapped as a special status species zone in the Cleanup Level Document (EKI, 2002).

3. Cleanup levels within the Tennessee Hollow drainage area, which is designated as a freshwater ecological protection zone (RWQCB, 2003) and mapped as a special status species zone in the Cleanup Level Document (EKI, 2002), are the more stringent of the levels between the Ecological Special Status and Freshwater Sediment criteria.

4. Soil cleanup levels are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-2: "Summary of Selection of Preliminary Remediation Goals and Proposed Cleanup Levels for Non-Petroleum Compounds in Soil". Listed criteria represent the applicable value of the following criteria: Proposed Buffer Zone PRGs, Human Health Residential PRGs, Colma fm. Background. Listed PRGs for metals are selected as applicable per EKI 2002 Table 7-2 footnote f. Background level for zinc based on revised value reported in the *Draft Development of Zinc Background Levels for Colma Formation and Mixed Beach Dune and Colma Formation Soils (AMEC, 2012).*

5. Soil and sediment cleanup levels for protection of groundwater are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-5 "Human Health and Ecological Cleanup Levels for Petroleum Hydrocarbons and Constituents in Soil and Sediments". Listed criteria represent cleanup level for soil or sediment to Maintain Drinking Water Standard in Groundwater, Greater than 5 Feet above Groundwater (for petroleum products only).

6. Soil cleanup levels are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-2: "Summary of Selection of Preliminary Remediation Goals and Proposed Cleanup Levels for Non-Petroleum Compounds in Soil" and Table 7-5 "Human Health and Ecological Cleanup Levels for Petroleum Hydrocarbons and Constituents in Soil and Sediments". Listed criteria represent the applicable value of the following criteria: Proposed Special Status PRGs, Human Health Residential PRGs, Colma fm. Background. Background level for zinc based on revised value reported in the Draft Development of Zinc Background Levels for Colma Formation and Mixed Beach Dune and Colma Formation Soils (AMEC, 2012).

7. Sediment PRGs are taken from the Presidio Cleanup Level Document (EKI, 2002), Table 7-3: "Ecological Cleanup Levels for Non-Petroleum Compounds in Sediment at the Presidio of San Francisco (Freshwater)".

8. Chlordane cleanup level was used for alpha-Chlordane and gamma-Chlordane.

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Bay Area AQMD Air District, Annual

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1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric
City Park	0.5	Acre

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Utility Company**
Climate Zone	5	**Precipitation Freq (Days)**	64	

1.3 User Entered Comments

Project Characteristics -

Land Use -

Construction Phase - Project includes no demlotion, building construction, paving, or architectural coating. Project phases are site preparation, trenching, and grading.

Off-road Equipment -

Off-road Equipment -

Off-road Equipment -

Trips and VMT - 66 miles to planned disposal facility at Hay Road Landfill, Vacaville, California.

Grading - 1300 cy of contaminated soil excavated and offhauled. 1300 cy of fill to replace it.

Construction Off-road Equipment Mitigation -

Mobile Land Use Mitigation -

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2013	0.04	0.31	0.21	0.00	0.05	0.02	0.07	0.00	0.02	0.02	0.00	35.93	35.93	0.00	0.00	36.00
Total	**0.04**	**0.31**	**0.21**	**0.00**	**0.05**	**0.02**	**0.07**	**0.00**	**0.02**	**0.02**	**0.00**	**35.93**	**35.93**	**0.00**	**0.00**	**36.00**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2013	0.04	0.31	0.21	0.00	0.01	0.02	0.03	0.00	0.02	0.02	0.00	35.93	35.93	0.00	0.00	36.00
Total	**0.04**	**0.31**	**0.21**	**0.00**	**0.01**	**0.02**	**0.03**	**0.00**	**0.02**	**0.02**	**0.00**	**35.93**	**35.93**	**0.00**	**0.00**	**36.00**

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2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Energy	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mobile	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.77	0.77	0.00	0.00	0.77
Waste						0.00	0.00		0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.02
Water						0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.77**	**0.78**	**0.00**	**0.00**	**0.79**

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2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Energy	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mobile	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.77	0.77	0.00	0.00	0.77
Waste						0.00	0.00		0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.02
Water						0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.77**	**0.78**	**0.00**	**0.00**	**0.79**

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3.0 Construction Detail

3.1 Mitigation Measures Construction

3.2 Site Preparation - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.01	0.06	0.04	0.00		0.00	0.00		0.00	0.00	0.00	6.36	6.36	0.00	0.00	6.38
Total	**0.01**	**0.06**	**0.04**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**6.36**	**6.36**	**0.00**	**0.00**	**6.38**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.25	0.00	0.00	0.26
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.25**	**0.25**	**0.00**	**0.00**	**0.26**

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3.2 Site Preparation - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.01	0.06	0.04	0.00		0.00	0.00		0.00	0.00	0.00	6.36	6.36	0.00	0.00	6.38
Total	**0.01**	**0.06**	**0.04**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**6.36**	**6.36**	**0.00**	**0.00**	**6.38**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.25	0.00	0.00	0.26
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.25**	**0.25**	**0.00**	**0.00**	**0.26**

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3.3 Grading - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.01	0.08	0.06	0.00		0.01	0.01		0.01	0.01	0.00	8.03	8.03	0.00	0.00	8.05
Total	**0.01**	**0.08**	**0.06**	**0.00**	**0.00**	**0.01**	**0.01**	**0.00**	**0.01**	**0.01**	**0.00**	**8.03**	**8.03**	**0.00**	**0.00**	**8.05**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.01	0.08	0.04	0.00	0.04	0.00	0.04	0.00	0.00	0.00	0.00	11.91	11.91	0.00	0.00	11.92
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.61	0.00	0.00	0.61
Total	**0.01**	**0.08**	**0.04**	**0.00**	**0.04**	**0.00**	**0.04**	**0.00**	**0.00**	**0.00**	**0.00**	**12.52**	**12.52**	**0.00**	**0.00**	**12.53**

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3.3 Grading - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road	0.01	0.08	0.06	0.00		0.01	0.01		0.01	0.01	0.00	8.03	8.03	0.00	0.00	8.05
Total	**0.01**	**0.08**	**0.06**	**0.00**	**0.00**	**0.01**	**0.01**	**0.00**	**0.01**	**0.01**	**0.00**	**8.03**	**8.03**	**0.00**	**0.00**	**8.05**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.01	0.08	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.91	11.91	0.00	0.00	11.92
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.61	0.00	0.00	0.61
Total	**0.01**	**0.08**	**0.04**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**12.52**	**12.52**	**0.00**	**0.00**	**12.53**

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3.4 Trenching - 2013

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.01	0.09	0.06	0.00		0.01	0.01		0.01	0.01	0.00	7.66	7.66	0.00	0.00	7.69
Total	**0.01**	**0.09**	**0.06**	**0.00**		**0.01**	**0.01**		**0.01**	**0.01**	**0.00**	**7.66**	**7.66**	**0.00**	**0.00**	**7.69**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.10	1.10	0.00	0.00	1.10
Total	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.10**	**1.10**	**0.00**	**0.00**	**1.10**

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3.4 Trenching - 2013

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.01	0.09	0.06	0.00		0.01	0.01		0.01	0.01	0.00	7.66	7.66	0.00	0.00	7.69
Total	**0.01**	**0.09**	**0.06**	**0.00**		**0.01**	**0.01**		**0.01**	**0.01**	**0.00**	**7.66**	**7.66**	**0.00**	**0.00**	**7.69**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.10	1.10	0.00	0.00	1.10
Total	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.10**	**1.10**	**0.00**	**0.00**	**1.10**

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4.0 Mobile Detail

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.77	0.77	0.00	0.00	0.77
Unmitigated	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.77	0.77	0.00	0.00	0.77
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	0.80	0.80	0.80	1,697	1,697
Total	0.80	0.80	0.80	1,697	1,697

4.3 Trip Type Information

	Miles			Trip %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW
City Park	9.50	7.30	7.30	33.00	48.00	19.00

5.0 Energy Detail

5.1 Mitigation Measures Energy

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	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Electricity Unmitigated						0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NaturalGas Mitigated	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NaturalGas Unmitigated	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**0.00**	**0.00**	**0.00**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

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5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU	tons/yr										MT/yr					
City Park	0	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**0.00**	**0.00**	**0.00**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
City Park	0					0.00	0.00	0.00	0.00
Total						**0.00**	**0.00**	**0.00**	**0.00**

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5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	kWh	tons/yr				MT/yr			
City Park	0					0.00	0.00	0.00	0.00
Total						**0.00**	**0.00**	**0.00**	**0.00**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unmitigated	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

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6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.00					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	0.00					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landscaping	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**0.00**	**0.00**	**0.00**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.00					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	0.00					0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landscaping	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**0.00**	**0.00**	**0.00**	**0.00**		**0.00**	**0.00**		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

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7.0 Water Detail

7.1 Mitigation Measures Water

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr				MT/yr			
Mitigated					0.00	0.00	0.00	0.00
Unmitigated					0.00	0.00	0.00	0.00
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
City Park	0 / 0.595741					0.00	0.00	0.00	0.00
Total						**0.00**	**0.00**	**0.00**	**0.00**

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7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	tons/yr				MT/yr			
City Park	0 / 0.595741					0.00	0.00	0.00	0.00
Total						**0.00**	**0.00**	**0.00**	**0.00**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
	tons/yr				MT/yr			
Mitigated					0.01	0.00	0.00	0.02
Unmitigated					0.01	0.00	0.00	0.02
Total	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

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8.2 Waste by Land Use

Unmitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
City Park	0.04					0.01	0.00	0.00	0.02
Total						**0.01**	**0.00**	**0.00**	**0.02**

Mitigated

	Waste Disposed	ROG	NOx	CO	SO2	Total CO2	CH4	N2O	CO2e
Land Use	tons	tons/yr				MT/yr			
City Park	0.04					0.01	0.00	0.00	0.02
Total						**0.01**	**0.00**	**0.00**	**0.02**

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9.0 Vegetation

APPENDIX G

Responsiveness Summary

Appendix G: Responsiveness Summary
Included only in Final RAW