Topock Project Executive Abstract

Document Title: Final *Soil Engineering Evaluation/Cost Analysis, PG&E Topock Compressor Station, Needles, California* Submitting Agency: DOI, DTSC Final Document? X Yes ___ No	Date of Document: 04/23/21 Who Created this Document?: (i.e. PG&E, DTSC, DOI, Other) PG&E
Priority Status: __ HIGH X MED __ LOW	Is this time critical? __ Yes X No
Type of Document: __ Draft X Report __ Letter __ Memo __ Other / Explain:	Action Required: __ Information Only X Review and Input __ Other / Explain:
What does this information pertain to? __ Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA)/Preliminary Assessment (PA) __ RCRA Facility Investigation (RFI)/Remedial Investigation (RI) (including Risk Assessment) X Corrective Measures Study (CMS)/Feasibility Study (FS) __ Corrective Measures Implementation (CMI)/ Remedial Action (RA) __ California Environmental Quality Act (CEQA)/ Environmental Impact Report (EIR) __ Interim Measures __ Other / Explain:	Is this a Regulatory Requirement? X Yes __ No If no, why is the document needed?
What is the consequence of NOT doing this item? What is the consequence of DOING this item? The consequence of not doing this item is that PG&E would be out of compliance with DOI's October 30, 2018 directive requesting PG&E to conduct an Engineering Evaluation/Cost Analysis (EE/CA) to evaluate the need for a non-time critical removal action (NTCRA) to prevent contamination from migrating to federal land.	Other Justification/s: __ Permit __ Other / Explain:
Brief Summary of attached document: The Soil EE/CA evaluates the need for a NTCRA, in this case to remove contaminated soil on federal lands or at locations where contamination has the potential to migrate to federal land. The EE/CA identifies fourteen potential areas for a removal action and evaluates each removal action alternative (including a No Action Alternative) for cleanup effectiveness, implementability, and cost. Each of these potential action areas are on federal lands (Havasu National Wildlife Refuge) or at locations where contaminants in soil have the potential to migrate to federal land. Written by: Pacific Gas and Electric Company	
Recommendations: Provide input to PG&E.	
How is this information related to the Final Remedy or Regulatory Requirements: This submittal complies with the requirements of DOI's Soil EE/CA Approval Memorandum transmitted in their October 30, 2018 directive and is consistent with the Comprehensive Environmental Response, Compensation, and Liability Act and the National Oil and Hazardous Substances Pollution Contingency Plan.	
Other requirements of this information? None.	

PG&E Topock Compressor Station, Needles, California

Soil Engineering Evaluation/Cost Analysis

Final

April 2021

Pacific Gas and Electric Company

Soil Engineering Evaluation/Cost Analysis

Project No:	D31084AF A.CS.EV.TM.01
Document Title:	Soil Engineering Evaluation/Cost Analysis, PG&E Topock Compressor Station, Needles, California
Revision:	Final
Date:	April 23, 2021
Client Name:	Pacific Gas and Electric Company
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File Name:	Topock_EECA_Final_2021.03.I9

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Executive Summary

This report presents an Engineering Evaluation/Cost Analysis (EE/CA) for a potential non-time-critical removal action (NTCRA) to address contaminated soil on land adjacent to the Pacific Gas and Electric Company (PG&E) Topock Compressor Station (TCS) in San Bernardino County, California. The TCS and adjacent land are collectively known as the Topock Project Site (Site). The lead regulatory agencies for cleanup at the Site are the U.S. Department of Interior (DOI) and the California Department of Toxic Substances Control (DTSC). The soil medium is currently in the Resource Conservation and Recovery Act (RCRA) Facility Investigation and Remedial Investigation (RFI/RI) phase of the cleanup process, with soil investigation activities (sampling and analysis) completed in 2017. Soil RFI/RI investigation results are presented in the third volume of the RFI/RI report for the Site (Draft RFI/RI Report Volume 3) (Jacobs, 2019a).

During evaluation of the RFI/RI soil investigation data, the U.S. Fish and Wildlife Service (USFWS) and DOI determined that there are specific areas outside of the TCS where concentrations of constituents in soil significantly exceeded background values or ecological and residential screening levels on federal land or in locations where constituents have the potential to migrate to federal land. On October 30, 2018, DOI directed PG&E in an Approval Memorandum to conduct an EE/CA to evaluate the need for an NTCRA to address contaminated soil and to evaluate and select technologies and remedial alternatives. The EE/CA Approval Memorandum (DOI, 2018b) cites the following National Contingency Plan (NCP) factors as the reasons an NTCRA is being considered:

- Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants
- Actual or potential contamination of drinking water supplies or sensitive ecosystems
- High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate
- Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released

Based on these NCP factors and comparison of soil concentrations at the Site to screening levels, preliminary potential action areas (PAAs) were identified where soil concentrations significantly exceeded screening levels for total chromium, copper, lead, mercury, molybdenum, zinc, and dioxins/furans.

Concurrently with this screening process and identification of preliminary PAAs, a Human Health and Ecological Risk Assessment (HHERA) was conducted for the Site, as part of the RCRA/CERCLA process. The purpose of the HHERA was to use environmental sample data to identify constituents of concern (COCs), provide an estimate of how and to what extent human and ecological receptors might be exposed to these chemicals, and provide an assessment of the health effects associated with these chemicals (Arcadis, 2019). The HHERA was conducted in accordance with the methods and assumptions agreed upon in the various HHERA Risk Assessment Work Plans (RAWPs) (Arcadis, 2008a; 2009a; 2015). An HHERA report was submitted to DTSC and DOI in October 2019 (Arcadis, 2019), and an errata to the HHERA was submitted in February 2020 (Arcadis, 2020). DTSC and DOI acceptance of the HHERA was provided on May 29, 2020 (DTSC and DOI, 2020).

With consideration of the HHERA and the NCP factors identified in the EE/CA Approval Memorandum (DOI, 2018b), the following removal action objectives (RAOs) were identified:

- RAO 1: Reduce human and ecological risk related to the COCs in soil up to 10 feet below ground surface (bgs) on or adjacent to federal land by removing soil at locations identified as driving risk in the HHERA.
- RAO 2: Address elevated concentrations of contaminants in soil up to 10 feet bgs outside the TCS in or adjacent to wash areas that are within, or have the potential to migrate to, the Havasu National Wildlife Refuge (HNWR) during storm events.

- RAO 3: Remove debris, burnt material, and/or discolored soil associated with elevated hazardous substances identified during the RFI/RI within Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) up to 10 feet bgs.

The RAOs were used to refine the preliminary PAAs identified in the EE/CA Approval Memorandum. PAAs were identified in the following RFI/FI investigation areas:

- SWMU 1 – Former Percolation Bed (3 PAAs)
- AOC 1 – Area Around Former Percolation Bed (3 PAAs)
- AOC 9 – Southeast Fence Line (1 PAA)
- AOC 10 – East Ravine (4 PAAs)
- AOC 11 – Topographic Low Areas (1 PAA)
- AOC 14 – Railroad Debris Site (1 PAA)
- AOC 27 – MW-24 Bench (1 PAA)

To address the RAOs and in consideration of identified applicable or relevant and appropriate requirements (ARARs) as well as results from bench-scale tests, the following removal action alternatives were identified:

- **Alternative 1 – No Action**. Alternative 1 is included in and carried through the entire analysis of removal action alternatives as the baseline condition against which the performance of the remaining alternatives is evaluated. In Alternative 1, no removal action would take place.

- **Alternative 2 – Excavation and Offsite Disposal of All Material**. Alternative 2 involves excavation of soil within the PAAs and disposal offsite.

- **Alternative 3 – Excavation, Mechanical Separation, Offsite Disposal of Fines, and Reuse of Coarse Material**. Alternative 3 involves excavation of soil within the PAAs and mechanical separation to isolate fine material (less than 3/8 inch) and coarse material (greater than 3/8 inch). Fine material would be disposed of offsite, and coarse material would be used to backfill the excavation areas.

- **Alternative 4 – Excavation, Mechanical Separation, Offsite Disposal of Fines, Soil Washing of Coarse Material, and Reuse of Washed Coarse Material**. Alternative 4 is the same as Alternative 3 except that coarse material would be washed with water prior to reuse in order to remove fines adhered to the surface of the coarse material.

- **Alternative 5 – Removal of Visible Hazardous Surface Debris.** Alternative 5 involves the removal of visible surface debris associated with elevated hazardous substances.

Based on the comparative analysis of the removal action alternatives against the criteria of effectiveness, implementability, and cost, the recommended alternative is:

- **Alternative 3 – Excavation, Mechanical Separation, Offsite Disposal of Fines, and Reuse of Coarse Material**

Alternative 3 is considered to be an effective alternative and will provide a high degree of long-term effectiveness; reduction in toxicity, mobility, and volume (TMV); and short-term effectiveness. This alternative has been developed to meet RAOs protective of human health and the environment and comply with location-, chemical-, and action-specific ARARs and to-be-considered (TBC) criteria. Alternative 3 meets the RAOs as follows:

- RAO 1 – To reduce human and ecological risk related to the COCs in the soil on or adjacent to federal land, the locations recommended for removal in the HHERA are included in the excavation areas of Alternative 3.

- RAO 2 – To address elevated concentrations of contaminants (that is, concentrations significantly exceeding the numerical removal action goals [RAGs]) outside the TCS in or adjacent to wash areas that are within, or have the potential to migrate to, the HNWR during storms, areas with significant exceedances of numerical RAGs are included in the excavation areas of Alternative 3.

- RAO 3 – To remove debris, burnt material, and/or discolored soil associated with elevated hazardous substances, visually identified debris, burnt material, and/or discolored soils will be removed and disposed of offsite.

Alternative 3 also minimizes the volume of soil removed from the Site without requiring disposal of water generated during soil washing. The estimated cost of Alternative 3 is $4,626,000. This cost is less than that of Alternatives 2 and 4.

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Acronyms and Abbreviations

95UCL	95% upper confidence limit on the mean
AMM	Avoidance and Minimization Measures
AOC	area of concern
ARAR	applicable or relevant and appropriate requirements
BAF	bioaccumulation factor
BCW	Bat Cave Wash
bgs	below ground surface
BIAMP	Bird Impact Avoidance and Minimization Plan
BLM	U.S. Bureau of Land Management
BMP	best management practice
BNSF	BNSF Railway
BOR	U.S. Bureau of Reclamation
BTV	background threshold value
CalEPA	California Environmental Protection Agency
CARB	California Air Resources Board
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
Caltrans	California Department of Transportation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CH2M	CH2M HILL, Inc.
CHPMP	Cultural and Historic Property Management Plan
COC	constituent of concern
COPC	constituent of potential concern
COPEC	constituent of potential ecological concern
CrVI	hexavalent chromium
CSM	conceptual site model
DOI	U.S. Department of the Interior
dioxin/furan	dioxin and furan
DTSC	California Department of Toxic Substances Control
EcoSSL	ecological soil screening level
ECV	ecological comparison value
EE/CA	Engineering Evaluation/Cost Analysis
EPC	exposure point concentration
ERA	ecological risk assessment

ESL	environmental screening level
FLPMA	Federal Land Policy and Management Act
FOD	frequency of detection
ft	feet
ft bgs	feet below ground surface
FRTR	Federal Remediation Technologies Roundtable
GANDA	Garcia and Associates
GHG	greenhouse gas
GSR	green and sustainable remediation
HAZWOPER	Hazardous Waste Operations and Emergency Response
HERO	DTSC Human and Ecological Risk Office
HHERA	human health and ecological risk assessment
HHRA	human health risk assessment
HI	hazard index
HNWR	Havasu National Wildlife Refuge
HQ	hazard quotient
ILCR	incremental lifetime cancer risk
I-40	Interstate 40
Jacobs	Jacobs Engineering Group Inc.
kg	kilograms
LOAEC	lowest observed adverse effects concentration
LOAEL	lowest observed adverse effects level
LCR MSCP	Lower Colorado River Multi-Species Conservation Program
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mm	millimeters
mph	miles per hour
NCP	National Contingency Plan
ng/kg	nanograms per kilogram
ng/kg-bw/day	nanograms per kilogram of body weight per day
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NTCRA	non-time-critical removal action
OCS	outside the Compressor Station
OHV	off-highway vehicle
PG&E	Pacific Gas and Electric Company
PA	Programmatic Agreement
PAA	potential action area

PAH	polycyclic aromatic hydrocarbon
PM_{10}	particulate matter 10 micrometers or less
RAG	removal action goal
RAO	removal action objectives
RAWP	Risk Assessment Work Plan
RBRG	risk-based remedial goals
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation
RI	remedial investigation
RWQCB	Regional Water Quality Control Board
S/S	solidification/stabilization
SO_x	sulfur oxides
SWMU	solid waste management unit
TBC	to-be-considered
TCLP	toxicity characteristic leaching procedure
TCP	traditional cultural property
TCRA	time-critical removal action
TCS	Topock Compressor Station
TEQ	toxicity equivalent
the Site	Topock Project Site
TMV	toxicity, mobility, volume
TPH	total petroleum hydrocarbons
TRV	toxicity reference value
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compounds
WDR	Waste Discharge Requirements
XRF	x-ray fluorescence

1. Introduction

This report presents an Engineering Evaluation/Cost Analysis (EE/CA) for a potential non-time-critical removal action (NTCRA) to address contaminated soil present on land adjacent to the Pacific Gas and Electric Company (PG&E) Topock Compressor Station (TCS) in San Bernardino County, California (Figure 1-1; figures and tables are presented at the end of this report). The TCS and adjacent land are collectively known as the Topock Project Site (Site). The regulatory framework for the NTCRA evaluated here and the purpose and organization of this EE/CA report are discussed in the following subsections.

1.1 Regulatory Framework

PG&E is conducting investigative and remedial activities at the Site under the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The California Department of Toxic Substances Control (DTSC) and the U.S. Department of Interior (DOI) are the lead regulatory agencies providing oversight of the environmental investigation and cleanup at the Site. The soil medium, which is the focus of this EE/CA, is currently in the RCRA Facility Investigation/Remedial Investigation (RFI/RI) phase of the cleanup process. RFI/RI activities have been conducted both within the TCS fence line and at adjacent land outside the TCS fence line. Soil RFI/RI investigation results are presented in the third volume of the RFI/RI report for the Site (Draft RFI/RI Report Volume 3) (Jacobs, 2019a). In advance of completion of the RFI/RI Report Volume 3, at the request of DOI (DOI, 2018a), PG&E submitted a Soil Investigation Data Package presenting the soil investigation results and comparing them to interim project screening levels for human and ecological receptors (PG&E, 2018).

During the RFI/RI soil investigation and after receipt of the Soil Investigation Data Package, the U.S. Fish and Wildlife Service (USFWS) and DOI evaluated the RFI/RI soil investigation data and determined that there are specific areas outside of the TCS where concentrations of constituents of potential concern to humans (COPCs) and constituents of potential ecological concern (COPECs) significantly exceed background values or ecological and human health screening levels. These areas, referred to in this report as potential action areas (PAAs), are located within or adjacent to active desert washes subject to potential scouring during rain events that could move contamination toward the Colorado River or spread the contamination footprint over a larger area. Because of this potential threat to public health and the environment, DOI directed PG&E to prepare an EE/CA to evaluate the need for a removal action to address contaminated soil in these PAAs (DOI, 2018b).

Removal actions are actions taken to address releases or threatened releases that require a prompt response. They may include the abatement, prevention, minimization, stabilization, mitigation, or elimination of the release or the threat of release. A removal action is authorized when there is release or threat of release of a hazardous substance into the environment or when an imminent and substantial danger to the public health welfare exists (CERCLA § 104). In addition, a removal action may be appropriate when taking early action could avoid the need for later, more expensive responses, even in cases where the risk of harm is less than imminent. Removal actions must, to the extent practicable, contribute to the efficient performance of any long-term remedial action for the release (40 Code of Federal Regulations [CFR] § 300.415(d); CERCLA § 104(b)).

There are three types of removal actions under CERCLA: emergency, time-critical, and non-time-critical. The primary difference between these types is the urgency of the threat and time frame in which an action must be initiated. NTCRAs are applicable in situations where the required action can start later than six months after it is determined a response is necessary. The National Contingency Plan (NCP) provides factors for determining the appropriateness of a removal action. These factors are (40 CFR § 300.415(b)(2)):

(i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;

(ii) Actual or potential contamination of drinking water supplies or sensitive ecosystems;

(iii) Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release;

(iv) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate;

(v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released;

(vi) Threat of fire or explosion;

(vii) The availability of other appropriate federal or state mechanisms to respond to the release; and

(viii) Other situations or factors that may pose threats to public health or welfare or the environment.

DOI and its bureaus have been delegated the authority to conduct time-critical removal actions (TCRAs) and NTCRAs to address contamination impacting DOI lands. In October 2018, DOI directed PG&E in an Approval Memorandum (DOI, 2018b [included as Appendix A]) to evaluate the need for an NTCRA for soil on federal lands or at locations where constituents have the potential to migrate to federal land, and to evaluate and select clean-up technologies and remedial alternatives. This Approval Memorandum documented DOI's rationale for this direction and cited the most applicable NCP factors for this determination as items (i), (ii), (iv), and (v). Under 40 CFR § 300.415, DOI is required to conduct an EE/CA to evaluate the need for and prior to selecting an NTCRA. The goals of an EE/CA are to identify the objectives of the removal action and to analyze the effectiveness, implementability, and cost of various alternatives that may satisfy these objectives. An EE/CA documents the removal action alternatives and selection process. Where the extent of the contamination is well-defined and limited, NTCRAs also allow for the expedited cleanup of sites under CERCLA.

DOI will issue the EE/CA for public comment in accordance with 40 CFR § 300.415(n)(4). DOI will also comply with the Programmatic Agreement (PA) (U.S. Bureau of Land Management [BLM], 2010) and PA Amendment 1 (BLM, 2017) regarding consultation with the signatories, invited signatories and Tribes, consistent with the National Historic Preservation Act, 54 U.S. Code (USC) § 300101 et seq. Written responses to significant comments will be summarized in a Responsiveness Summary following the response to comment process defined for the Site.

1.2 Purpose and Organization of Report

The purpose of this EE/CA report is to present the development and evaluation of removal action alternatives addressing contaminated soil on federal lands or at locations where constituents have the potential to migrate to federal land. Submittal of this document fulfills the requirements for NTCRAs defined by CERCLA and the NCP. This EE/CA has been performed in accordance with U.S. Environmental Protection Agency's (USEPA's) guidance document, *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (USEPA, 1993). The purpose of this EE/CA is to:

- Satisfy environmental review and public information requirements for removal actions
- Satisfy Administrative Record requirements for documenting the removal action selection
- Provide a framework for evaluating and selecting removal action alternative technologies

This EE/CA report is organized as follows:

- **Section 1, Introduction**, presents the regulatory framework for the Site and the purpose and organization of the report.
- **Section 2, Site Characterization**, presents a description of the portions of the Site relevant to the EE/CA; a summary of previous investigations and remedial activities; the source, nature, and extent of contamination; analytical data; a summary of the human health and ecological risk assessment (HHERA) performed for the Site; and the basis for the NTCRA.
- **Section 3, Identification of Removal Action Objectives**, identifies the removal scope, applicable or relevant and appropriate requirements (ARARs), removal action objectives (RAOs), goals, schedule, and potential removal areas.

- **Section 4, Identification and Analysis of Removal Action Alternatives**, provides detailed descriptions of potential removal action alternatives and assesses each individual alternative against the criteria of effectiveness, implementability, and cost.
- **Section 5, Comparative Analysis of Removal Action Alternatives**, evaluates the relative performance of each alternative against the criteria of effectiveness, implementability, and cost.
- **Section 6, Recommended Removal Action Alternative**, identifies the alternative that best satisfies the evaluation criteria of effectiveness, implementability, and cost.
- **Section 7, References**, presents a list of works cited in this document.
- **Appendix A, Signed Approval Memorandum for an Engineering Evaluation/Cost Analysis at the PG&E Topock Compressor Station, San Bernardino County, CA,** presents the rationale for conducting an NTCRA at the Site and approval to proceed with this EE/CA.
- **Appendix B, Nature and Extent of Contamination**, presents tables with the RFI/RI soil investigation results for the investigation areas evaluated in this EE/CA screened against interim screening levels, which were used during the RFI/RI to guide delineation of the nature and extent of contamination.
- **Appendix C, Soil HHERA Executive Summary,** presents a summary of the HHERA report.
- **Appendix D, Derivation of Risk-Based Remediation Goals for Risk Drivers in Soil**, presents the derivation of risk-based remediation goals (RBRGs) for risk drivers in soil, as presented in the HHERA report.
- **Appendix E, Removal Objective 2 Data Screening,** contains tables and figures presenting RFI/RI soil investigation results for constituents evaluated in this EE/CA screened against removal action goals (RAGs).
- **Appendix F, Treatability Study Results, Laboratory Data Packages, and Data Quality Evaluation Report**, presents results of treatability testing performed to evaluate possible soil treatment technologies.
- **Appendix G, Cost Evaluation**, presents an evaluation of potential costs associated with removal action alternatives evaluated in this EE/CA.

2. Site Characterization

This section provides a summary of Site information relevant to this EE/CA, including Site description and background; previous investigations and remedial actions; the source, nature, and extent of soil contamination; analytical data; a summary of the HHERA conducted for the Site; and the basis for the NTCRA.

2.1 Site Description and Background

The TCS is located adjacent to the Colorado River in eastern San Bernardino County, California, approximately 12 miles southeast of Needles, California, north and south of Interstate 40 (I-40) (Figure 1-1). The TCS is an active facility that began operations in December 1951. The TCS compresses natural gas supplied from the southwestern United States for transport through pipelines to PG&E's service territory in central and northern California.

The surrounding Site includes land owned and/or managed by a number of private and government entities including PG&E, the U.S. Bureau of Reclamation (BOR), the BLM, the USFWS (which manages the Havasu National Wildlife Refuge [HNWR]), San Bernardino County, BNSF Railway (BNSF), the Fort Mojave Indian Tribe, and the Metropolitan Water District of Southern California (Figure 2-1). In addition, several other entities have easements and/or rights-of-way including the California Department of Transportation (Caltrans), Southern California Gas Company, Transwestern Pipeline Company, Mojave Pipeline Company, Kinder Morgan, Inc, PG&E, City of Needles Electric, Southwest Gas Corporation, and Frontier Communications.

2.1.1 Areas of the Site Addressed in the EE/CA

This EE/CA develops and evaluates alternatives for a potential NTCRA at the 14 PAAs identified by the USFWS and DOI, which are located within the following seven RFI/RI investigation areas:

- Solid Waste Management Unit (SWMU) 1 – Former Percolation Bed (3 PAAs)
- Area of Concern (AOC) 1 – Area Around Former Percolation Bed (3 PAAs)
- AOC 9 – Southeast Fence Line (1 PAA)
- AOC 10 – East Ravine (4 PAAs)
- AOC 11 – Topographic Low Areas (1 PAA)
- AOC 14 – Railroad Debris Site (1 PAA)
- AOC 16 – Former Sandblast Shelter
- AOC 27 – MW-24 Bench (1 PAA)

These PAAs are outside the TCS fence line on federal lands or at locations where constituents have the potential to migrate to federal land including the HNWR (Figure 2-1). The HNWR is considered a sensitive ecosystem. The HNWR was established in 1941 to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. AOC 1, SWMU 1, AOC 10, AOC 11, AOC 14, and AOC 27 are located adjacent to and partially on the HNWR. Due to the minimal volume, a PAA was not defined for the AOC 16 materials identified for removal under this NTCRA.

Selection of PAAs at the Site is discussed in Section 3.6. Descriptions of the RFI/RI investigation areas included in this EE/CA are provided in the following subsections.

2.1.1.1 SWMU 1 – Former Percolation Bed and AOC 1 – Area Around Former Percolation Bed

AOC 1 and SWMU 1 are located west and north of the TCS within Bat Cave Wash (BCW; Figure 2-1). AOC 1 comprises a portion of BCW adjacent to the station including SWMU 1, as well as the portion of BCW extending north of SWMU 1 toward the Colorado River. SWMU 1 is the former percolation bed for TCS. From about 1964 to approximately 1971, the facility discharged wastewater from the cooling towers to the percolation bed (SWMU 1) and allowed it to percolate into the ground and/or evaporate. Historical aerial photo review indicates that, prior to the establishment of the bermed percolation bed, discharges to

BCW may have extended as far downstream as the railroad tracks. Further north, near the mouth of BCW, thick vegetation, widening of the channel, and blockage of flow by National Trails Highway greatly reduces the energy of flow during runoff events, resulting in deposition of entrained soil within the vegetated area at the lower end of BCW. Sediment sampling was performed at the mouth of BCW where it meets the Colorado River, on both sides of National Trails Highway. No exceedances of interim screening levels were detected in samples collected on the east side of National Trails Highway. However, exceedances of interim screening levels were detected in several soil and sediment samples on the west side of National Trails Highway (Jacobs, 2019a). Removal of significant sources upstream of this vegetated area will further ensure protection of the river as a source of drinking water. The area is heavily vegetated, predominantly with salt cedar (also known as tamarisk), which is an invasive, exotic plant species. This heavily vegetated portion of BCW is a long-term depositional area that existed before the TCS was built. Depositional history and patterns within this area are not known with certainty. AOC 1 is located partially on property owned by PG&E, BOR (managed by BLM), BNSF, and Fort Mojave Indian Tribe, as well as the HNWR (managed by USFWS), with PG&E as the easement holder.

A historic exploratory well that was likely used for water supply and disposal in the 1960s, TCS-4, is located within AOC 1, just north of the SWMU 1 boundary (CH2M, 2018). Soil samples collected near the TCS-4 well head contained dioxins and furans (dioxin/furan) toxicity equivalent (TEQ), total chromium, hexavalent chromium (CrVI), molybdenum, and zinc concentrations well above background concentrations. Additional sampling of pipe wrap material collected from the pipe connected to TCS-4 also contained exceedances for TEQ dioxins and furans as well as asbestos containing material (CH2M, 2015c). Well TCS-4 was decommissioned in 2016 (CH2M, 2016a).

2.1.1.2 AOC 9 – Southeast Fence Line

AOC 9 is located in the southeast portion of the facility, just south of the visitor parking lot and immediately east of (outside) the facility fence line (Figure 2-1). A small amount of discolored surface soil was encountered just outside the fence line on an extremely steep slope in 2000. About 1.5 cubic yards of the stained soil was removed and shipped offsite for disposal. Site conditions (the steepness and stability of the slope) limited the feasible extent of excavation at that time. AOC 9 is located entirely on property owned by PG&E.

2.1.1.3 AOC 10 – East Ravine

AOC 10 is located southeast of the TCS in a small ravine known as East Ravine. The ravine runs eastward toward the Colorado River. AOC 10 generally includes all of East Ravine as well as the specific areas shown on Figure 2-1. The ravine is approximately 1,600 feet (ft) long and is bisected by three constructed berms. Due to the berms, surface flow within the ravine does not typically reach the Colorado River. AOC 10 received fluids and waste discharge from the TCS including discharge from stormwater drain pipes, surface debris disposed of on the slopes of the ravine, and incidental overflows of wastewater via the former trench drain at the top of the station access road. Historical aerial photographs document a large impoundment area where well MW-58R is now located that was filled with liquids in the 1960s and 70s (CH2M, 2007a; 2007b). A greenish-grey layer also occurs here and is associated with elevated chromium contamination. Thin white powdery waste layers were also identified on the floor of the East Ravine (CH2M, 2009b). AOC 10 is located on both PG&E property and the HNWR.

2.1.1.4 AOC 11 – Topographic Low Areas

AOC 11 consists of topographic low areas on the northeast side of the TCS (Figure 2-1). While the principal drainage pathways leading away from the TCS have been identified, certain channels and storm drains drain into topographic low points or depressions. Runoff from the facility can collect at these low points and infiltrate or evaporate. AOC 11 is internally draining, so runoff into AOC 11 cannot reach the Colorado River due to topographic constraints. A stormwater pipe that captures runoff from I-40 and Park Moabi Road also discharges into AOC 11 north of 11a, immediately south of the I-40 crossing. AOC 11 is located on both PG&E property and the HNWR.

2.1.1.5 AOC 14 – Railroad Debris Site

AOC 14 is located outside the facility fence line approximately 1,000 ft north of the TCS and is currently bounded by the BNSF railroad tracks to the north, I-40 to the south, BCW to the west, and a former access road (Historic Route 66) to the east (Figure 2-1). AOC 14 currently contains miscellaneous construction debris related to construction of the railroad including chunks of asphalt, railroad ties, and piping. Asbestos-containing material and burned material from PG&E operations have also been disposed of within AOC 14. In addition to waste burning activities in the area, former TCS employees reported that water softening (lime) sludge was also disposed of in this area. A thin white layer assumed to be water softening material can be observed in the I-40 freeway cut. Employee reports suggest that a removal action for some of the debris and white powdery material was conducted in the mid-1990s; however, no documentation regarding the removal has been found (CH2M, 2006). The contours of the site suggest that some excavation may have occurred in the southern portion of the area. PG&E also completed a cleanup action in AOC 14 in 1999 to address asbestos. Surface water runoff along the western side of AOC 14 flows into BCW (AOC 1). AOC 14 is located on property owned by BNSF, HNWR, and Caltrans.

2.1.1.6 AOC 16 – Former Sandblast Shelter

AOC 16, the Former Sandblast Shelter, is located above SWMU 1/AOC 1 in the lower yard of the TCS. The sandblast shelter is constructed of four supports and a roof with open sides. The area immediately surrounding the shelter is currently and has historically been unpaved, except for the concrete driveway between the eastern edge of the shelter and the paved roadway. The sandblast shelter was installed in the late 1980s and was used to prepare metal items at the facility for protective coating. Some sandblasting historically occurred in this area before the sandblast shelter was constructed. The shelter in its current configuration was used by PG&E until the early 1990s. Two different colors of apparent abrasive material (sandblast grit) are present on the ground in the immediate vicinity of the sandblast shelter. Samples collected from the sandblast grit detected elevated levels of copper and molybdenum. Due to the proximity of AOC 16 to SWMU 1/AOC 1, high levels of copper, and the potential of surficial materials to migrate into BCW, removal of surficial sandblast grit is included in the EE/CA.

2.1.1.7 AOC 27 – MW-24 Bench

AOC 27 is located outside the facility fence line north of the TCS, south of I-40, and east of BCW (AOC 1) as shown on Figure 2-1. A former TCS employee indicated that AOC 27, informally known as the MW-24 bench, was formerly used as a waste disposal area. Prior to construction of I-40, this area was contiguous with AOC 14 to the north. Miscellaneous construction debris and burned material are present in AOC 27. Burned debris was observed in the eastern edge of the road cut on the road from AOC 27 to BCW (AOC 1). Runoff from AOC 27 flows into BCW (AOC 1). AOC 27 is located on property owned by PG&E, HNWR, and Caltrans. The area of impacts being evaluated in the EE/CA are located on HNWR property.

2.1.2 Geology and Hydrogeology

As described in detail in the *Final Groundwater Corrective Measures Study/Feasibility Study Report for SWMU 1/AOC 1 and AOC 10* (CH2M, 2009b), the Site is in the Basin and Range geomorphic province, characterized by roughly parallel north/south fault-block mountains separated by alluvial valleys. The oldest rocks in the surrounding area are exposed in the Chemehuevi Mountains and include Precambrian and Mesozoic-age metamorphic and igneous rocks. Miocene-age sedimentary and volcanic rocks, associated with the tectonic uplift and faulting in the region, were deposited on the metamorphic and plutonic bedrock complex. The bedrock basement formations are, in turn, overlain by younger Tertiary and Quaternary to Recent-age sedimentary deposits.

Groundwater occurs under unconfined to semi-confined conditions within alluvial fan and fluvial sediments beneath most of the Site. The alluvial sediments consist primarily of clayey/silty sand and clayey gravel deposits interfingered with more permeable sand and gravel deposits. The fluvial sediments similarly consist of interbedded sand, sandy gravel, and silt/clay. The saturated portion of the alluvial fan and fluvial sediments are collectively referred to as the Alluvial Aquifer. The water table in the Alluvial Aquifer has a very gently-sloping gradient throughout the Site and typically equilibrates to an elevation within 2 to 3 ft of the river level. Groundwater also resides in bedrock. Metamorphic bedrock underlying the Site is assumed to possess very low fracture permeability. Limited amount of rainfall recharge in the nearby mountains enters the Alluvial Aquifer via upward seepage from the bedrock underlying the Alluvial Aquifer. Due to the variable topography at the Site, the depth to groundwater ranges from as shallow as 5 feet below ground surface (ft bgs) in the floodplain next to the river to approximately 170 ft bgs in the upland alluvial terrace areas. RFI/RI Report Volume 2 provides a detailed description of hydrogeologic conditions at the Site (CH2M, 2009a).

2.1.3 Surface Water Hydrology

The primary surface water feature near the Site is the Colorado River, which is located to the east. The Site consists of a series of terraces divided by dry desert washes. The terraces are considerably eroded with very steep slopes. Incised drainage channels separate the alluvial terraces. The largest incised channel is BCW, a north-south trending dry wash. BCW flows on the surface only intermittently (as an ephemeral stream) following intense rainfall events and extends to the Colorado River.

Jurisdictional waters and wetlands at the Site have been delineated previously (CH2M, 2014a; 2014b; 2014c; 2015a). The U.S. Army Corps of Engineers (USACE) regulates wetlands at the Site and both the USACE and California Department of Fish and Wildlife (CDFW) regulate non-wetland waters (the ephemeral desert washes).

Figure 2-2 presents a map of jurisdictional wetlands and waters in the project area.

2.1.4 Special Status Species

The following special-status wildlife, aquatic, avian, mammal, and plant species have been included in prior project environmental analyses related to remedial activities at the Site:

Special-Status Wildlife

- Southwestern willow flycatcher (*Empidonax traillii extimus)* – Federal listed and legally protected
- Agassiz's desert tortoise (*Gopherus agassizii)* – Federal and State listed and legally protected
- Yuma clapper rail (*Rallus longirostris yumanensis)* – Federal listed and legally protected

Special-Status Aquatic Species

- Bonytail chub (*Gila elegans)* – Federal and State listed and legally protected
- Razorback sucker (*Xyrauchen texanus)* – Federal and State listed and fully protected
- Flannelmouth sucker (*Catostomus latipinnis*) – covered under the Lower Colorado River Multi-Species Conservation Program (LCR MSCP)

Other Avian Species

- Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) – Federal and State listed and legally protected
- California black rail (*Laterallus jamaicensis corturniculus*) – State listed and fully protected
- Arizona Bell's vireo (*Vireo bellii arizonae*) – State listed and legally protected; also covered under the LCR MSCP
- Western least bittern (*Ixobrychus exilis hesperis*) – California species of concern (no formal protection)

- Sonoran yellow warbler (*Dendroica petechia sonorana*) – California species of concern (no formal protection); covered under the LCR MSCP
- Yellow breasted chat (*Icteria virens*) – California species of concern (no formal protection)
- Crissal thrasher (*Toxostoma crissale*) – California species of concern (no formal protection)

Other Mammal Species

- Ringtail cat (*Bassariscus astutus*) – California fully protected species
- Nelson's bighorn sheep (*Ovis canadensis nelsoni*) – California species of concern (no formal protection)
- Townsend's big eared bat (*Corynorhinus townsendii*) – California species of concern (no formal protection)
- Pallid bat (*Antrozous pallidus*) – California candidate threatened or endangered species
- Cave myotis (*Myotis velifer*) – California species of concern (no formal protection)
- Western mastiff bat (*Eumops perotis*) –California species of concern (no formal protection)

Other Reptile Species

- Northern Mexican garter snake *(Thamnophis eques megalops)* – Federal listed as threatened and legally protected

California Native Plant Society Rare Plants

- Mousetail suncup (*Chylismia arenaria*)
- Spiny-haired blazing-star (*Mentzelia tricuspis*)
- Small-flowered androstephium (*Androstephium breviflorum*)
- Hillside palo verde (*Parkinsonia microphylla*)

The DOI, BLM, and USFWS will consider the effects of activities to Endangered Species Act listed and special status species within the PAAs prior to the selection or implementation of any soil cleanup action.

2.1.5 Cultural and Historical Resources

The areas to be evaluated within the EE/CA are within a larger area of traditional and cultural importance. Thousands of years of human history are evident in the area surrounding the TCS. Among the larger and better-known cultural resources on the Site is an expansive desert geoglyph or intaglio known as the Topock Maze. The BLM has determined that the project area is part of a traditional cultural property (TCP) or property of traditional religious and cultural significance and is part of what the Tribes have identified as a larger area of traditional and cultural importance, whose boundaries have yet to be defined and will not be defined within the scope of this action. The TCP within this area includes but is not limited to the Topock Maze.

In recognition of the cultural and historical significance of the area, planning of all remedial and removal activities at the Site considers minimizing impact to the cultural, historic, and biological resources. Any actions taken under an NTCRA will include measures to avoid, minimize, or mitigate impacts to cultural and historic resources by implementing the mitigation measures prescribed in the PA (BLM, 2010), the Cultural and Historic Properties Management Plan (BLM, 2012), the Cultural and Historic Properties Treatment Plan (AE, 2018), and in consultation with the Tribes and signatories/invited signatories to the PA . Measures currently include but are not limited to: avoidance of ground disturbance at historic and cultural properties to the maximum extent practicable; archaeological and Native American monitoring during earth-disturbing construction work; and periodic monitoring to assess site conditions throughout the duration of the NTCRA. Recognition of and respect for these cultural and historic resources and the spiritual values of the area is an important component of the selection and evaluation of removal action alternatives.

2.2 Previous Investigations and Remedial Activities

Environmental investigations have been underway at the Site since 1997. As directed by DTSC (DTSC, 2006), reporting of RFI/RI activities and results was separated into three volumes. The first two volumes covering Site background and history (RFI/RI Report Volume 1; CH2M, 2007a) and hydrogeologic characterization/groundwater and surface water investigation results (RFI/RI Report Volume 2; CH2M, 2009a) are complete. The first phase of the RFI/RI soil investigation was completed in 2008. The data were reviewed, and data gaps identified. From 2015 to 2017, PG&E conducted additional soil investigations to fill these data gaps. On June 20, 2017, DOI determined that the soil RFI/RI field work was complete (DOI, 2017). As stated in Section 1.1, the results are presented in the draft RFI/RI Report Volume 3. In advance of completion of the RFI/RI Report Volume 3, at the request of DOI (DOI, 2018a), PG&E submitted a data package presenting the soil investigation results and compared them to interim project screening levels for human and ecological receptors (PG&E, 2018).

Remedial activities have occurred at AOC 4 (Debris Ravine), AOC 9 (Southeast Fence Line), and AOC 14 (Railroad Debris Site). As reported in the RFI/RI Report Volume 1 (CH2M, 2007a), PG&E employee reports suggested that a cleanup of white powdery material at AOC 14 was conducted in the early 1990s; however, no documentation regarding the action has been found (Russell, 2006). The contours of the Site indicate excavation may have occurred. A roughly 1-foot-thick layer of white powdery material is present in the embankment immediately adjacent to I-40 and a thin lens of the same material is visible to the north of the excavation area. In addition, a 1998 investigation of the area indicated that a layer of white powdery material is present below the current soil surface (PG&E, 1999a). Sampling results indicate that the white powder exceeded interim screening levels for calcium, magnesium, and sodium. Bulk samples of the white powder analyzed by polarized light microscopy indicated that asbestos fibers were present in AOC14-1 through -5, AOC14-9, AOC14-12, AOC14-13, and AOC14-SS1 and -SS4. To confirm the presence of asbestos fibers, the white powder sample was also analyzed by California Air Resources Board (CARB) Method 435 and transmission electron microscopy. CARB Method 435 did indicate that very low levels of asbestos were present in AOC14-2 and AOC14-SS1 (detected concentration of less than 0.1 percent, where the detection limit was less than 0.1 percent). Based on these results, a very small percentage of asbestos fibers (less than 0.1 percent) are present in the white powder and soil samples (Jacobs, 2019a).

Also reported in the RFI/RI Report Volume 1, an asbestos removal was completed at AOC 14 in 1999 (PG&E, 1999b). In November 1998, during soil sampling at AOC 14, a small amount of friable construction debris and transite were found. The friable material contained over 1 percent asbestos. The transite was non-friable, and after sampling, the trench was covered with clean fill material. PG&E removed the friable asbestos-containing material on April 14, 1999 and disposed of the material at an licensed landfill. Two shallow confirmation samples were collected of the underlying soils. At one sample location, asbestos was detected in the underlying soil. Additional sampling was implemented to characterize the extent of the asbestos in the soil underlying the loose construction material near this sample. On June 1, 1999, 14 additional samples were taken, and no asbestos was detected in any of the sample locations.

In April 2000, a small amount of discolored surface soil was discovered on the southeast side of the facility and is thought to have been uncovered by erosion. The discovery was reported to the DTSC and the area was designated AOC 9. The source of the green staining is believed to be spills from an auxiliary jacket cooling water system, and/or runoff from a steam-cleaning area, into a broken stormwater discharge pipe leading to a storm drain at AOC 9. Per a corrective action agreement with the DTSC, approximately 1.5 cubic yards of soil were excavated and shipped offsite for disposal. Additional soil removal was not feasible at the time due to the extremely steep slope at AOC 9. A new stormwater drainage pipe was installed, and the area was backfilled with clean soil to prevent erosion of the slope.

In June 2009, the DOI issued an Action Memorandum TCRA at the AOC 4 - Debris Ravine at the TCS (DOI, 2009); this memorandum directed PG&E to initiate activities necessary to implement and perform

TCRA activities at AOC 4. The TCRA was conducted in accordance with CERCLA and, as an interim remedial action, was intended to stabilize and mitigate the threat of release of contaminated material. The history of previous investigations and agency direction leading up to the AOC 4 TCRA are described in the approved *Final Work Plan for Time-Critical Removal Action at AOC 4 Debris Ravine, PG&E Topock Compressor Station, Needles, California* (Alisto et al., 2009)

AOC 4 is located in the southern portion of the TCS and is a narrow, steep-sided arroyo that drains into BCW at the southwestern corner of the TCS. AOC 4 is located on PG&E property, except for a small portion of the westernmost end that extends onto HNWR. The operational history at AOC 4 is not well documented; however, over the years, fill material and debris were deposited in the ravine and burning of trash appears to have occurred within AOC 4. COPCs that pose a risk to human receptors, and COPECs that pose a risk to ecological receptors, for AOC 4 identified in the RFI/RI Report Volume 1 (CH2M, 2007a) and the *Revised Final Soil RCRA Facility Investigation / Remedial Investigation Work Plan, PG&E Topock Compressor Station, Needles, California* (Soil RFI/RI Work Plan; CH2M, 2013) include Title 22 metals, CrVI, polycyclic aromatic hydrocarbons (PAHs), asbestos, dioxins and furans, and polychlorinated biphenyls.

TCRA activities were performed from December 2009 through December 2010 in compliance with the TCRA Work Plan (Alisto et al., 2009). The TCRA removed approximately 11,799 tons of waste from AOC 4. The TCRA objectives were met by the removal action, which was conducted in safely accessible areas of AOC 4. The excavation, screening, and confirmation approach followed the TCRA Work Plan, including the quality criteria established in the data quality objectives and quality assurance program addendum. Based on the confirmation data set and installation of erosion control measures, the substantial threat of release of contaminated material from AOC 4 has been stabilized and mitigated and this AOC is not a significant source of contamination.

2.3 Source, Nature, and Extent of Contamination

The source, nature, and extent of the contamination in soil in SWMU 1, AOC 1, AOC 9, AOC 10, AOC 11, AOC 14, and AOC 27 is presented in the following subsections. Further details results are presented in the draft RFI/RI Report Volume 3 (Jacobs, 2019a).

2.3.1 Source of Contamination

From 1951 to 1985, PG&E added chromium to the water used in the cooling towers and other equipment at the TCS to prevent equipment corrosion. From 1951 to 1964, cooling tower wastewater containing CrVI was discharged into BCW. Later, treated wastewater was discharged into ponds for storage and evaporation, until chromium use was discontinued in 1985. Potential sources of dioxins/furans may include historical industrial activities, such as fire training exercises and burning of garbage. Other sources unrelated to TCS activities may include unauthorized dumping and burning, regional wildfires, combustion of diesel and leaded gasoline, and exhaust from cars, trucks, and trains (CH2M, 2017a).

2.3.2 Nature and Extent of Contamination

The nature and extent of soil contamination at the Site has been evaluated as part of the RFI/RI. Over the course of the RFI/RI soil investigation, constituent concentration data collected outside the TCS fence line have been screened against the following residential and ecological screening levels and background values for soil, which were identified as interim screening levels for the purpose of evaluating the nature and extent of contamination (Jacobs, 2019a).

- USEPA residential regional screening levels (USEPA, 2017)
- Residential DTSC screening levels (DTSC, 2017; 2018)
- Ecological comparison values (ECVs) (Arcadis, 2008b; 2009b)
- Background values (CH2M, 2009c; CH2M, 2017a; Jacobs, 2019b)

- California Regional Water Quality Control Board (RWQCB) environmental screening levels (ESLs) (RWQCB, 2016) (total petroleum hydrocarbons [TPH] only)

The results of the RFI/RI soil investigation were presented in a data package to DOI (PG&E, 2018) and are described in detail in the draft RFI/RI Report Volume 3 (Jacobs, 2019a). RFI/RI soil investigation results for the relevant investigation areas screened against the interim screening levels are presented in Appendix B.

As identified in DOI's 2018 Approval Memorandum (Appendix A) and tabulated in Appendix B, metals and dioxins/furans (assessed as dioxins furans TEQ[1]**)** were detected at concentrations significantly exceeding background values, ECVs, and/or residential human screening levels in certain locations, including in SWMU 1, AOC 1, AOC 10, AOC 14, and AOC 27 (areas located on federal land or in locations where constituents have the potential to migrate to federal land). Metals with elevated concentrations include total chromium, copper, lead, mercury, molybdenum, and zinc. Concentration of these constituents in soil are further evaluated in this EE/CA through comparison to risk-based values.

2.3.3 Conceptual Site Models

Conceptual site models (CSMs) for each SWMU and AOC were presented in the *Revised Final Soil RCRA Facility Investigation/ Remedial Investigation Work Plan, PG&E Topock Compressor Station, Needles, California* (CH2M, 2013) and updated in the draft RFI/RI Report Volume 3, Appendix A (Jacobs, 2019a). Summaries for each NTCRA area with a focus on contaminant sources and contaminant migration pathways are presented in Exhibit 2-1.

The primary potential sources of contamination are (1) direct discharge or runoff from the compressor station; (2) discharge from stormwater drain pipes; and (3) disposal of debris including some asbestos-containing material, water softening sludge, and potentially residuals from burning of office garbage, waste or debris. Potential releases would primarily have been in liquid form and would have affected surface soil. Releases from debris, whether consisting of solid particles or dissolved constituents, would also have affected surface soil. Historically, contamination in surface soil may have been eroded and entrained in stormwater/surface water runoff during flow events and may have been subsequently re-deposited downstream. This is supported by the presence of COPCs and COPECs throughout the washes as shown in Figures E-1a through E-8h in Appendix E. Evidence of flooding and significant mass movement of material in washes has been highlighted by the damage to wells in BCW and transport of material from an upgradient quarry located south of BCW. From surface soil, contaminants could have migrated to shallow and deeper soils. Shallow soils may act as a secondary source medium to subsurface soil, and subsurface soil may act as a secondary source medium to groundwater. Continued scouring and mobilization of contamination from areas of high concentration of contaminants to areas of less contamination qualifies as a release. A detailed discussion of the migration pathways, exposure media, exposure routes, and potential human and ecological receptors is included in the Soil Part A Data Quality Objectives Technical Memorandum (CH2M, 2010).

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[1] Dioxins/furans TEQ values are calculated from 17 individual dioxin and furan congeners for human/mammal and avian receptors.

Exhibit 2-1. Conceptual Site Models for RFI/RI Investigation Areas Addressed in this EE/CA
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

SWMU/AOC	Primary Source	Primary Source Media*	Potential Release Mechanism	Secondary Source Media*	Potential Secondary Release Mechanism
SWMU 1 and AOC 1	Runoff from TCS, including sandblast material from AOC 16 Discharge of wastewater from TCS to BCW/ percolation bed	Surface soil	• Percolation and/or infiltration • Potential entrainment in stormwater/surface water runoff	• Surface soil • Shallow soil • Potential sediments • Potential groundwater[b]	• Wind erosion and atmospheric dispersion of surface soil • Potential volatilization and atmospheric dispersion/enclosed space accumulation (for volatile compounds only) • Potential discharge of groundwater to surface water[a] • Potential extracted groundwater[b]
AOC 9	Runoff from TCS, TCS access road, and AOC 9 – Southeast Fence Line Discharge from TCS via broken stormwater/ trench drain pipe	Surface soil Shallow soil	• Percolation and/or infiltration • Potential entrainment in stormwater/surface water runoff	• Surface soil • Subsurface soil • Potential groundwater[b]	• Wind erosion and atmospheric dispersion of surface soil • Potential volatilization and atmospheric dispersion/enclosed space accumulation (for volatile compounds only) • Potential extracted groundwater[b]
AOC 10	Runoff from TCS, TCS access road, and AOC 9 – Southeast Fence Line Discharge from TCS via stormwater drains Disposal of debris	Surface soil	• Percolation and/or infiltration • Potential entrainment in stormwater/surface water runoff	• Surface soil • Subsurface soil • Potential groundwater[b]	• Wind erosion and atmospheric dispersion of surface soil • Potential volatilization and atmospheric dispersion/enclosed space accumulation (for volatile compounds only) • Potential discharge of groundwater to surface water[c] • Potential extracted groundwater[b]
AOC 11	Runoff from TCS, TCS access road, and I-40 Discharge from TCS via stormwater drains Disposal of debris	Surface soil	• Percolation and/or infiltration • Potential entrainment in stormwater/surface water runoff	• Surface soil • Subsurface soil • Potential groundwater[b]	• Wind erosion and atmospheric dispersion of surface soil • Potential volatilization and atmospheric dispersion (for volatile compounds only) • Potential extracted groundwater[b]

SWMU/AOC	Primary Source	Primary Source Media*	Potential Release Mechanism	Secondary Source Media*	Potential Secondary Release Mechanism
AOC 11	Burned material	Surface soil	• Percolation and/or infiltration • Potential entrainment in stormwater/surface water runoff	• Surface soil • Subsurface soil	• Wind erosion and atmospheric dispersion of surface soil
AOC 14, AOC 16, and AOC 27	Disposal of debris	Surface soil	• Percolation and/or infiltration • Potential entrainment in stormwater/surface water runoff	• Subsurface soil • Potential groundwater[b]	• Wind erosion and atmospheric dispersion of surface soil • Potential volatilization and atmospheric dispersion (for volatile compounds only) • Potential extracted groundwater[b]
AOC 14 and AOC 27	Burned material	Surface soil	• Percolation and/or infiltration • Potential entrainment in stormwater/surface water runoff	• Subsurface soil	• Wind erosion and atmospheric dispersion of surface soil

Notes:

[*] Surface soil = 0 to 0.5 ft bgs; shallow soil = 0 to 3 ft bgs; subsurface soil = 0 to 10 ft bgs

[a] Discharge to surface water is an insignificant transport pathway as evaluated in the groundwater risk assessment (Arcadis, 2009a).

[b] No current or potential threat to groundwater from vadose zone soil was identified in the draft RFI/RI Report Volume 3 (Jacobs, 2019a).

[c] Discharge to surface water is an insignificant transport pathway as evaluated in the groundwater risk assessment (Arcadis, 2009a) and confirmed by the results of the sediment and porewater samples at the mouth of East Ravine.

AOC = area of concern
BCW = Bat Cave Wash
I-40 = Interstate 40
SWMU = solid waste management unit
TCS = Topock Compressor Station

2.4 Analytical Data

This EE/CA utilizes metal and dioxins/furans data tabulated and collected during the RFI/RI soil investigation. The results of the dioxins/furans nature and extent were presented in a data package to DOI in 2018 (PG&E, 2018) and are described in detail in the draft RFI/RI Report Volume 3 (Jacobs, 2019a). RFI/RI soil investigation results for the relevant investigation areas are presented in Appendix B. Appendix B draws from the RFI/RI soil investigation combined soil data set which, as described in the draft RFI/RI Report Volume 3, includes historical data collected prior to 2008 and data collected as part of the RFI/RI soil investigation (Jacobs, 2019a). The resulting combined data set is referred to in this report as the Combined Soil RFI/RI Data Set. The Combined Soil RFI/RI Data Set spans a wide range of dates, analytical parameters, and data quality. During data validation, the data were classified using three data usability categories based on data quality:

- Category 1 are suitable for all uses, including risk assessment and remedial action decisions.
- Category 2 data are suitable for use in characterization of the COPCs at the facility and to help define the nature and extent of contamination.
- Category 3 data are suitable only for use in qualitative characterization of the nature and extent of contamination.

Although all data categories are shown in Appendix B, only Category 1 data were considered in this EE/CA. Samples from soil that has been removed as part of a removal action are not included. Data for a small number of samples of other matrices (asphalt, concrete, debris, tar, and white powder) are included. Data collected during implementation of the Soil RFI/RI Work Plan (CH2M, 2013) and subsequent data gap work plans (CH2M, 2016b-d) were validated as described in the draft RFI/RI Report Volume 3 (Jacobs, 2019a).

2.5 Human Health and Ecological Risk Assessment Summary

A soil HHERA has been completed for the entire TCS Site. An HHERA report was submitted to DTSC and DOI in 2019 (Arcadis, 2019). An errata to the HHERA was submitted in February 2020 (Arcadis, 2020). DTSC and DOI acceptance of the HHERA was provided on May 29, 2020 (DTSC and DOI, 2020). The objectives of the HHERA were to:

- Provide a basis for determining levels of constituents that can remain in soil at the Site and still be adequately protective of public health and the environment
- Help determine the need for remedial action with respect to soil conditions

The HHERA was conducted using the methodologies presented in the associated agency-approved HHERA Work Plans (Arcadis, 2008a, 2009, 2015) and included evaluating all constituents detected during the RFI/RI soil investigations to identify COPCs and/or COPECs that could potentially pose an unacceptable risk to human health or the ecological environment. The HHERA also developed RBRGs for the COPCs/COPECs that were driving potential risks and identified the specific areas of the Site that could be targeted for risk management.

Risk-based criteria (RBC) were derived during in the HHERA using the same approach and equations as for the development of the human health and ecological RBRGs (presented in Appendix D) for use in soil handling and management decisions. Human health RBCs for receptors identified in the HHERA are presented in Appendix RBC of the HHERA Report (Arcadis, 2019). Updated ecological RBCs for receptors identified in the HHERA are presented in the HHERA Errata (Arcadis, 2020).

The sections that follow provide a brief summary of the approach and the conclusions of the HHERA. An executive summary of the HHERA with additional detail is provided as Appendix C.

2.5.1 Data Evaluation and Exposure Point Concentration Calculation

As discussed in the HHERA report (Arcadis, 2019), only the highest quality data collected during the RFI/RI (Category 1) were used in the HHERA. Samples representative of soil that has since been removed as part of a prior removal action were not included. Data were grouped into datasets by individual potential exposure areas (for example, Bat Cave Wash [AOC1/SWMU1] or AOC 10) and into combined exposure areas (for example, all exposure areas outside the Compressor Station [OCS]) based on assumptions about how the human and ecological receptors at the Site could be exposed to the soils.

Data for each potential exposure area were also grouped according to exposure depth. Humans were assumed to contact soil from 0 to 10 ft bgs and ecological receptors were assumed to contact soil from 0 to 6 ft bgs. Additionally, for the two soil potential exposure areas encompassing wash areas (Bat Cave Wash [AOC1/SWMU1] and AOC 10), two scouring scenarios were evaluated. The 2-foot scouring scenario assumes that the top 2 ft of soil is removed during potential future scouring resulting from surface runoff following heavy rainfalls. Similarly, in the 5-foot scouring scenario, 5 ft of soil is assumed to be removed during scouring. Datasets were adjusted so that potential exposures for the human health receptors were from the 'new' surface to a depth of 10 ft bgs, and the ecological exposures were from the 'new' surface to 6 ft bgs.

Within each depth interval, interim intervals were defined based on specific receptor activities. COPCs and COPECs were identified using various statistical comparisons and tests to assess whether the constituents were detected at concentrations above background levels; organic constituents without background values were selected as COPCs/COPECs, if detected. Exposure point concentrations (EPCs) (the representative concentration potentially contacted by the potential receptors), based on the 95% upper confidence limit on the mean (95UCL), were estimated for the specific depth intervals relevant to various receptors and exposure scenarios.

2.5.2 Human Health Risk Assessment Overview

Potential human receptors were evaluated as four main categories: worker, recreational user, tribal user, and hypothetical resident. The primary potentially complete exposure pathways evaluated were soil direct contact exposure pathways (that is, incidental ingestion, inhalation, and dermal exposure). Worker types evaluated were long-term maintenance worker, short-term maintenance worker, and commercial worker (assumed to work inside the TCS fence line only). Worker activities outside the TCS fence line could include intrusive activities associated with contacting soil up to 10 ft bgs. Recreation user types evaluated were camper, hiker, hunter, and off-highway vehicle (OHV) rider (or all-terrain vehicle rider). Recreational users were evaluated for exposure to soil up to 3 ft bgs outside the TCS fence line. Tribal use was associated with exposure outside the TCS fence line, and exposure was assumed to occur from the inhalation pathway only (that is, inhalation of dust arising from wind erosion or volatile organic compounds [VOCs] that may volatilize from soil). The hypothetical future residential user was evaluated, as requested by the BLM, and was assumed to contact soil up to 10 ft bgs and to grow and consume vegetables, fruits, and poultry from the Site. This hypothetical future residential user evaluation was included in the HHRA for informational purposes only. As stated in DOI's (2015) Land Use Memo, "DOI will not utilize a future residential scenario on Federal lands within the project area when evaluating cleanup options in the Feasibility Study phase."

Incremental lifetime cancer risks (ILCRs) and noncancer hazard indices (HIs) were estimated for potential exposures to constituents in soil and/or soil gas. Cumulative ILCRs (sum of chemical-specific ILCRs) posed by the Site should not exceed 1×10^{-6} to 1×10^{-4}. As stated in the HHERA report, the DTSC point of departure for excess incremental lifetime cancer risk is 1×10^{-6}. A cumulative non-cancer HI that is less than or equal to 1 implies that the predicted exposure is not expected to result in adverse, non-cancer health effects.

As described in the HHERA Work Plan (Arcadis, 2008a) and HHERA (Arcadis, 2019), the human populations that could be present in the areas outside the TCS (i.e., maintenance workers, recreational users, and tribal users) would more likely be exposed randomly, over the course of a lifetime, to soil present in all potential exposure areas outside of TCS, rather than have a lifetime of contact limited to the area of a single SWMU/AOC. Therefore, the combination of all exposure areas outside the TCS fence line (the OCS exposure area) is the scenario in the HHERA considered to most appropriately represent both current and potential future exposures for maintenance workers, recreational users, and tribal users.

2.5.3 Ecological Risk Assessment Overview

Potential ecological receptors evaluated included plants, terrestrial invertebrates, and representative small- and large home range wildlife (that is, birds and mammals). The primary potential exposure pathways for soil were determined to be direct contact or incidental ingestion of surface soil (0 to 0.5 ft bgs), shallow soil (0 to 3 ft bgs), and/or subsurface soil (0 to 6 ft bgs) and, for mammals and birds, uptake and subsequent ingestion of COPECs in biota. Hazard quotients (HQs) were estimated for each potential receptor population and exposure area using EPCs developed for each COPEC over the appropriate soil exposure intervals in accordance with the agency-approved HHERA Work Plans (Arcadis, 2008a; 2009; 2015). Multiple sets of exposure (for example, EPCs) and toxicity assumptions (for example, toxicity reference values [TRVs]) were evaluated, proceeding from generic to more refined assumptions. Risk drivers were identified based on those COPECs for which unacceptable community/population level risk (that is, HQs greater than 1 for plants and soil invertebrate communities and lowest observable adverse effect level (LOAEL)-based HQs for wildlife populations [or LOAEL-based HQs greater than 10 for dioxin TEQ]) were predicted using the most refined exposure and effects assumptions (that is, selected TRVs, area-weighted EPCs, and site-specific site use factor) and additional supporting lines of evidence. For threatened or endangered species and other species of concern observed onsite (ring-tail cat and bats, respectively), a qualitative assessment was completed based on surrogate and representative receptors.

2.5.4 HHERA Conclusions

Several complete pathways of exposure to COPCs/COPECs are present at the Site, both now and potentially in the future. The HHERA generally found no unacceptable risk for most human and ecological receptors. Of the potential human receptors, no unacceptable risk was identified for all relevant potential exposure areas for tribal users, hunters, and commercial and short- and long- term maintenance workers. Of the potential ecological receptors, no unacceptable risk was identified for all relevant potential exposure areas for special-status species, large home-range receptors, herbivorous and insectivorous birds, and herbivorous small mammals.

For certain human recreators and desert shrew (insectivorous small mammals), the potential for unacceptable risk was identified in nine localized areas in the following exposure areas: the SWMU 1 exposure area (within BCW), the AOC 9 exposure area (including portions of the RFI/RI investigation area known as AOC 10), and/or the AOC 10 exposure area.

The potential for unacceptable risk was also identified for plants and invertebrates; however, only generic risk-based screening levels were available to estimate HQs and, as discussed in the HHERA, there is low confidence in the ability to predict risk to plants and invertebrates at the Site based on these generic screening levels. For plants, risk conclusions were based primarily on communities observed during floristic surveys at the Site. Vegetation communities observed at the Site during the floristic surveys conducted in 2013 (GANDA and CH2M, 2013) and in 2017 (CH2M, 2017b) are typical of Mojave Desert plant communities. More than 100 different vascular plant species have been observed at the Site and documented in these survey reports. The floristic survey observations indicate relatively sparse vegetative cover with a variety of species representative of the region, consistent with desert habitats in general and the Lower Colorado River Valley subdivision of the Sonoran Desert in particular (MacMahon, 1988; Brown, 1994).

Although vegetative cover is sparse, no obvious impairment of the plant community was observed in the vicinity of the Site and it provides the important habitat functions necessary for ecological receptors that inhabit the area. However, it should be noted that adverse effects to plant community composition would be difficult to detect given that the habitat is dominated by low-density species like creosote bush. The lack of any noticeable impairment does not mean that plants have not been affected at the Site. Plant communities have been affected by human impacts related to over 60 years of transportation and energy development activities and remedial activities at the Site, potentially resulting in the creation of environments that favor the establishment/dominance of certain plant species. Since plant community composition, distribution, and diversity are affected by human disturbance, it would be very difficult to distinguish between changes in the plant community due to human activities versus contaminant impacts on growth or reproduction due to chemical releases associated with the Site. Because chemical impacts, if they are occurring, are difficult to distinguish from changes associated with physical human disturbances, the potential for adverse effects to the health of the plant community can be considered to be low and therefore risk drivers were not identified for plants.

To summarize, the risk drivers or constituents of concern (COCs) for human recreators and the desert shrew are dioxin/furan TEQ, total chromium (desert shrew only), CrVI (recreator only), and copper (desert shrew only).

2.5.5 Risk-Based Remedial Goals for Risk Drivers

The HHERA (Arcadis, 2019) presents RBRGs for COPCs/COPECs in soil that most significantly contribute to estimates of unacceptable risk to human health and/or ecological receptors (that is, risk drivers or COCs). RBRGs are concentrations that do not present unacceptable risk to human health and ecological receptors. An RBRG is a proposed health-protective target cleanup concentration that can be used, in combination with other factors such as background concentrations, as a starting point for making risk management decisions. RBRGs are calculated for constituents in soil for a given potential receptor where the findings of the HHERA suggest some form of risk management may be warranted. As stated in the HHERA, the RBRGs are not intended to be a bright line, nor used on a point by point basis to identify locations that may warrant risk management. Rather, and consistent with the HHERA approach, RBRGs are applied based on the potential exposure area of interest (that is, the 95UCL for the potential exposure area should be less than or equal to the RBRG).

2.5.5.1 Human Health RBRGs

Consistent with USEPA guidance (1991), a risk-based process was used in the HHERA to estimate RBRGs for COPCs that drive soil risk concerns above *de minimis* risk levels (Arcadis, 2019). For compounds identified as carcinogens, negligible or *de minimis* risk levels were defined in accordance with state and federal guidance as one in one million (1×10^{-6}). DTSC and USEPA ultimately have authority to allow for residual risks to be within the risk management range of 1×10^{-4} to 1×10^{-6}. As indicated in the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300), cancer risks between 1×10^{-6} and 1×10^{-4} fall within a risk management range. This is generally referred to as the acceptable risk range. Within this estimated cancer risk range, there is flexibility for risk managers in deciding what action, if any, is necessary and appropriate for the protection of human health.

For dioxins TEQ, the HHERA notes that DTSC's Human and Ecological Risk Office supports the use of residential and indoor commercial worker remedial goals equal to 10 times the theoretical potential cancer risk of 1×10^{-6} (equal to that associated with a theoretical potential cancer risk of 1×10^{-5}). This regulatory approach is based on studies of bioavailability of dioxins that demonstrate exposure under normal residential and indoor commercial conditions has minimal influence of the serum of exposed individuals. Recreational users are assumed to have the same intake rates via ingestion, dermal contact, and inhalation exposure pathways as under a residential scenario, but exposure occurs on a less frequent basis than assumed under a residential scenario. Therefore, potential exposure to dioxin TEQ in soil for the recreational users over a lifetime would be less than for a hypothetical resident. As such, the HHERA concludes that RBRGs for recreational users equal to 10 times the theoretical potential cancer risk of 1×10^{-6} (that is, 1×10^{-5}) may be appropriate for the Site.

As described in the HHERA, human health RBRGs were calculated for CrVI and dioxin TEQ, as these were the significant contributors to risks above *de minimis* levels, under the camper, hiker and OHV rider potential exposure scenarios. As none of the risk drivers were based on the potential for adverse noncancer effects (i.e., the noncancer HIs were below 1 for relevant exposure scenarios), the human health RBRGs are all based on the potential for carcinogenic effects. RBRGs protective of potential human receptors are summarized in Exhibit 2-2. Risk levels of 1×10^{-4}, 1×10^{-5}, and 1×10^{-6} are shown in the exhibit. Additional information regarding derivation of the RBRGs is presented in Appendix D.

Exhibit 2-2. Human Health Risk-Based Remediation Goals
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Risk Drivers for Potential Recreational Users	Human Health RBRG	RBRG Basis
Chromium, hexavalent	3.1 mg/kg	Off-highway vehicle rider at 1 x 10^{-6} risk
Chromium, hexavalent	31 mg/kg	Off-highway vehicle rider at 1 x 10^{-5} risk
Chromium, hexavalent	310 mg/kg	Off-highway vehicle rider at 1 x 10^{-4} risk
Dioxin/furan TEQ	100 ng/kg	Hiker at 1 x 10^{-6} risk
Dioxin/furan TEQ	1,000 ng/kg	Hiker at 1 x 10^{-5} risk
Dioxin/furan TEQ	10,000 ng/kg	Hiker at 1 x 10^{-4} risk

mg/kg = milligrams per kilogram
ng/kg = nanograms per kilogram
RBRG = risk-based remedial goal
TEQ = toxicity equivalent

2.5.5.2 Ecological RBRGs

The HHERA identified the following risk drivers and potential exposure areas as presenting an unacceptable risk to one or more potential ecological receptors:

- Bat Cave Wash [AOC1/SWMU1] exposure area (baseline) – dioxin TEQ for small mammals
- AOC 9 exposure area (including portions of RFI/RI investigation area known as AOC 10) – CrVI and copper for plants; CrVI, total chromium, and copper for invertebrates; total chromium, copper, and dioxin TEQ for small mammals
- AOC 10 exposure area – CrVI and total chromium for plants; total chromium for invertebrates; and total chromium and dioxin TEQ for small mammals.

Vegetation communities observed at the Site during the floristic surveys conducted in 2013 (GANDA and CH2M, 2013) and in 2017 (CH2M, 2017b) are typical of Mojave Desert plant communities. As noted in Section 2.5.4 and in the HHERA, the floristic surveys provide site-specific observations that suggest the presence of healthy plant communities at the Site. This is considered a reasonable line of evidence than the exceedances of generic plant screening values have low ability to predict toxicity in plants. Therefore, these generic screening levels for plants and soil invertebrates are not recommended for use as RBRGs at the Site. Because the key risk COPECs with HQs greater than 1 for plants and soil invertebrates (CrVI and total chromium) tend to be co-located with risk drivers for human receptors and shrews, risk management considered for the protection of wildlife receptors potentially exposed to total chromium will also reduce risk to plants and invertebrates.

For potential wildlife receptors, RBRGs based on protection of wildlife populations were derived for insectivorous small mammals (desert shrew), the only potential wildlife receptor identified with the potential for unacceptable risk associated with exposure to COPECs in soil at this Site. The RBRGs for small home range insectivorous mammals (desert shrew) were derived using the dietary dose model used to estimate HQs in the predictive ERAs. The RBRGs were calculated using Microsoft Excel Solver software that determines the soil concentration for a target HQ equal to 1.

For dioxin TEQ, a range of RBRGs were calculated using alternate and more robust bioaccumulation factor (BAF) and TRV approaches/values. The congener-specific BAFs (EPA 1999, Fagervold et al. 2010) and a recommended mammalian dioxin TRV developed in Section 6.7.5 of the HHERA Report of 30 nanograms per kilogram body weight per day (ng/kg-bw/day) derived using the USEPA's Ecological Screening Level approach were used to calculate the RBRGs protective of insectivorous small mammals.

Ecological RBRGs are summarized in Exhibit 2-3. Additional information regarding derivation of the RBRGs is presented in Appendix D.

Exhibit 2-3. Ecological Risk-Based Remediation Goals
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Risk Driver for Shrew	BAF	LOAEL-based Mammalian TRV	Ecological RBRG
Chromium, total	ERA / RAWP	ERA / HHERA Work Plan	145 mg/kg
Copper	ERA / RAWP	ERA / HHERA Work Plan	145 mg/kg
Dioxin/furan TEQ	EPA 1999	30 ng/kg-day (geomean of rodent studies)	190 ng/kg
Dioxin/furan TEQ	Fagervold et al. 2010	30 ng/kg-day (geomean of rodent studies)	360 ng/kg

BAF = bioaccumulation factor
ERA = ecological risk assessment
HHERA = Human Health and Ecological Risk Assessment
LOAEL = lowest observed adverse effects level
RAWP = Risk Assessment Work Plan
RBRG = risk-based remedial goal
TEQ = toxicity equivalent
TRV = toxicity reference value

2.5.6 HHERA Key Findings

Overall, the HHERA found no potentially unacceptable risk to most human and ecological receptors exposed to COPCs/COPECs in soil at the Site, both within the TCS (inside the compressor station exposure area) and exposure areas outside the TCS. Estimated risks were determined to be acceptable for all relevant exposure areas for the following receptors:

- Human Health Receptors
  - Tribal User and hunter
  - Workers (Commercial and Short- and Long-term Maintenance Workers).
- Ecological Receptors
  - Special-status species (state- and federal-listed threatened and endangered wildlife species and state species of concern), including ring-tailed cat, cave myotis, and pallid bats
  - Large home range receptors (desert kit fox, Nelson's desert bighorn sheep, red-tailed hawk, and Yuma myotis)
  - Herbivorous and insectivorous birds (Gambel's quail and cactus wren)
  - Herbivorous small mammals (Merriam's kangaroo rat).

For the remaining receptors (camper, hiker, OHV rider, and desert shrew), the potential for unacceptable risk was identified as being driven by a limited number of compounds (i.e., dioxin/furan TEQ and CrVI for human health; dioxin/furan TEQ, total chromium, and copper for ecological receptors) in nine localized areas within SWMU 1, AOC 9, and/or AOC 10.

As an example of applying RBRGs, the RBRGs described in the preceding sections were used to identify locations driving risk above acceptable levels for relevant human and ecological receptors. That process revealed a total of nine locations in three exposure areas (SWMU 1, AOC 9, and AOC 10) as associated with unacceptable risk. Those locations are as follows:

Protection of human recreators (four total locations for the 0 to 3 ft bgs interval):

- Dioxin/furan TEQ: SWMU1-25 in OCS / SWMU 1
- CrVI: AOC10-20, #10 in AOC 9, and MW-58BR_S in AOC 10.

Protection of desert shrew (seven total locations for the 0 to 0.5 ft bgs interval):

- Dioxin TEQ (based on RBRG of 190 ng/kg): SWMU1-25 in BCW; PA-20, AOC10-23, and PA-21 in AOC 9; and AOC10c-4 in AOC 10
- Total chromium: AOC10-20 in AOC 9
- Copper: AOC10-21 in AOC 9.

In total, the nine locations fall within three main exposure areas: SWMU 1 (near SWMU1-25) in BCW, AOC 9 along the TCS fence line (which is within the RFI/RI investigation area known as AOC 10), and AOC 10 within the AOC10c subarea (i.e., drainage depression behind the middle berm in the East Ravine).

2.6 Basis for Removal Action

As documented in the EE/CA Approval Memorandum (DOI, 2018b) and described in Section 1.1, this EE/CA considers an NTCRA to address the following NCP factors:

- Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants
- Actual or potential contamination of drinking water supplies or sensitive ecosystems
- High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate
- Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released

As summarized in Section 2.5, the overall findings of the HHERA support that remedial or removal action addressing hexavalent chromium, total chromium, copper, and dioxin/furan TEQ at the nine locations described in Section 2.5.7 will reduce overall calculated risks to levels that are protective of human health and potential ecological receptors. It is proposed that an NTCRA address these locations.

In addition, in accordance with the cited NCP factors, this EE/CA also evaluates high levels of COPCs/COPECs in soils largely at or near the surface that may migrate as well as weather conditions that may cause COPC/COPECs to migrate (especially scouring). As identified in the EE/CA Approval Memorandum (DOI, 2018b) and summarized in Section 2.3.2, high levels of the following COPCs/ COPECs have been measured in soil on federal land or in locations where constituents have the potential to migrate to federal land: total chromium, copper, lead, mercury, molybdenum, zinc, and dioxins/furans. It is proposed that the NTCRA also address these locations. A detailed description of each location recommended for inclusion under the NTCRA along the rationale are presented in Section 3.6.

3. Identification of Removal Action Objectives

This section identifies the scope, objectives, and goals of the NTCRA.

3.1 Statutory Limits on Removal Actions

This removal action will not be USEPA fund-financed; therefore, statutory limits for removal action do not apply.

3.2 Determination of Removal Scope

The scope of the potential removal action alternatives evaluated in this EE/CA is limited to soil and other solid-phase matrices including sediment, white powder, black sandy material, and debris on federal land or in locations where constituents have the potential to migrate to federal land. The removal action will be limited to PAAs identified in the EE/CA Approval Memorandum and further refined in this EE/CA. Specifically, PAAs are located within the following RFI/RI investigation areas: SWMU 1, AOC 1, AOC 9, AOC 10, AOC 11, AOC 14, and AOC 27.

3.3 Identification of Applicable or Relevant and Appropriate Requirements

To assist with the determination of the RAOs and the development and screening of removal action alternatives, applicable or relevant and appropriate requirements (ARARs) have been identified for the Site. ARARs are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law. As indicated by the USEPA (1988), ARARs may be either “applicable” or “relevant and appropriate.” Distinct from ARARs, USEPA’s regulations also acknowledge to-be-considered (TBC) criteria that may be helpful in evaluating remedies, but for which compliance is not required (USEPA, 1988).

ARARs and TBC criteria fall into three types: chemical-specific, location-specific, and action-specific. The identified criteria for this removal action are presented in Table 3-1.

3.4 Removal Action Objectives and Goals

The Site-specific ARARs and TBC criteria and the NCP factors described in Section 1.1 were used to define RAOs for the proposed NTCRA. The following subsections describes these RAOs and associated removal action goals (RAGs).

3.4.1 Description of Removal Action Objectives and Goals

As described in Section 1.1, an NTCRA at the Site is being evaluated based on the following NCP factors per 40 CFR § 300.415(b)(2):

- Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants
- Actual or potential contamination of drinking water supplies or sensitive ecosystems
- High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate
- Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released

Based on these factors, consideration of ARARs, and the information presented in Sections 2.3 and 2.5, several RAOs have been developed. The RAOs and the specific RAGs associated with each RAO are presented in Exhibit 3-1. The RAGs are the specific metrics associated with each RAO. The RAGs are

Exhibit 3-1. Removal Action Objectives and Goals
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Removal Action Objective	Removal Action Goal
RAO 1: Reduce human and ecological risk related to the COCs in soil up to 10 ft bgs on or adjacent to federal land by removing soil at locations identified as driving risk in the HHERA.	In order to meet RAO 1, the recommendations of HHERA will be followed, that is, removal action alternatives will include removal of soil at the following locations identified in the HHERA: Protection of potential human recreators (four total locations for the 0- to 3-ft bgs depth interval): • Dioxin TEQ: SWMU1-25 • Hexavalent chromium: AOC10-20, #10, and MW-58BR_S Protection of desert shrew (up to seven total locations for the 0- to 0.5-ft bgs depth interval): • Dioxin/furan TEQ (based on RBRG of 190 ng/kg): SWMU1-25, PA-20, AOC10-23, PA-21, and AOC10c-4 Total chromium: AOC10-20 • Copper: AOC10-21 Following the NTCRA, risk will be recalculated for the relevant exposure areas and compared to numerical RAGs, specifically RBRGs defined in the HHERA. Risk calculations will be performed during implementation of the removal action alternative and will include existing soil concentration data for sample locations not removed in the NTCRA and new data from confirmation samples. RAO 1 will be met when the residual 95UCL of the mean concentration for the potential exposure area is less than or equal to the RBRG. Where human health drives risk, the RBRG protective of risk at 1×10^{-6} will be used. Relevant RBRGs are presented in Exhibit 3-2.
RAO 2: Address elevated concentrations of contaminants in soil up to 10 ft bgs outside the TCS in or adjacent to wash areas that are within, or have the potential to migrate to, the HNWR during storm events.	In order to meet RAO 2, removal action alternatives will address direct contact with soil up to 10 ft bgs within the HNWR or that may migrate to the HNWR that contains elevated concentrations of contaminants (specifically, hexavalent chromium, total chromium, copper, lead, mercury, molybdenum, zinc, and/or dioxins/furans). Identification of areas with elevated concentrations have been guided in this EE/CA by comparing individual soil concentration results (from existing RFI/RI data) to a set of numerical RAGs described in Section 3.4.2 and identifying the factor of exceedance of 10 times this numerical RAG. Removing highly contaminated soils and wastes that contain mobile contaminants also minimizes the potential for further degradation of the groundwater aquifer. Confirmation samples will be collected during the NTCRA and compared to numerical RAGs to confirm the completeness of removal activities.
RAO 3: Remove debris, burnt material, and/or discolored soil associated with elevated hazardous substances as identified during the RFI/RI within SWMUs and AOCs up to 10 ft bgs.	In order to meet RAO 3, removal action alternatives will address visually identified debris, burnt material, and/or discolored soil from 0 to 10 ft bgs. RAO 3 will rely on visual identification of material rather than comparison of soil concentrations to numerical RAGs. Areas with observed debris, burnt material, sandblast grit, and/or discolored soil are preliminarily identified for the purpose of evaluating removal action alternatives and costing in Section 3.6 and will be refined based on visual observation during the NTCRA. The completeness of the NTCRA will be confirmed through visual observation and confirmation sampling for COCs.

Notes:
95UCL = 95% upper confidence limit on the mean
AOC = area of concern
bgs = below ground surface
COC = constituent of concern
EE/CA = Engineering Evaluation/Cost Analysis
ft = feet
HHERA = human health and ecological risk assessment
HNWR = Havasu National Wildlife Refuge
ng/kg = nanograms per kilogram
NTRCA = Non-time-critical removal action
RAG = removal action goal
RAO = removal action objective
RBRG = risk-based remedial goals
RFI/RI = RCRA facility investigation/remedial investigation
SWMU = solid waste management unit
TEQ = toxicity equivalent
TCS = Topock Compressor Station

used in this EE/CA to refine the extents of the preliminary PAAs first presented in the EE/CA Approval Memorandum (DOI, 2018b) and to evaluate treatment technologies. The RAGs will also be used to guide the potential NTCRA and evaluate its completeness.

3.4.2 Numerical Removal Action Goals

As described in Exhibit 3-1, RAO 1 will be met when the residual 95UCL for the potential exposure area is less than or equal to the RBRG. In consideration of Tribal input received during the EE/CA comment period, the RAGs have been modified. Consistent with the HHERA, where human health drives risk, the RBRG protective of human receptors at the theoretical potential cancer risk of 1 x 10^{-6} will be used for soil in the upper 2 feet of the PAAs. For soils below 2 feet, the selected human health RBRGs are based on a theoretical potential cancer risk of 1 x 10^{-5}. The relevant RBRGs and RBCs are presented in Exhibit 3-2. Derivation of the RBRGs is presented in Appendix D.

Exhibit 3-2. Numerical Removal Action Goals (RAGs)
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Contaminant	Numerical RAG	Basis	Source	Applicable RAO
Chromium, hexavalent	3.1 mg/kg (surface to 2 ft bgs) 31 mg/kg (2 to 10 ft bgs)	Off-highway vehicle rider at 1 x 10^{-6} risk Off-highway vehicle rider at 1 x 10^{-5} risk	RBRG calculated in HHERA	RAO 1[a] and RAO 2[b]
Chromium, total	145 mg/kg	Desert shrew	RBRG calculated in HHERA	RAO 1[a] and RAO 2[b]
Copper	145 mg/kg	Desert shrew	RBRG calculated in HHERA	RAO 1[a] and RAO 2[b]
Dioxin/furan TEQ[c]	100 ng/kg (surface to 2 ft bgs) 190 ng/kg (2 to 10 ft bgs)	Hiker at 1 x 10^{-6} risk Desert shrew	RBRG calculated in HHERA	RAO 1[a] and RAO 2[b]
Lead	36 mg/kg	Cactus wren	RBC calculated in HHERA Appendix RBC	RAOs 2[b]
Mercury	1 mg/kg	Cactus wren	RBC calculated in HHERA Appendix RBC	RAOs 2[b]
Molybdenum	22 mg/kg	Desert shrew	RBC calculated in HHERA Appendix RBC	RAOs 2[b]
Zinc	1,050 mg/kg	Cactus wren	RBC calculated in HHERA Appendix RBC	RAOs 2[b]

Notes:

[a] For RAO 1, the residual 95UCL of the mean concentration for the potential exposure area will be compared to the RBRG.

[b] For RAO 2, individual soil samples are and will be compared directly to the RBRG to identify significant exceedances.

[c] Dioxin/Furan TEQs for humans and mammals are calculated using the same toxic equivalency factors. The dioxin/furan RAGs are protective of both human recreators and the desert shrew. The RBC for protection of the desert shrew is 190 ng/kg. The RBC for human recreators from 2 to 10 ft bgs is 1,000 ng/kg based on a hiker at 1 x 10^{-5} risk.

95UCL = 95 percent upper confidence limit on the mean
HHERA = Human Health and Ecological Risk Assessment
ft bgs = feet below ground surface
mg/kg = milligram(s) per kilogram
ng/kg = nanogram(s) per kilogram
RAG = removal action goal
RBC = risk-based concentration
RBRG = risk-based remedial goal
TEQ = toxicity equivalent

To support the EE/CA process and implementation of the proposed NTCRA, numerical RAG values were also identified to support RAO 2. These are referred to in this report as numerical RAGs. Chemical-specific ARARs (that is, cleanup standards promulgated under federal or state law) are often used to guide NTCRAs; however, no chemical-specific ARARs were identified by DOI for purposes of this EE/CA at the Site (Table 3-1). In the absence of applicable ARARs, numerical RAGs will be risk-based values (that is, RBRGs and risk-based concentrations [RBCs] calculated in the HHERA). The numerical RAGs are intended to be a tool in identifying areas with elevated concentrations of contaminants in soil.

Numerical RAGs are presented in Exhibit 3-2. For constituents identified as driving risk in the HHERA (CrVI, total chromium, copper, and dioxins/furans), the numerical RAG is the RBRG identified in the HHERA. Where human health drives risk, the RBRG protective of risk at 1×10^{-6} will be used. For other constituents identified in the EE/CA Approval Memorandum (lead, mercury, molybdenum, and zinc), RBCs developed during the HHERA for use in soil handling and management decisions, will be used. Note that the ecological RBCs for these four metals are lower than the human health RBCs, and because of the generic nature of the RBCs for plants and soil invertebrates, and other uncertainties associated with their development, the HHERA Report does not recommend the plant and soil invertebrate RBCs for soil-management decisions at the Site. The basis used for selection of the numerical RAGs for lead, mercury, molybdenum, and zinc is as follows:

- **Lead** – The minimum lead RBC is the ecological RBC of 36 mg/kg. This value is based on protection of cactus wren, and is lower than all other ecological RBCs, including plants and soil invertebrates, and human health RBCs. It is greater than background concentrations (soil background threshold value [BTV] = 8.39 mg/kg). The cactus wren RBC of 36 mg/kg is recommended as the RBC for lead.
- **Mercury** – The two lowest mercury RBCs are ecological RBCs for soil invertebrates (0.1 mg/kg) and plants (0.3 mg/kg). Both values were derived by the Oak Ridge National Laboratory (Efroymson et al. 1997a,b) and the authors have low confidence in their ability to predict risk based on the extremely small datasets evaluated. The lowest observed adverse effects concentration (LOAEC) used to derive the soil invertebrate RBC is 0.5 mg/kg. The only other effects data evaluated by Efroymson et al. (1997a) was a chronic LOAEC of 12.5 mg/kg for methylmercury, and in this study a concentration of methylmercury at 2.5 mg/kg had no effects. For plants, the RBC is based on a secondary source, citing unspecified toxic effects in unspecified plant species; the only other effects data evaluated by Efroymson et al. (1997b) were more than two orders of magnitude higher. The next lowest RBC is the ecological RBC of 1.0 mg/kg, protective of cactus wren. This value was derived using toxicity data for organic forms of mercury, which are unlikely to be present in desert soils. Inorganic mercury is less toxic to wildlife than organic mercury (USEPA, 1995) and using inorganic mercury toxicity data to derive wildlife RBCs would result in higher RBC values for both birds and mammals. No BTV is available for comparison to the RBCs. Due to low confidence in the soil invertebrate and plant RBCs and the conservative nature of the wildlife RBCs (based on organic mercury), the cactus wren RBC of 1.0 mg/kg is recommended as the RBC for mercury.
- **Molybdenum** - The lowest molybdenum RBC is the ecological RBC for plants (2 mg/kg); no RBC is available for soil invertebrates. The plant value was derived by Oak Ridge National Laboratory (Efroymson et al. 1997b) and the authors have low confidence in its ability to predict risk based on the extremely small dataset evaluated. Only a single secondary study reporting unspecified effects in plants was available as the basis of the RBC. Efroymson et al. (1997b) include additional information that molybdenum toxicity to plants has never been reported, and that low concentrations of this element are used to fertilize legumes, which contain nitrogen-fixing bacteria that require molybdenum. The next lowest RBC is the ecological RBC of 22 mg/kg protective of desert shrew. This value was calculated by Sample et al. (1996) and is based on a chronic LOAEL for mouse reproduction. For comparison, the molybdenum BTV is 1.87 mg/kg. Due to the low confidence in the plant RBC, the next lowest RBC based on the desert shrew of 22 mg/kg is recommended as the RBC for molybdenum.
- **Zinc** - The lowest zinc RBC is 120 mg/kg for soil invertebrates. This is an ecological soil screening level (EcoSSL) derived by USEPA (2008) based on a relatively robust dataset consisting of five studies, a variety of test soils, and at least three test species. For comparison, the next lowest RBC is 160 mg/kg for plants (EcoSSL); the minimum wildlife RBC is 1,050 mg/kg for cactus wren; and the zinc BTV is 58 mg/kg. Zinc is an essential element for plants and wildlife. Although there is a higher

relative confidence in the plant and invertebrate EcoSSLs compared with the screening levels from the Oak Ridge National Laboratory (Efroymson et al., 1997a; 1997b), the HHERA does not recommend using RBCs for plants and invertebrates for soil management decisions at the Site. Therefore, the lowest wildlife RBC of 1,050 mg/kg based on the cactus wren is the recommended RBC for zinc.

3.5 Determination of Removal Schedule

The total project period to construct the selected alternative will depend on the selected removal action.

Because this removal action has been designated as non-time-critical, the start date of the removal action will be determined by factors other than the urgency of threat. Possible factors include weather, the availability of resources, and site constraints. The total project period is anticipated to last up to 16 months. Critical milestone periods for the removal action are as follows:

- Work Plan Development and Procurement – 6 months
- Removal Action – 6 months
- Reporting – 4 months

3.6 Potential Action Areas

The PAAs are portions of the Site that do not meet the RAOs. As described in Section 2.3, PAAs were initially identified in the EE/CA Approval Memorandum (DOI, 2018b) based on significant exceedances of background values, ECVs, and/or residential screening since the RFI/RI soil samples were collected (especially in Bat Cave Wash). The lateral extents of the PAA are presented here for the purpose of comparing removal action alternatives and developing cost estimates. It is anticipated that the lateral extent of these areas may be refined during the work planning phase and based on observations and sampling made during implementation of the NTCRA.

The lateral extent of the preliminary PAAs were refined in this EE/CA based on consideration of the following:

- **Inclusion of locations contributing most significantly to calculated unacceptable risk (to address RAO 1)**. Nine locations identified in the HHERA as contributing most significantly to levels of calculated unacceptable risk for ecological receptors and risks above *de minimis* levels for potential human receptors were included in the refined PAA lateral extents.
- **Comparison of soil data to numerical RAGs (to address RAO 2)**. Data from the RFI/RI soil investigation (the Combined Soil RFI/RI Data Set) were compared to the numerical RAGs. Only Category 1 data were considered. Data for each constituent considered in this EE/CA were categorized based on the degree to which they exceeded the corresponding numerical RAGs. Specifically, factors of exceedance were calculated by dividing the constituent concentration in soil by the numerical RAG. The results of this evaluation are summarized in Figures 3-1 through 3-3, which show the highest factor of exceedance for any constituent considered in this EE/CA at any depth between 0 and 10 ft bgs. Additional tables and figures presenting the detailed screening of data for individual constituents against each of the numerical RAGs is presented in Appendix E. Locations identified as significantly exceeding the numerical RAGs were included in the refined PAA lateral extents.
- **Inclusion of debris, burnt material, and/or discolored soil with elevated hazardous substances (to address RAO 3).** Refinement of the lateral extent of the PAAs considered areas where debris, burnt material, and/or discolored soil have been observed. Areas where debris, burnt material, sandblast grit, and/or discolored soil have been observed in the past were included in the refined PAA lateral extents.

PAAs were identified in SWMU 1, AOC 1, AOC 9, AOC 10, AOC 11, AOC 14, and AOC 27. Other RFI/RI investigation areas (for example, AOC 4 – Debris Ravine) were considered, but significant exceedances were not identified or not considered a significant source of contamination. Refined extents of the PAAs are presented on Figures 3-1 through 3-3. A list of PAAs is presented in Exhibit 3-3 along with the rationale for inclusion as a PAA. For the purposes developing and comparing removal action alternatives and costs, the approximate surface area, assumed excavation depth, and soil volume in each PAA is also presented in Exhibit 3-3. Areas, depths, and volumes are estimates only; the actual extent and depth of excavation will be dependent on constituent concentrations measured in the RFI/RI, observations during removal, and the results of confirmation sampling after removal. Surficial deposits of sand blast grit identified at AOC 16 are identified for removal, and sandblast grit samples contained copper at greater than 10 times the RAG. Due to the minimal volume, a PAA was not defined for the AOC materials.

Exhibit 3-3. Potential Action Areas: Surface Areas and Volumes

Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Investigation Area	Potential Action Area Identified in EE/CA Approval Memorandum	Existing Condition [a]	Surface Area (ft^2)	Assumed Excavation Depth (ft)	Volume [b] (cubic yards)
SWMU 1 – Former Percolation Bed	SWMU 1 PAA #1	Existing conditions within this PAA do not meet RAOs 1, 2, and 3. Includes SWMU1-25, which is associated with unacceptable risk to ecological receptors and human health risks above *de minimis* levels (does not meet RAO 1). Soil data collected at several locations significantly exceed numerical RAG(s) for RAO 2 (Figure 3-1). This area is vulnerable to weather-related soil migration and is partially within the HNWR. Discolored soil is present in the shallow soil between boring locations SWMU1-25 and SWMU1-1 (does not meet RAO 3).	6,886	10	2,550
SWMU 1 – Former Percolation Bed	SWMU 1 PAA #2	Existing conditions within this PAA do not meet RAOs 2 and 3. Soil data collected at several locations significantly exceed numerical RAG(s) for RAO 2 (Figure 3-1). This area is vulnerable to weather-related soil migration and is partially within the HNWR. White powder is present in soil within this PAA (does not meet RAO 3).	2,380	5	441
SWMU 1 – Former Percolation Bed	SWMU 1 PAA #3	Existing conditions within this PAA do not meet RAO 2. Soil data collected at one location significantly exceed numerical RAG(s) for RAO 2 (Figure 3-1). This area is vulnerable to weather-related soil migration.	114	5	21
AOC 1 – Area Around Former Percolation Bed	AOC 1 PAA #1	Existing conditions within this PAA do not meet RAO 2. Soil data collected at one location significantly exceed numerical RAG(s) for RAO 2 (Figure 3-2). This area is vulnerable to weather-related soil migration.	351	5	65
AOC 1 – Area Around Former Percolation Bed	AOC 1 PAA #2	Existing conditions within this PAA do not meet RAOs 2 and 3. Soil data collected at several locations significantly exceed numerical RAG(s) for RAOs 2 (Figure 3-1). This area is vulnerable to weather-related soil migration. Discolored soil is present in the area around former well TCS-4 (does not meet RAO 3).	1,912	10	708
AOC 1 – Area Around Former Percolation Bed	AOC 1 PAA #3	Existing conditions within this PAA do not meet RAO 2. Soil data collected at several locations exceed numerical RAG(s) for RAOs 2 (Figure 3-1). This area is vulnerable to weather-related soil migration.	473	5	88
AOC 9 – Southeast Fence Line	AOC 9 PAA #1	Existing conditions within this PAA do not meet RAOs 1 and 2. Includes #10, which is associated with unacceptable risk to ecological receptors and human health risks above *de minimis* levels (does not meet RAO 1). Soil data collected at several locations significantly exceed numerical RAG(s) for RAOs 2 (Figure 3-3). This area is vulnerable to weather-related soil migration.	210	5	39
AOC 10 – East Ravine	AOC 10 PAA #1	Existing conditions within this PAA do not meet RAOs 1, 2, and 3. Includes AOC10-20, AOC10-21, AOC10-23, PA-20, and PA-21, which are associated with unacceptable risk to ecological receptors and/or human health risks above *de minimis* levels (does not meet RAO 1). Soil data collected at several locations significantly exceed numerical RAG(s) for RAOs 2 (Figure 3-3). This area is vulnerable to weather-related soil migration. White powder may be present within AOC 10 (does not meet RAO 3).	6,472	5	1,199

Investigation Area	Potential Action Area Identified in EE/CA Approval Memorandum	Existing Condition [a]	Surface Area (ft^2)	Assumed Excavation Depth (ft)	Volume [b] (cubic yards)
AOC 10 – East Ravine	AOC 10 PAA #2	Existing conditions within this PAA do not meet RAOs 1, 2, and 3. Includes MW-58BR_S and AOC10c-4, which are associated with unacceptable risk to ecological receptors and/or human health risks above *de minimis* levels (does not meet RAO 1). Soil data collected at several locations significantly exceed numerical RAG(s) for RAOs 2 (Figure 3-3). This area is vulnerable to weather-related soil migration and is partially within the HNWR. White powder may be present within AOC 10 (does not meet RAO 3).	6,650	5	1,231
AOC 10 – East Ravine	AOC 10 PAA #3	Existing conditions within this PAA do not meet RAOs 2 and 3. Soil data collected at one location exceed one numerical RAG for RAO 2 (Figure 3-3). This area is within the HNWR. Discolored / stained soil and debris are present.	379	5	70
AOC 10 – East Ravine	AOC 10 PAA #4	Existing conditions within this PAA do not meet RAO 2 and 3. Soil data collected at several locations exceed numerical RAG(s) for RAOs 2 (Figure 3-3). This area is within the HNWR. White powder may be present within AOC 10 (does not meet RAO 3).	265	5	49
AOC 11 – Topographic Low Areas	AOC 11 PAA #1	Existing conditions within this PAA do not meet RAO 2. Soil data collected at several locations significantly exceed numerical RAG(s) for RAOs 2 (Figure 3-3). This area is vulnerable to weather-related soil migration and is within the HNWR.	1,917	5	355
AOC 14 – Railroad Debris Site	AOC 14 PAA #1	Existing conditions within this PAA do not meet RAOs 2 and 3. Soil data collected at several locations significantly exceed numerical RAG(s) for RAOs 2 (Figure 3-2). This area is vulnerable to weather-related soil migration. Burnt material, trash, and debris are present (does not meet RAO 3). Trenching in the areas between AOC14-16W and AOC14-14W encountered debris.	1,513	5	280
AOC 27 – MW-24 Bench	AOC 27 PAA #1	Existing conditions within this PAA do not meet RAOs 2 and 3. Soil data collected at several locations significantly exceed numerical RAG(s) for RAOs 2 (Figure 3-2). This area is vulnerable to weather-related soil migration. Burnt material, trash, and debris are present (does not meet RAO 3).	828	5	153
Total	--	--	**30,350**	--	**7,250**

Notes:

[a] Data considered were for soil samples collected between 0 and 10 feet bgs (or the deepest depth sampled, if less than 10 feet bgs). Some locations for which data do not significantly exceed the numerical RAGs but are adjacent to or bounded by locations with significant exceedances were included. There were two primary reasons for this: (1) it would not be practical to address the significant exceedances during a removal action without addressing the adjacent or nearby locations, and (2) soil at the Site has likely been redistributed since RFI/RI soil samples were collected (especially in Bat Cave Wash). PAA lateral extent refinement also considered relevant site features such as topography that impact the practical extent of removal activities.

[b] For simplicity, volume calculations do not include cut slope volumes.

AOC = area of concern
bgs = below ground surface
EE/CA = Engineering Evaluation/Cost Analysis
ft = feet
PAA = potential action area
RAG = removal action goal
RAO = removal action objective
SWMU = solid waste management unit
PAA = potential action area

4. Identification and Analysis of Removal Action Alternatives

Several potential removal action alternatives have been identified that meet the RAOs. This section describes the treatment technologies identified, provides detailed descriptions of removal action alternatives, and summarizes the screening criteria used to assess removal action alternatives. The Guidance on Conducting NTCRAs (USEPA, 1993) notes that only a limited number of alternatives appropriate for addressing the RAOs should be identified and assessed. Consistent with remedial activities at this Site, an effort was made to identify alternatives that minimize the volume of material removed from the Site.

4.1 Treatment Technology Identification and Testing

4.1.1 Treatment Technology Identification

Several treatment technologies that could potentially meet one or more of the RAOs were identified as appropriate based on engineering judgment. Technology identification considered current knowledge regarding soil treatment and remedial options. A brief description of each technology or treatment process is provided below.

- **Excavation and Offsite Disposal.** Contaminated soil is excavated, transported, and disposed of at a permitted offsite disposal facility. Pretreatment may be required to meet land disposal requirements of the offsite facility; however, this is not expected to be necessary for Topock Site soils. Excavation and offsite disposal is a well-proven and readily implementable technology for treatment of the soil (FRTR, 2007).
- **Excavation and Ex-Situ Treatment.** Contaminated soil is excavated and treated. Treatment methods evaluated in this EE/CA are mechanical separation, soil washing, thermal treatment, chemical reduction, and solidification/stabilization.
  - ***Mechanical Separation***. Soil particles are physically separated using a mechanical sieve. This process physically separates coarse granular materials from fine soil particles where most of the contaminant mass is adsorbed. Fine soil particles are further treated or disposed of, and coarse material is returned to the Site. Mechanical separation is appropriate for metals and dioxins/furans. CERCLA defines soil as having particle size under 2 millimeters (mm); RCRA allows for particles under 9 mm (approximately 3/8-inch) (USEPA, 2002). Mechanical testing was retained for bench-scale testing, as described below.
  - ***Soil Washing***. Soil particles are tumbled with water to physically desorb contaminants adsorbed onto the fine soil particles. Soil washing can be enhanced by adding a reagent to the water such as a surfactant, leaching agent, or chelating agent. Wash water can be recycled through the soil washing system. Wash water may be further treated or disposed of directly in accordance with regulatory requirements. Soil washing is appropriate for metals and dioxins/furans. Mechanical testing was retained for bench-scale testing, as described below.
  - ***Thermal Treatment***. Soil is heated, and contaminants are desorbed, vaporized, and/or destroyed through processes such as combustion. Thermal treatment is appropriate for dioxins/ furans but is not an effective treatment method for metals.
  - ***Ex-Situ Chemical Reduction***. Reagents are added that react with targeted constituents in soil to chemically convert hazardous contaminants to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert. Reductants can be applied ex-situ using commercially available mixing equipment. Chemical reduction is a common treatment for chromium (FRTR, 2007). Chemical reduction is appropriate for stabilization of CrVI; however, this approach will not reduce total chromium mass. Chemical reduction of dioxins/furans is feasible under certain conditions; however, performance of this technology is poorly characterized and generally lacking in commercial suppliers capable of supplying field-scale treatment services.

- ***Solidification/Stabilization (S/S)***. Can be implemented ex-situ or in-situ and involves use of various chemical additives to physically bind or encapsulate target contaminants within a stabilized mass (solidification) or to chemically reduce the contaminants' mobility by inducing chemical reaction between the stabilizing agent and the contaminants; treated materials may range from inert solid granules to void-free monoliths. Materials stabilized in-situ would remain onsite. For that reason, materials stabilized in-situ must be resistant to natural erosion forces including wind and water scour. Conditions at this Site severely limit options for permanent protection of stabilized materials from natural erosion forces; accordingly, the use of in-situ stabilization is not considered practical.

  Ex-situ S/S could be effective at the Site but is not implementable due to space constraints. In an ex-situ S/S scenario, excavated soil from the PAAs would be consolidated and stabilized with a cement-type mixture. Contaminants would be bound within a solid mass, or monolith. The resulting monolith of material would need to be capped and maintained in perpetuity to reduce direct exposure and future migration risks. There are limited areas on the TCS or within PG&E property where S/S-treated material could be safely placed. Placement would need to avoid areas with vehicle traffic, as S/S-treated material could be prone to cracking under the stress of vehicles. Based on the volume of soil to be treated, including the added 15% S/S reagent volume, placement of S/S-treated material on PG&E property would be impractical due lack of space for placement of over 8,500 cubic yards of material.

- **In-Situ Treatment**. Contaminated soil is treated in place. Treatment methods evaluated in this EE/CA are soil flushing, thermal treatment, chemical reduction, and solidification/stabilization. Thermal treatment, chemical reduction, and solidification/stabilization as described in Excavation and Ex-Situ Treatment can also be applied to soil in-situ but are not appropriate for the Site as explained in the previous section.

  - ***Soil Flushing***. Soil flushing uses the contaminant's solubility in liquid to physically separate it from the soil, possibly combined with other suitable amendments such as a surfactant, cosolvent, acid, or base. The aqueous solution can be applied to the soil surface, the vadose zone, and/or the saturated zone. Contaminants in the soil partition into the flushing solution by mechanisms such as solubilization, emulsification, or chemical reaction. The solution is collected for aboveground treatment through a series of extraction wells, points, or trenches (FRTR, 2007). This technology is impractical for the site given the geographically isolated PAAs.

The following technologies were retained for alternative development or further evaluation in bench-scale laboratory treatability testing:

- Excavation and offsite disposal
- Excavation and ex-situ treatment with mechanical separation
- Excavation and ex-situ treatment with soil washing

4.1.2 Bench-Scale Treatability Testing

Mechanical separation and soil washing were evaluated with treatability studies to determine whether these treatment technologies would be effective at remediating both dioxins/furans and metals at the bench scale. Appendix F1 presents the detailed narrative and results from these bench-scale tests, including laboratory data packages and the data quality evaluation report. In May 2019, soil samples were collected from seven locations within BCW and sent to Hazen Research, Inc. (Golden, Colorado). The samples were collected at locations known to contain elevated contamination concentrations in soil in BCW.

The lab performed baseline testing to establish the particle size distribution, volumetric size distribution, bulk density, and contaminant concentrations.

Mechanical Separation

Soil samples sent to the lab ranged from fines (<200 US mesh [0.074 mm]) to about 3 inches in diameter. Samples were sieved at ¾ inch to remove cobbles and rocks that were too large for bench-scale processing. The sub-¾ inch soil was further dry-sieved into representative splits at the 4 (4.67 mm), 10 (2 mm), 30 (0.595 mm), 35 (0.5 mm), 70 (0.210 mm), 100 (0.149 mm), and 200 (0.074 mm) US mesh to determine particle size distribution. Select finer fractions were analyzed for total chromium, hexavalent chromium, and zinc. This analysis provided the approximate distribution of contamination with respect to particle size. A summary of the results is presented in Exhibit 4-1. Dioxin/furans were not included in this portion of the test as the metals results were a conservative proxy for assessing contaminant concentrations in the finer fractions. Dioxin/furans were analyzed in the sub-¼ inch samples from each of the seven samples, but were not analyzed in the individual finer grain splits (see Table 7 in Appendix F1 for dioxin/furan results in the less than ¼ inch fraction). The results confirm that soil sample fractions less than ¼ inch exceed the RAGs. Higher contaminant concentrations were found in the finer fractions. The bench-scale testing supports the conclusion that sieving out the fine soil fraction will reduce the overall metals concentration in soil.

Material greater than ¼ inch was not tested for contaminants during the bench-scale testing, as it does not qualify as a soil, and the laboratory cannot analyze this material without pulverization due to the large grain sizes. Material was not pulverized as pulverization was not representative of exposure pathway assumptions and natural conditions. Material greater than ¼ inch is not expected to exceed the RAGs.

Exhibit 4-1. Average Soil Concentrations by Particle Size

Soil Engineering Evaluation/Cost Analysis

PG&E Topock Compressor Station, Needles, California

Particle Size	Average Hexavalent Chromium Concentration [a] (mg/kg)	Average Total Chromium Concentration [a] (mg/kg)	Average Zinc Concentration [a] (mg/kg)
Greater than ¼ inch	NA	NA	NA
Less than ¼ inch	12	930	94
¼ inch to 4 US mesh	5.7	470	69
4 US mesh to 70 US mesh	15	1,200	100
70 US mesh to 200 US mesh	18	1,800	150
Less than 200 US mesh	32	3,700	240
Numerical RAG[b]	***3.1***	***145***	***1,050***

Notes:

[a] Averages are the arithmetic mean of seven samples collected in Bat Cave Wash.

[b] Please refer to Exhibit 3-2 for additional information regarding the numerical RAGs.

mg/kg = milligrams per kilogram

NA = not analyzed; material greater than ¼ inch was not tested for contaminants during the bench-scale testing, as it does not qualify as a soil, and the laboratory cannot analyze this material without pulverization.

Soil Washing

Soil washing was evaluated at laboratory scale with Site soil that exhibited the highest contaminant concentration values sieved to the sub-¼ inch fraction. Testing was performed using a small-scale batch washing system designed to mimic the action of a trommel screen which would be used in the field for a full-scale soil washing system. Soil samples were washed using tap water and a Union Carbide Triton X-100 surfactant mixture. The washed soil was wet sieved at 35 and 70 mesh (0.5 and 0.21 mm respectively) with the oversize fraction dried and the undersize fraction filtered and dried before contaminant concentration analysis. Although the Triton X-100 was applied using a high dosage, the aqueous concentration of contaminants in wash water was not appreciably changed. As expected, soil washing concentrated the metal and dioxin compounds in the undersized 35/70 mesh fraction, but the 35/70 oversized mesh fraction only showed an order of magnitude reduction in dioxin/furan TEQ value calculated for mammals, and the metals analyzed (total chromium, CrVI, and zinc) yielded concentration values that were greater than the numerical RAGs. For example, total chromium was 1,644 mg/kg in the parent sample and ranged from 540 to 720 mg/kg in the oversize washed samples, compared to the total chromium numerical RAG of 145 mg/kg. Overall, bench-scale results suggest that the soil washing would not effectively reduce contaminant concentration values in soil below the RAGs for material at or below ¼ inch. Soil washing was, however, demonstrated effective in removing fines present on the outer surfaces of coarser materials that may contain contaminants.

Soil washing for the fine soil fraction (designated as material less than 1/4 inch) was not retained for detailed analysis since bench-scale testing was unable to achieve the necessary contaminant reduction to meet the numeric RAGs established under RAO 2. In laboratory testing the coarse fraction constitutes materials which are larger than 1/4 inch. However, based on the treatability testing results, mechanical separation with subsequent water washing of the coarse fractions is expected to meet the numerical RAGs.

4.2 Detailed Description of Alternatives

Three removal action alternatives have been developed to address the RAOs at the Site. A total of four alternatives including No Action were analyzed in this EE/CA. They are:

- Alternative 1 – No Action
- Alternative 2 – Excavation and Offsite Disposal of All Material
- Alternative 3 – Excavation, Mechanical Separation, Offsite Disposal of Fines, and Reuse of Coarse Material
- Alternative 4 – Excavation, Mechanical Separation, Offsite Disposal of Fines, Soil Washing of Coarse Material, and Reuse of Washed Coarse Material
- Alternative 5 – Removal of Visible Hazardous Surface Debris

Alternative descriptions are provided in the following subsections. Details regarding implementation of the various alternatives and associated technologies are presented for the purpose of developing costs and supporting comparative analysis of identified alternatives; accordingly, details and assumptions described herein are subject to future change. Details regarding the selected removal action will be refined during the design stage and will be presented in the Removal Action Work Plan to be developed after a removal action is selected. Cost analyses for each alternative are presented in Appendix G.

4.2.1 Alternative 1 – No Action

Alternative 1 is included in and carried through the entire EE/CA process as the baseline condition against which the performance of the remaining alternatives is evaluated. In Alternative 1, no removal action would take place. The contaminated media would be left in place, without removal, treatment, or other mitigation measures to reduce the potential for future exposure to Site contaminants. Because no removal action would be implemented, Site conditions would be unchanged and long-term risks due to exposure to Site contamination would remain the same as described in Section 2.5.

4.2.2 Alternative 2 – Excavation and Offsite Disposal of All Material

Alternative 2 consists of excavation of soil and other soil-like material (such as white powder) as well as debris and burnt material to meet RAOs followed by the offsite disposal of excavated materials at an approved disposal facility. Excavation would occur within the PAAs shown on Figures 3-1 through 3-3. The major components of Alternative 2 are:

- Site preparation
- Soil excavation
- Confirmation sampling
- Excavation backfill
- Waste transportation
- Waste disposal
- Site restoration (regrading and revegetation)

It is important to note that the removal areas shown on Figures 3-1 through 3-3 are approximate and were used primarily to estimate the removal costs. Exhibit 3-3 provides the assumed soil areas and depths used for the scope and cost estimate. The actual removal area extent and depth would be guided by a phased approach of field screening with confirmatory sampling supported by offsite laboratory analysis. Soil samples would be analyzed for metals in the field using an x-ray fluorescence (XRF) analyzer and for dioxins/furans in the laboratory using a modified SW8290 method to shorten analytical turn-around times. Additional lateral excavation may be required depending on the results of visual observations, field XRF measurements, or post-excavation confirmation samples. Upon completion of the soil removal, the final confirmation sample results would be entered into the risk assessment to calculate the post-treatment risk at the Site.

Site preparation would include mobilization and setup of support facilities including access routes, site surveys, vegetation removal, and establishment of soil erosion and sediment controls. Cultural resources and biological pre-construction field verifications would be performed prior to any intrusive work. Coordination with USFWS and CDFW would occur to ensure applicable management measures are implemented during the removal action to avoid and protect sensitive habitats and wildlife in the work areas. The removal action would comply with all applicable measures and stipulations of the PA (BLM, 2010), the PA Amendment (BLM, 2017), and the Cultural and Historic Property Management Plan (CHPMP) (BLM, 2016). Equipment and support facilities (e.g., excavators, loaders, office trailer, storage containers, sanitary facilities, etc.) would be mobilized to the Site and staged at approved locations. Utility clearance surveys, vegetation removal, and access routes would be improved where necessary to provide access to the areas marked for excavation (Figure 4-1). Grubbing of root systems associated with smaller vegetation would be performed incidentally to the excavation of contaminated soil from the indicated areas. Vegetation removal would be minimized to the practical extent needed to complete the removal action. Erosion and sediment control measures would be established to ensure that soil disturbance activities do not adversely impact downgradient surface water bodies and floodplains. Throughout the removal action implementation, erosion and sediment controls would be regularly inspected and maintained until excavation and backfilling are demonstrated complete. An erosion and sediment control plan would be prepared as part of the Removal Action Work Plan.

The estimated quantity of soil to be removed from all PAAs is approximately 10,900 tons. Excavation operations would be performed by qualified excavation personnel with current Hazardous Waste Operations and Emergency Response (HAZWOPER) training, as required by the Occupational Health and Safety Administration (OSHA). Standard dust control techniques would be used during removal activities to mitigate fugitive dust emissions. Engineering controls would be used to minimize erosion during storm events and would remain in effect until the excavated area is stabilized and revegetation is complete, if appropriate. The health and safety plan submitted as part of the Removal Action Work Plan would specify the dust suppression techniques, air monitoring requirements, and action levels necessary to ensure worker safety, as well as the Site access controls necessary to prevent members of the public from being exposed to contamination during removal operations. Excavation areas will be controlled to limit falls and minimize wildlife entrapment. Following excavation, material would be stockpiled at a location agreed upon by landowners and stakeholders. Stockpiled soil would be managed in accordance with the Removal Action Work Plan prior to offsite disposal; proposed soil processing and staging areas are shown on Figure 4-1. Trash, debris, burnt material, and discolored soil would be stockpiled separately for offsite disposal without mechanical separation.

After XRF readings show acceptable levels, confirmation sampling would be performed to confirm the extent of excavation. Confirmation samples would be collected from the bottoms and sidewalls of each excavation area and analyzed for contaminants to verify RAGs have been met. Based on the confirmation sampling results, additional excavation would be conducted, as necessary, to remove residual soil that exceeds cleanup goals.

Excavated waste would be transported offsite to an appropriate waste disposal facility. For the purposes of this EE/CA it is assumed that approximately 40 waste characterization samples (at least one per 250 tons and at least one per PAA) would be collected and analyzed for the full toxicity characteristic leaching procedure (TCLP) waste characterization suite, metals, VOCs, semivolatile organic compounds (SVOCs), and TPH. The waste characterization sampling would be in accordance with the approved Soil

Management Plan for the Topock Groundwater Remedy (Appendix L of the Construction/Remedial Action Work Plan [CH2M, 2015b]) and would be described in the Removal Action Work Plan. Hazardous waste would be transported to a RCRA Subtitle C (i.e., permitted) facility, and non-hazardous waste would be transported to a Subtitle D facility. Soil with TCLP-chromium concentrations greater than 5.0 milligrams per liter (mg/L) as determined by waste characterization sampling results would be classified as hazardous waste based on chromium toxicity, and thus would be subject to special transportation and disposal requirements. In the absence of Site-specific TCLP data, for the purposes of the cost estimate (Appendix G), it is estimated that 70 percent (7,600 tons) would be classified as non-hazardous waste and would be disposed of at a Subtitle D facility, and that 30 percent (3,300 tons) would be classified as hazardous waste suitable for disposal at a Subtitle C landfill.

After confirming that the RAGs have been met, the excavated areas would be backfilled and re-graded to the approximate original contours, ensuring appropriate site drainage and maintaining current exposure depth intervals (described in Section 2.5). The preference would be to use onsite material generated during groundwater remedy construction for backfill if available as it appropriately matches grain size distribution of excavated materials. Material from the BOR quarry (Figure 4-1) may be used for backfill for the PAAs. Import material would be used only as needed to achieve acceptable grades. Backfill material would be sampled to verify that the material meets RAGs. Within BCW, grading of areas around excavations may be performed to reduce slopes of excavation cut faces. Compaction specifications would be calculated during preparation of the Removal Action Work Plan.

Revegetation activities would begin immediately following removal action, if applicable, with the intent to offset loss of habitat incurred during excavation, as represented by the loss of mature plants and trees. In general, the revegetation approach would be informed by the preconstruction condition, as documented through ground photographic records, topographic/aerial maps, and pre-construction archaeological and biological field verifications. The goal is to restore the areas affected by the removal action as closely as possible to preconstruction conditions. Specific information related to the impacts, generalized locations for restoration activities, and revegetation procedures would be presented in the Removal Action Work Plan.

4.2.3 Alternative 3 – Excavation, Mechanical Separation, Offsite Disposal of Fines, and Reuse of Coarse Material

Alternative 3 incorporates all the components of Alternative 2 except that coarse-grained material (greater than 3/8”) would not be disposed of offsite. For the purposes of the EE/CA alternative analysis, the coarse fraction constitutes materials larger than 3/8 inch and the fine fraction is material less than 3/8 inch, as this is the finest particle size that can readily be screened using typical construction equipment. Under this Alternative, contaminated soil would be excavated and mechanically separated. Fines (assumed for this EE/CA to be material less than 3/8 inch) would be collected and disposed of at an offsite facility, and the remaining coarse material (assumed for this EE/CA to be material greater than 3/8 inch) would be returned to the excavation site. Coarse material with significant residual staining or colored encrustation would be removed offsite for disposal. The major components of Alternative 3 are:

- Site preparation (as described for Alternative 2)
- Soil excavation (as described for Alternative 2)
- Confirmation sampling (as described for Alternative 2)
- Mechanical separation
- Stockpile construction and management for fine and coarse soil
- Waste disposal
- Coarse material reuse
- Site restoration (regrading and revegetation, as described for Alternative 2)

Excavated soil would be mechanically separated onsite using a sequential combination of equipment such as a bar screen, hopper, trommel, and/or vibratory screening tables. Coarse particles greater than 3/8 inch would be separated, stockpiled, and returned to the excavation areas as backfill. Coarse material with significant residual staining or colored encrustation will be removed offsite for disposal. Testing of the material greater than 3/8 inch would be considered during the removal action to verify that the material meets RAGs. Testing details would be developed during the Removal Action Work Plan. Material greater than 3/8 inch is not defined as soil per RCRA (USEPA, 2002), and for the purpose of this EECA it is assumed that the material would not exceed the RAGs on a mg/kg basis. If material greater than 3/8 inch does not meet RAGs, then the material would be disposed of at an approved offsite facility as described in Alternative 2. Fine soil less than 3/8 inch would be collected, stockpiled, and disposed of at an approved offsite facility. The preferred area for mechanical separation is within BCW, which would greatly reduce the amount of truck traffic for transport to and from the separator, as shown on Figures 3-1 and 4-1. Temporary engineering controls, such as k-rails or jersey barriers, would be installed around work areas and excavation areas to route stormwater around work areas and equipment in the event of a storm event. The main access road to/from BCW would be regularly maintained to ensure accessibility to/from the work areas for workers and equipment in the event of a storm event. Dust suppression measures such as water addition would be implemented during screening as determined necessary by site conditions and established best management practices (BMPs). Excess water used for dust control is not anticipated to be generated. Trash, debris, burnt material, and discolored soil would be stockpiled separately for offsite disposal without mechanical separation.

Waste classified as hazardous by characterization sampling would be transported to a RCRA Subtitle C (i.e., permitted) facility, and non-hazardous waste would be transported to a Subtitle D facility. The total mass of soil to be disposed of offsite is estimated to be approximately 7,350 tons. Soil with TCLP-chromium concentrations greater than 5.0 mg/L as determined by waste characterization sampling results would be classified as hazardous waste based on chromium toxicity, and thus would be subject to special transportation and disposal requirements. In the absence of Site-specific TCLP data, it is estimated that 30 percent (2,200 tons) would be classified as hazardous waste and need to be disposed of at a Subtitle C facility, and that 70 percent (5,150 tons) would be classified as non-hazardous waste suitable for disposal at a Subtitle D landfill.

Upon confirmation sampling results of excavation area extent, coarse material greater than 3/8 inch diameter would be returned to the excavated areas and re-graded with clean backfill to match the approximate original contours as described for Alternative 2. Separated coarse material available for backfill will be placed in the bottom of the excavation areas and the remaining excavation will be backfilled with native material as described in Alternative 2. Other sources of backfill will be considered during the development of the Removal Action Work Plan. Revegetation activities would be conducted as described for Alternative 2.

4.2.4 Alternative 4 – Excavation, Mechanical Separation, Offsite Disposal of Fines, Soil Washing of Coarse Material, and Reuse of Washed Coarse Material

Alternative 4 incorporates all the components of Alternative 3 (including excavation components described for Alternative 2), with the addition of washing the excavated material greater than 3/8 inch with water before returning it to the excavated areas. Coarse material with significant residual staining or colored encrustation would be removed offsite for disposal. Waste wash water would be tested and discharged to the TCS evaporation ponds, if suitable. The major components of Alternative 4 are:

- Site preparation (as described for Alternative 2)
- Soil excavation (as described for Alternative 2)
- Confirmation sampling (as described for Alternative 2)
- Mechanical separation (as described for Alternative 3)
- Stockpile construction and management for fine and coarse soil (as described for Alternative 3)
- Coarse material soil washing
- Waste disposal (as described for Alternative 3)
- Coarse material reuse (as described for Alternative 2)
- Site restoration (regrading and revegetation, as described for Alternative 2)

Prior to coarse fraction reuse, this alternative would include a final washing step for the removal of fines present among and on the surface of large materials excavated from each removal area. Coarse soil (greater than 3/8 inch) retained by screening would be washed with water. Coarse material with significant residual staining or colored encrustation would be removed offsite for disposal. The washing process is estimated to require 35,000 gallons of water. Wash water would be recycled to the extent practical without treatment. Spent wash water is assumed to be suitable to be trucked for discharge to the TCS evaporation ponds.

Washed coarse material greater than 3/8-inch diameter would be returned to the excavated areas and re-graded with clean backfill to match the approximate original contours as described for Alternative 3.

Revegetation activities would be conducted as described for Alternative 2.

4.2.5 Alternative 5 – Removal of Visible Hazardous Surface Debris

Alternative 5 was added at the request of the Tribes during Tribal Consultation per the PA. Alternative 5 consists of removal of visible debris associated with hazardous substances on the surface within AOC 10 PAA#3, AOC 14 PAA#1, and AOC 27 PAA#1 as shown on Figures 3-2 and 3-3. All other contaminated media would be left in place without removal, treatment, or other mitigation measures to reduce the potential for future exposure to Site contaminants. The major components of Alternative 5 are:

- Site preparation
- Waste removal
- Waste disposal

Site preparation would include mobilization and setup of support facilities including access routes as well as site surveys. Cultural resources and biological pre-construction field verifications would be performed prior to any intrusive work. Coordination with USFWS and CDFW would occur to ensure applicable management measures are implemented during the removal action to avoid and protect sensitive habitats and wildlife in the work areas. The removal action would comply with all applicable measures and stipulations of the PA (BLM, 2010), the PA Amendment (BLM, 2017) and the CHPMP (BLM, 2016). Equipment and support facilities (e.g., excavators, loaders, office trailer, storage containers, sanitary facilities, etc.) would be mobilized to the Site and staged at approved locations. This alternative would require minimal intrusive work; therefore, utility clearance surveys and vegetation removal would not be needed. (Figure 4-1).

The time to completion of this alternative assumes that debris removal could be completed in five days. The estimated quantity of debris to be removed from all areas is approximately 1 ton. Removal operations would be performed by qualified personnel with current HAZWOPER training, as required by OSHA. The health and safety plan submitted as part of the Removal Action Work Plan would specify the dust suppression techniques, air monitoring requirements, and action levels necessary to ensure worker safety, as well as Site access controls necessary to prevent members of the public from being exposed to contamination during removal operations. Following debris removal, material would be containerized or stockpiled at a location agreed upon by landowners and stakeholders. Containerized or stockpiled material would be managed in accordance with the Removal Action Work Plan prior to offsite disposal; proposed material staging areas are shown on Figure 4-1.

Removed debris would be transported offsite to an appropriate waste disposal facility. For the purposes of this EE/CA it is assumed that approximately 10 waste characterization samples would be collected and analyzed for the full TCLP waste characterization suite, metals, VOCs, SVOCs, and TPH. The waste characterization sampling would be in accordance with the approved Soil Management Plan for the Topock Groundwater Remedy (Appendix L of the Construction/Remedial Action Work Plan [CH2M, 2015b]) and would be described in the Removal Action Work Plan. Hazardous waste would be transported to a RCRA Subtitle C (i.e., permitted) facility, and non-hazardous waste would be transported to a Subtitle D facility.

4.3 Evaluation Process and Criteria

The alternatives described in Section 4.2 have been evaluated against the criteria of effectiveness, implementability, and cost as described in the *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (USEPA, 1993). These criteria are summarized as follows:

- **Effectiveness.** This criterion addresses the overall protection of human health and the environment that would be achieved by the alternative based on the following factors:
  - **Compliance with ARARs.** Used to determine whether an alternative meets the substantive portions of federal and state ARARs.
  - **Long-term Effectiveness and Permanence.** Assesses long-term effectiveness in maintaining protection of human health and the environment after the RAOs have been met. The magnitude of residual risk and adequacy and reliability of the post-removal Site control measures (such as long-term engineering or administrative controls, if applicable) are taken into consideration.
  - **Reduction in Toxicity, Mobility, and Volume (TMV) through Treatment.** Reflects the statutory preference of USEPA for selecting remedial/removal actions that employ treatment technologies resulting in permanent and significant reductions of TMV of the hazardous substances as their principal element. This criterion is satisfied when treatment is used to reduce the principal threats at a site through destruction of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media.
  - **Short-term Effectiveness.** Assesses the effects of an alternative in protecting human health and the environment during construction and implementation before the RAOs have been met. The duration of time until the RAOs are met is also considered.
- **Implementability**. This criterion addresses the overall technical and administrative feasibility of implementing an alternative based on the following factors:
  - **Technical Feasibility.** Assesses the ability to construct and operate the technology, reliability of the technology, ease of undertaking additional remedial/removal actions, and the ability to monitor effectiveness of the source control action.
  - **Administrative Feasibility.** Assesses the activities required to coordinate with other offices, agencies, and third-parties (for example, permitting, access, and right-of-way).
  - **Availability of Services and Materials.** Evaluates the availability of appropriate offsite treatment, storage capacity, and disposal services; necessary equipment and specialists; services and materials, including the potential for competitive bidding; and the availability of prospective technologies.
  - **State Acceptance**. State acceptance will be considered in the final selection of an alternative in the Action Memorandum. This factor cannot be evaluated until DTSC has had an opportunity to comment on the EE/CA. Comments on this report will be considered prior to finalizing the EE/CA and developing the Action Memorandum.
  - **Community Acceptance.** Community acceptance will be considered in the final selection of a source control alternative. This factor is considered after the public has had an opportunity to comment on this report. Additionally, DOI, USFWS, and BLM have a responsibility to consult with the Native American Tribes regarding the proposed actions. Once public comment and consultation is complete, all input will be considered prior to finalizing the EE/CA and developing the Action Memorandum.
- **Cost**. This criterion considers capital costs associated with implementing the removal action.

A qualitative evaluation of green and sustainable remediation (GSR) metrics has been incorporated into the development and evaluation of the alternatives where appropriate – especially within evaluation of short-term effectiveness. The goal of considering GSR during remedy selection is to allow sustainability to be considered within the decision-making process in order to avoid the use of wasteful and ecologically unfriendly remedies and remedy implementation where greener approaches can also meet the RAOs.

4.4 Detailed Individual Analysis of Alternatives

Detailed analyses of the removal action alternatives have been performed to assess how and to what extent each alternative meets the criteria defined in Section 4.3. The detailed analyses of alternatives against the EE/CA criteria of effectiveness, implementability, and cost and associated are presented in Table 4-1.

Cost estimates presented as part of the detailed analysis have been developed based on the design assumptions and are presented for comparative purposes only. The final costs of the selected remedy will depend on actual labor and material costs, competitive market conditions, final project scope, the implementation schedule, and other variables. The cost estimates are considered Class 4 as defined by the Association for the Advancement of Cost Engineering. Alternative costs presented herein are order-of-magnitude estimates with an intended accuracy range of plus 50 to minus 30 percent. The range applies only to the alternatives as they are described in this report and does not account for changes in the scope of the alternatives. The cost estimates are presented in Appendix G.

5. Comparative Analysis of Removal Action Alternatives

The detailed evaluations described in Section 4.4 were used to develop a comparative analysis of removal action alternatives. The purpose of the comparative analysis is to compare and rank the relative performance of each alternative against the criteria defined in Section 4.3: effectiveness, implementability, and cost. The following subsections present this analysis with a summary provided in Exhibit 5-1. Throughout the discussion and in Exhibit 5-1 the performance of each alternative against the specified criterion is ranked in order of least, low, moderate, better, and best in relation to the other alternatives. The comparative analysis focuses on performance against the RAOs 1 through 3. Alternatives 2 through 4 would address RAO 3 using the same treatment technology (excavation and offsite disposal), and therefore would perform equally against this objective. Alternative 5 (Removal of Visible Hazardous Surface Debris) would only remove debris, and therefore does not completely address RAO 3 and does not address RAO 1 and 2. Alternative 1 (No Action) does not address RAOs 1 through 3 and is not protective of human health and the environment.

5.1 Effectiveness

A comparison of the alternatives against effectiveness criteria is provided in the following subsections.

5.1.1 Overall Protection of Human Health and the Environment

Alternative 1 (No Action) would not provide overall protection of human health, because the risk to human health and ecological receptors would not be mitigated. Furthermore, this alternative provides no reduction for current or future potential migration of contaminants from areas that require remediation. Alternatives 2 through 4, which involve removing soil from locations with chemicals contributing most significantly to unacceptable human health or ecological risk, would meet RAOs designed to be protective of human health and the environment. Alternative 5, which involves removing visible surface debris associated with hazardous substances, would partially meet RAO 3 but does not meet RAO 1 or 2, and is therefore more protective of human health and the environment than Alternative 1 but less than Alternatives 2 through 4.

5.1.2 Compliance with Identified Applicable or Relevant and Appropriate Requirements and TBCs

Although no chemical-specific ARARs were identified by DOI for the purposes of this EE/CA, it is PG&E's understanding that DOI will make management decisions using certain identified chemical-specific TBCs; therefore, the chemical-specific TBCs will be used in the comparative analysis of the remedial alternatives. TBCs must be attained to the same extent as ARARs if included in the NTCRA Action Memorandum.

Alternative 1 would not meet the chemical-specific TBCs. Alternatives 2 through 5, as described in this EE/CA, were designed to comply with location- and action-specific ARARs. Alternatives 2 through 4 were designed the meet the numerical RAGs which were derived from the first two identified chemical-specific RBCs. Alternative 5 does not meet the numerical RAGs which were derived from the first two identified chemical-specific TBCs.

Because Alternative 1 (No Action) and Alternative 5 (Removal of Visible Hazardous Surface Debris) would not provide overall protection of human health, they are not included in the comparative analysis against the remaining criteria.

Exhibit 5-1. Comparative Analysis of Alternatives
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Criteria	Alternative 1: No Action	Alternative 2: Excavation and Offsite Disposal of All Material	Alternative 3: Excavation, Mechanical Separation, Offsite Disposal of Fines, and Reuse of Coarse Material	Alternative 4: Excavation, Mechanical Separation, Offsite Disposal of Fines, Soil Washing of Coarse Material, and Reuse of Washed Coarse Material	Alternative 5: Removal of Visible Hazardous Surface Debris
Effectiveness – Protection of Human Health & Environment	Unacceptable (does not meet criterion)	Acceptable (meets criterion)	Acceptable (meets criterion)	Acceptable (meets criterion)	Unacceptable (does not meet criterion)
Effectiveness – Compliance with ARARS	Acceptable (meets criterion)*	Acceptable (meets criterion)	Acceptable (meets criterion)	Acceptable (meets criterion)	Acceptable (meets criterion)*
Effectiveness – Long-Term Effectiveness and Permanence	N.A.	Best	Better	Better	N.A.
Effectiveness – Reduction in TMV through Treatment	N.A.	Moderate	Better	Better	N.A.
Effectiveness – Short-Term Effectiveness	N.A.	Better	Best	Better	N.A.
Effectiveness – Time Until RAOs are Achieved	N.A.	Approximately 4 months	Approximately 5 months	Approximately 5 months	N.A.
Implementability – Technical Feasibility	N.A.	Best	Better	Moderate	N.A.
Implementability – Administrative Feasibility	N.A.	Least	Best	Moderate	N.A.
Implementability – Availability of Services and Materials	N.A.	Best	Best	Best	N.A.
Cost – Estimated Total Cost (US Dollars)	N.A.	$5,281,000	$4,626,000	$5,159,000	N.A.

Notes:

* There were no chemical-specific ARARs identified for the Site. Alternatives 1 and 5 do not comply with chemical-specific TBC criteria.

ARAR = applicable or relevant and appropriate requirement

N.A. = not applicable

RAO = removal action objective

TBC = to-be-considered

TMV = toxicity, mobility, volume

5.1.3 Long-term Effectiveness and Permanence

Long-term effectiveness and permanence consider the magnitude of residual risk and the adequacy and reliability of post-removal site control measures. Alternative 2 poses the least residual risk (that is, ranks best against this criterion). Because all excavated material would be disposed of offsite, no residuals would remain in place in the PAAs. Alternatives 3 and 4 rank slightly lower, because contaminants potentially adhered to coarse material replaced in excavation areas would remain within the PAAs. In the case of Alternative 4, soil washing is anticipated to be more effective in removing soil fines (dust) adhered to the coarse material that may contain contaminants than Alternative 3. For all viable alternatives (Alternatives 2 through 4) risk calculations, confirmation sampling, and visual observation would be performed to ensure RAOs 1 through 3 were met, and therefore Alternatives 2 through 4 would all provide long-term effectiveness. Alternatives 2 through 4 would not require post-removal site controls. Overall, Alternative 2 would provide the best long-term effectiveness and permanence, followed by Alternatives 3 and 4.

5.1.4 Reduction in Toxicity, Mobility, and Volume through Treatment

Reduction in TMV through treatment considers the overall reduction in TMV at the completion of the removal action, including the amount of material destroyed or treated, the degree to which this treatment is irreversible, and the type and quantity of residuals remaining after treatment. This criterion reflects the statutory preference of USEPA for selecting remedial/removal actions that employ treatment technologies resulting in permanent and significant reductions of TMV of the hazardous substances as their principal element.

No hazardous material would be destroyed in Alternatives 2 through 4, because destructive treatment technologies would not adequately meet RAOs 2 through 4. The primary difference between the alternatives is the reduction in volume of hazardous materials. Alternatives 3 and 4 would concentrate contaminants into the smallest volume, specifically the fine soil fraction, which would be disposed of offsite. Alternative 4 would also generate excess wash water, which would be discharged to existing TCS evaporation ponds once sampling confirmed acceptability. Alternative 2 would not provide any reduction in waste volume—all excavated material would be disposed of offsite without any reduction in the volume of material disposed of.

The processes used in Alternatives 2 through 4 are all irreversible (excavation, mechanical separation, soil washing, and offsite disposal). Alternative 3 may leave some residuals in place (in the form of contaminants in fines adhered to the coarse soil fraction). Regardless of supplemental contaminant removal, Alternative 3 is anticipated to fully satisfy the RAOs and RAGs established for the project.

Overall, Alternatives 3 and 4 provide better reduction in TMV than Alternative 2. The reduction of TMV under Alternative 3 is expected to similar or equal to that under Alternative 4. This statement is supported by laboratory-scale testing results, as surfactant application to screened soil was generally ineffective in achieving acceptable contaminant reduction. Accordingly, incremental contaminant removal (if any) by water washing does not provide Alternative 4 with greater reduction in contaminant TMV compared to Alternative 3.

5.1.5 Short-term Effectiveness

Short-term effectiveness considers protection of the community, workers, and environment during the removal action, as well as the time until the RAOs are met. Included in this evaluation is a qualitative evaluation of GSR metrics, such as emissions of greenhouse gases (GHGs) and criteria pollutants, consumption of resources, ecological impacts, worker safety/accident risk, and community impacts. GHG emissions can also be considered under long-term effectiveness because GHGs are residuals of remedial or removal activities that do not attenuate for a long period of time; however, for the purposes of document organization, all discussion of GSR metrics in the alternative analyses is presented under short-term effectiveness.

In Alternatives 2 through 4, the public can be protected using normal health and safety protocols including dust suppression and air monitoring. Access to excavation areas will be controlled to minimize risk of falls. Some risk to the public is associated with transportation of hazardous material offsite (this risk would be lower for Alternatives 3 and 4 because less material would be transported offsite). Some risk to workers would be encountered during excavation and transportation of soil in Alternatives 2 through 4; however, workers can be protected using conventional occupational health and safety protocols. In Alternatives 3 and 4, mechanical separation would generate dust that may pose risk to workers, but again, workers can be protected using normal health and safety protocols and appropriate dust control measures. Overall, Alternative 2 is least favorable from a short-term risk perspective, as it requires the greatest volume material to be transported, which presents the highest risk for public exposure during transit and offsite disposal operations.

In Alternatives 2 through 4, removal action activities would produce GHG emissions, energy usage, and air emissions of criteria pollutants (nitrogen oxides [NO_x], sulfur oxides [SO_x], and particulate matter 10 micrometers or less in diameter [PM_{10}]). Qualitatively, Alternative 3 is anticipated to perform most favorably against GSR metrics because the volume of material transported for disposal is low (compared to Alternative 2) and the input of supplemental wash water is not required (as is the case for the soil washing operation considered by Alternative 4). In all cases, once initial construction activities are completed, the alternative would not require any additional energy inputs.

The time to meet RAOs for Alternatives 2 through 4 is less than 1 year. Alternative 2 is expected to take approximately 4 months to complete, and Alternatives 3 and 4 are expected to take about 5 months to complete. In all cases, no operation and maintenance period would be required within the scope of the removal action alternatives; however, future soil management activities such as sampling may occur after the final soil remedy.

Overall, Alternative 3 provides better short-term effectiveness than Alternatives 2 and 4.

5.2 Implementability

A comparison of the alternatives against the implementability criteria is provided in the following subsections. This discussion does not include Alternative 1 (No Action) as it would not be effective.

5.2.1 Technical Feasibility

Technical feasibility considers the ability to construct and operate the technology, the reliability of the technology, the ease of undertaking additional source control actions (if necessary), and the ability to monitor the effectiveness of the removal action.

Alternatives 2 and 3 are both highly feasible. Excavation (for Alternatives 2 through 4) and mechanical separation (for Alternatives 3 and 4) are straightforward. Alternatives 3 and 4 will require additional staging time for subsequent soil processing compared to Alternative 2. The soil washing step in Alternative 4 is comparatively less feasible. It requires more steps than mechanical separation alone, including washing and separation of washed material from wastewater, and disposal of wastewater.

The alternatives considered are founded on the use of excavation, which is considered a reliable technology. There are many remediation contractors capable of providing the necessary services to complete the remedy; excavation, transportation and disposal services are considered readily available. Since Alternative 2 includes offsite disposal it has the highest implementability of comparative alternatives. Mechanical separation equipment applied in Alternatives 3 and 4 and the soil washing step in Alternative 4 are reliable, but fewer contractors may be available to implement screening and washing operations. The integration of water for soil washing in Alternative 4 adds another layer of complexity to an environment where natural resources are already scarce; for this reason, Alternative 4 is considered the least implementable. Alternatives 2 through 4 all offer a high ease of undertaking additional actions and a high ability to monitor removal action effectiveness. Risk calculations, confirmation sampling, and visual observation would be performed to ensure RAOs 1 through 3 were met.

Overall, Alternative 2 is the most technically feasible alternative, followed by Alternative 3. Alternative 4 is comparatively the least feasible.

5.2.2 Administrative Feasibility

Administrative feasibility considers the ease of coordinating with other offices, agencies, and third parties. Alternatives 2 through 4 would all require review by the current land owners/managers (BLM, Caltrans, USFWS) and other stakeholders (including the Tribes). Alternative 3 is anticipated to have the highest administrative feasibility, primarily because it minimizes the volume of soil removed from the Site. The Tribes have expressed a preference for minimizing the volume of soil removed due to the cultural and historical significance of the Site. Alternative 4 also minimizes the volume of soil removed from the Site, but disposal of water generated during soil washing in the TCS evaporation ponds must meet WDR Order No. R7-2018-0022. If it becomes necessary to amend the WDRs for the ponds to accept wastewater from the proposed removal action, a revised Report of Waste Discharge (ROWD) would be required. Alternative 4 also requires additional infrastructure for water management due to soil washing.

Alternatives 2 through 4 would require staging of excavated material (for disposal) and stockpile management for soil screened during treatment operations. Alternatives 3 and 4 would require additional staging area for processing and operation due to mechanical separation, and due to soil washing of coarse material (Alternative 4 only). Selection of an appropriate staging area would require consultation and agreement with landowners and other project stakeholders.

Alternatives 2 through 4 would require activities within the right-of-way maintained by Caltrans for work in AOC 14. Given the limited access to AOC 14, equipment may need to be lifted by crane onto AOC 14 and a lane closure of I-40 would be needed. Lane closure would require Caltrans approval and coordination with the California Highway Patrol. To access AOC 14, personnel and equipment would also need to cross the BNSF railroad tracks.

Alternatives 2 through 4 would require the closure of certain areas during excavation activities to hikers and other recreators. This closure would need to be coordinated with land owners/managers.

Alternative 2 is anticipated to be the least administratively feasible because it would result in the greatest volume of soil removed from the Site.

Based on input from the Tribes prior to and during the comment period, it is understood that avoidance of ground disturbance of the Topock historic and cultural properties to the maximum extent practicable is important. Alternatives 3 and 4 reduce the amount of soil removed through mechanical separation and are considered to have a higher degree of community acceptance. Additionally, the RAGs were modified based on Tribal input and the total amount of soil to be removed from the Site is likely reduced for alternatives 2 through 4.

5.2.3 Availability of Services

This criterion considers the availability of necessary services, equipment, specialists, and prospective technologies. For Alternatives 2 through 4, the prospective technologies and offsite disposal services are all highly available. Excavation equipment and specialists are highly available. Equipment and specialists for mechanical separation and soil washing are available but limited. Overall, the services for Alternative 2 are most available, followed by the services for Alternatives 3 and 4.

5.3 Cost

This criterion considers capital costs associated with implementing the removal action. A detailed cost evaluation for Alternatives 2 through 4 is presented in Appendix G. A summary of the total estimated costs in presented in Exhibit 5-1. Because no operation and maintenance is anticipated with Alternatives 2 through 4, there is no anticipated operation and maintenance cost. The cost estimates have been developed based on the design assumptions presented in the alternatives descriptions (Section 4.2) and are presented primarily for the purpose of comparing the alternatives. The final costs of the selected remedy will depend on actual labor and material costs, competitive market conditions, final project scope, implementation schedule, and other variables. Consistent with USEPA guidance, the cost estimates are order-of-magnitude estimates with an intended accuracy range of plus 50 percent to minus 30 percent. The range applies only to the alternatives as they are described in this report and does not account for changes in scope of the alternatives.

6. Recommended Removal Action Alternative

Based on the comparative analysis of the removal action alternatives against the criteria of effectiveness, implementability, and cost as summarized in Exhibit 5-1, the recommended alternative is **Alternative 3 – Excavation, Mechanical Separation, Offsite Disposal of Fines, and Reuse of Coarse Material.** This alternative provides the best balance against all EE/CA evaluation criteria as summarized in the following subsections.

6.1 Effectiveness

Alternative 3 is considered to be the most effective alternative evaluated. This alternative has been developed to meet RAOs protective of human health and the environment and comply with location-, chemical-, and action-specific ARARs. Alternative 2 is more effective at reducing TMV of the contaminants and requires less staging area than Alternative 3; however, Alternative 3 provides a balance by reducing the amount of material disposed offsite. It would meet the RAOs as follows:

- RAO 1 – To reduce human and ecological risk related to the contaminants in the soil on or adjacent to federal land, the locations recommended for removal in the HHERA are included in the excavation areas of Alternative 3.
- RAO 2 – To address elevated concentrations of contaminants (that is, concentrations significantly exceeding the numerical RAGs) outside the TCS in or adjacent to wash areas that are within, or have the potential to migrate to, the HNWR during storm events, areas with significant exceedances of numerical RAGs are included in the excavation areas of Alternative 3.
- RAO 3 – To remove debris, burnt material, and/or discolored soil associated with elevated hazardous substances, visually identified debris, burnt material, sandblast grit, and/or discolored soils would be removed and disposed of offsite.

6.2 Implementability

Alternative 3 is considered to be highly implementable. It is technically feasible from a construction standpoint. Alternative 3 minimizes the volume of soil removed from the Site and imported backfill needed, without requiring the large quantities of wastewater to be disposed as needed for Alternative 4. Excess water is not anticipated to be generated and would be absorbed by the fine-grain fraction disposed of offsite. All necessary services and materials are available.

6.3 Cost

The estimated total cost of Alternative 3 is $4,626,000. This cost is less than that of Alternatives 2 and 4.

7. References

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Tables

Table 3-1a. Potential Applicable or Relevant and Appropriate Requirements (ARARs) or Other Factors To Be Considered (TBCs): Chemical-Specific

Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Item No.	ARARs or TBCs and Citation	Determination	Description and Applicability
1	Risk-Based Remediation Goals (RBRGs) for Risk Drivers in Soil at Topock Site [a]	TBC	Final Human Health and Ecological RBRGs were estimated for two significant contributors to soil risks at the Topock Site, namely total chromium, CrVI, copper, and dioxin/furan TEQ.
2	Risk-Based Concentrations (RBCs) for Soil Management Purposes [a]	TBC	Final Human Health and Ecological RBCs were estimated for purposes of soil management at the Topock Site,
3	Soil Ecological Comparison Values (ECVs) [b]	TBC	Soil ECVs were developed for Topock COPCs (metals and polycyclic aromatic hydrocarbons [PAHs]) using both lowest observed adverse effect levels or concentrations and no-adverse effect levels or concentrations based on target toxicity values (i.e., values below which no unacceptable risk is expected) for the protection of the ecological receptors at the PG&E Topock Site based on the representative receptors selected for the ecological risk assessment.
4	Ambient or Background Soil Concentrations at Topock Site [c,d,e]	TBC	Ambient or background levels of inorganic chemicals in soils in/around the PG&E Topock Site were calculated to assist in remedial planning, risk assessment, as well as remedial and soil management decision making.
5	DTSC HHRA Note Number 2, Dioxin-TEQ Soil Remediation Goals for Sites in California [f]	TBC	The DTSC Human and Ecological Risk Office (HERO) recommends the following remedial goal for soils contaminated by dioxins and dioxin like-compounds: • Dioxins/furans TEQ Humans – 50 ng/kg
6	DTSC HHRA Note Number 3, DTSC-modified Screening Levels [g]	TBC	The DTSC HERO HHRA Note Number 3 presents recommended screening levels for constituents in soil, tap water, and ambient air.
7	USEPA "Regional Screening Levels for Chemical Contaminants at Superfund Sites" [h]	TBC	Establishes comparison values for residential and commercial/industrial exposures to soil, air, and tap water for screening chemicals at Superfund sites.
8	San Francisco Bay Regional Water Quality Control Board Environmental Screening Levels for residential direct exposure	TBC	Conservative screening levels for chemicals found at sites with contaminated soil and groundwater. These levels are intended to help expedite the identification and evaluation of potential environmental concerns at contaminated sites. ESLs address a range of media (soil, groundwater, soil gas, and indoor air) and a range of concerns (e.g., impacts to drinking water, vapor intrusion, and impacts to aquatic habitat).
9	Occupational Safety and Health Act (29 U.S. Code (USC) § 651, et seq.; 29 CFR § 1910.1026)	TBC	Sets standards for workers engaged in activities associated with remedial actions under the National Contingency Plan, including occupational exposure to hexavalent chromium. Pursuant to the NCP preamble, Occupational Safety and Health Act standards are not ARARs but may be included as TBCs.

Notes:

[a] Arcadis. 2019. Final Soil Human Health and Ecological Risk Assessment Report, Topock Compressor Station, Needles, California. October.

[b] Arcadis. 2018. Topock Compressor Station – Technical Memorandum 3: Ecological Comparison Values for Metals and Polycyclic Aromatic Hydrocarbons in Soil. May 28.

[c] CH2M. 2009c. Final Soil Background Investigation at Pacific Gas and Electric Company Topock Compressor Station, Needles, California.

[d] CH2M. 2017a. Ambient Study of Dioxins and Furans at PG&E Topock Compressor Station, Needles, California, October 13.

[e] CH2M. 2019. Determination of Thallium Ambient/ Background Concentration at PG&E Topock Compressor Station, Needles, California, August 13.

[f] DTSC. 2017. Human Health Risk Assessment (HHRA) Note Number 2: Soil Remedial Goals for Dioxins and Dioxin-like Compounds for Consideration at California Hazardous Waste Sites – (April 2017).

[g] DTSC. 2019. Human Health Risk Assessment (HHRA) Note Number 3: DTSC-modified Screening Levels (DTSC-SLs) – (April 2019). https://dtsc.ca.gov/human-health-risk-hero/

[h] USEPA. 2019. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. May. https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables

Table 3-1b. Potential Applicable or Relevant and Appropriate Requirements (ARARs) or Other Factors To Be Considered (TBCs): Location-Specific

Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Item No.	ARARs or TBCs and Citation	Determination	Description and Applicability
10	Federal Land Policy and Management Act (FLPMA) (43 USC § 1701, et seq.)	Applicable	In managing public lands, BLM is directed to take any action necessary to prevent unnecessary or undue degradation of the lands. Actions taken on the public land (i.e., BLM-managed land) portions of the Topock Site should provide the optimal balance between authorized resource use and the protection and long-term sustainability of sensitive resources. Figure 2-1 shows property managed by BLM.
11	U.S. Department of Interior, Bureau of Land Management, *Approved Resource Management Plan and Final Environmental Impact Statement*, May 2007	TBC	The Resource Management Plan provides further direction on how FLPMA requirements will be satisfied.
12	National Wildlife Refuge System Administration Act (16 USC § 668dd-ee, 50 CFR § 27)	Applicable	This Act governs the use and management of the Havasu National Wildlife Refuge portion of the Topock Site. It requires that the USFWS evaluate ongoing and proposed activities and uses to ensure that such activities are appropriate and compatible with the mission of the National Wildlife Refuge System, as well as the specific purposes for which the HNWR was established. Prior to the selection of a removal action by DOI/USFWS, that removal action must be found by the Refuge Manager to be both an appropriate use of the HNWR and compatible with the mission of the HNWR and the Refuge System as a whole. Any removal action proposed to be implemented on the HNWR that was not selected by DOI/USFWS would be subject to the formal appropriate use/compatibility determination process. Portions of the Site are located in the HNWR (Figure 2-1).
13	Executive Order 8647 (6 CFR 593)	TBC	This Executive Order establishes the HNWR for the primary purpose of providing migratory bird habitat. Any response action selected must be appropriate and compatible with this purpose, as determined by the Refuge Manager.
14	Appropriate Use Policy 603 FW 1	TBC	This policy elaborates on the appropriate uses of a National Wildlife Refuge, ensuring that such uses contribute to fulfilling the specific refuge's purposes and the National Refuge System's mission.
15	Compatibility Policy 603 FW 2	TBC	This policy specifies the guidelines for determining the compatibility of proposed uses of a National Wildlife Refuge. This determination is done once a proposed use is deemed appropriate.
16	Lower Colorado River National Wildlife Refuges, Comprehensive Management Plan (1994-2014)	TBC	The Comprehensive Management Plan provides further direction on how compliance with the National Wildlife Refuge System Administration Act, as amended, shall be achieved.
17	Fish and Wildlife Conservation Act (16 USC §§ 2901-2911)	Relevant and Appropriate	Federal departments and agencies are encouraged to utilize their authority to conserve nongame fish and wildlife and their habitats and assist States in the development of their conservation plans.
18	Fish and Wildlife Coordination Act (16 USC § 661-667e)	Applicable	This Act requires that any federally-funded or authorized modification of a stream or other water body must provide adequate provisions for conservation, maintenance, and management of wildlife resources and their habitat. Necessary measures should be taken to mitigate, prevent, and compensate for project-related losses of wildlife resources.
19	National Historic Preservation Act (54 USC § 300101, et seq., 36 CFR Part 800)	Applicable	This statute and the implementing regulations require that a federal agency undertaking a removal action at or near historic properties must take into account the effects of such undertaking on the historic properties. The federal agency must determine, based on consultation, if an undertaking's effects would be adverse and seek ways that could avoid, mitigate, or minimize such adverse effects on a National Register eligible property. The agency must then specify how adverse effects will

Item No.	ARARs or TBCs and Citation	Determination	Description and Applicability
			be avoided or mitigated or acknowledge that such effects cannot be avoided or mitigated. Measures to avoid or mitigate adverse effects of any selected removal action that are adopted by the agency through federal consultation must be implemented by the removal action to comply with the National Historic Preservation Act. Properties on and near the Site that are eligible for or listed on the National Register of Historic Places include Native American cultural resources and elements of the historic “built environment.” In recognition of this, all removal activities will be conducted in ways that avoid, minimize, or mitigate adverse effects to cultural and historic properties within the Area of Potential Effects in accordance with the Programmatic Agreement (BLM, 2010, as amended 2016), the Cultural and Historic Properties Management Plan (BLM, 2012), the Cultural and Historic Properties Treatment Plan (AE, 2018), and in consultation with the Tribes.
20	Programmatic Agreement and Amendment among the Bureau of Land Management, Arizona Historic Preservation Officer, California State Historic Preservation Officer, and the Advisory Council on Historic Preservation for the Topock Remediation Project in San Bernardino County, California and Mohave County, Arizona (BLM, 2010, 2016)	TBC	The Programmatic Agreement (PA) is a Topock-specific document that requires the Federal Agencies, in consultation with the Tribes, State Historic Preservation Offices of Arizona and California, Advisory Council on Historic Preservation, PG&E, and other interested parties to ensure that PG&E shall conduct all removal activities in ways that avoid, minimize, or mitigate adverse effects to cultural and historic properties within the Area of Potential Effects (APE) to the maximum extent practicable. In addition, the Federal Agencies will ensure that PG&E shall restore the areas affected by all removal activities to the conditions existing prior to the removal to the extent practicable. During a removal action, the Discovery Protocol (Stipulations IX(A)-(D)) and the Monitoring Protocol (Appendix C) of the PA shall be implemented. In addition, Tribal access to areas within the APE for religious, cultural, or spiritual purposes shall be implemented in accordance with the Tribal Access Plan for lands under federal management and with the Access Plan for the lands not under federal management.
21	Cultural and Historic Properties Management Plan, PG&E Topock Compressor Station, Needles, California (BLM, 2012)	TBC	The CHPMP is a Topock-specific document prepared under the PA that specifies measures to avoid or mitigate adverse effects to cultural and historic properties within the APE. PG&E shall conduct all removal activities in compliance with these specified measures.
22	Draft Cultural and Historic Property Treatment Plan for the Topock Compressor Station Groundwater Remediation Project, San Bernardino County, California and Mojave County, Arizona (AE, 2018)	TBC	The Cultural and Historic Property Treatment Plan is a Topock-specific document prepared under the PA that identifies measures to avoid, minimize, or mitigate adverse effects to the maximum extent practicable on the Topock Maze, the Traditional Cultural Property, and individual sites that have been determined eligible for listing on the National Register of Historic Places (NRHP), such as the trail site (CA-SBR-29943). PG&E shall implement the Treatment Plan contemporaneously with all removal activities. All unevaluated sites are treated as eligible for the NRHP and shall be avoided to the maximum extent practicable. In accordance with the PA, should unanticipated adverse effects occur as a result of a removal action, the Treatment Plan shall be modified to include measures to minimize or mitigate the adverse effects.
23	National Register Bulletin 38	TBC	Guidelines for evaluating and documenting traditional cultural properties.
24	Preservation Brief 36	TBC	Guidelines for planning, treating, and managing historic landscapes.
25	National Archaeological and Historical Preservation Act (16 USC § 469, et seq.)	Applicable	This statute requires the evaluation and preservation of historical and archaeological data that might otherwise be irreparably lost or destroyed through any alteration of terrain as a result of federal construction projects or a federally licensed activity.
26	Archaeological Resources Protection Act (16 USC § 470aa-ii, et seq., 43 CFR Part 7)	Applicable	This statute provides for the protection of archeological resources located on public and tribal lands. The Act establishes criteria that must be met for the land manager’s approval of any excavation or removal of archaeological resources if a proposed activity involves soil disturbances.

Item No.	ARARs or TBCs and Citation	Determination	Description and Applicability
27	Historic Sites Act (54 USC § 320101 et seq., 36 CFR Part 65)	Applicable	Pursuant to this Act, federal agencies must consider the existence and location of historic sites, buildings, and objects of national significance, using information provided by the National Park Service, to avoid undesirable impacts upon such landmarks. There are no designated historic landmarks within the Site, although Public Law 106-45, 113 Stat. 224 (1999), provides for a cooperative program "for the preservation of the Route 66 corridor" through grants and other measures.
28	Executive Order 11593	TBC	This Order directs the Federal Agencies to initiate measures for the protection and enhancement of the cultural environment. These measures include assuring that steps are taken to make records, drawings, and/or maps and have such items deposited in the Library of Congress when, as the result of a federal action, a property listed on the National Register of Historic Places is to be substantially altered.
29	Native American Graves Protection and Repatriation Act (25 USC § 3001 et seq., 43 CFR Part 10)	Applicable	This Act regulates the removal and trafficking of human remains and cultural items, including funerary and sacred objects. If removal activities result in the discovery of Native American human remains or related objects, these requirements must be met. Portions of the Site contain archaeological areas that may contain human remains.
30	Religious Freedom Restoration Act (42 USC § 2000bb, et seq.)	Relevant and appropriate	Under this Act, the government shall not substantially burden a person's exercise of religion, unless the application of the burden is in furtherance of a compelling government interest, and it is the least restrictive means of furthering that compelling interest. To constitute a "substantial burden" on the exercise of religion, a government action must (1) force individuals to choose between following the tenets of their religion and receiving a governmental benefit or (2) coerce individuals to act contrary to their religious beliefs by the threat of civil or criminal sanctions. If any removal action selected imposes a substantial burden on a person's exercise of religion, it must be in furtherance of a compelling government interest and be the least restrictive means of achieving that interest.
31	American Indian Religious Freedom Act (42 USC § 1996, et seq.)	Relevant and appropriate	This Act requires that the United States protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise their traditional religions.
32	Executive Order 13175	TBC	Federal Agencies are to conduct regular and meaningful consultation and collaboration with tribal officials in the development and implementation of federal policies that have tribal implications.
33	Executive Order 12898	TBC	Federal agencies shall conduct "activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons (including populations) the benefits of, or subjecting persons (including populations) to discrimination under such programs, policies, and activities, because of their race, color, or national origin."
34	Executive Order 13352	TBC	The Department of Interior shall, to the extent permitted by law, "implement laws relating to the environment and natural resources in a manner that promotes cooperative conservation."
35	Indian Sacred Sites (Executive Order 13007)	TBC	In managing federal lands, the United States "shall, to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions, (1) accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, and (2) avoid adversely affecting the physical integrity of such sacred sites."
36	Resource Conservation and Recovery Act (42 USC § 6901, et seq., 40 CFR § 264.18)	Applicable	These regulations promulgated under RCRA establish Seismic and Floodplain considerations which must be followed for treatment, storage, or disposal facilities constructed, operated, or maintained within certain distances of fault lines and floodplains. Portions of the Topock Site are located on or near a 100-year floodplain.
37	Floodplain Management and Wetlands Protection (40 CFR § 6.302(a) & (b))	Applicable	Before undertaking an action, agencies are required to perform certain measures in order to avoid the long- and short- term impacts associated with the destruction of wetlands and the occupancy and modification of floodplains and wetlands. The regulation sets forth requirements as means of carrying out the provisions of Executive Orders 11988 and 11990.

Item No.	ARARs or TBCs and Citation	Determination	Description and Applicability
38	Executive Order 11988 – Floodplain Management	TBC	Executive Order 11988 requires evaluation of the potential effects of actions that take place in a floodplain to avoid, to the extent possible, adverse impacts.
39	Executive Order 11990 – Responsibilities of Federal Agencies to Protect Wetlands	TBC	Executive Order 11990 requires that potential impacts to wetlands be considered, and as practical, destruction, loss, or degradation of wetlands be avoided.

Table 3-1c. Potential Applicable or Relevant and Appropriate Requirements (ARARs) or Other Factors To Be Considered (TBCs): Action-Specific

Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Item No.	ARARs or TBCs and Citation	Determination	Description and Applicability
40	Clean Water Act. Stormwater Management (33 U.S.C. § 1342, 40 CFR Part 122, 40 CFR Part 125)	Relevant and appropriate	These regulations define the necessary requirements with respect to the discharge of stormwater under the National Pollutant Discharge Elimination System (NPDES) program. These regulations will apply if proposed removal actions disturb more than 1 acre of soil and result in stormwater runoff that comes in contact with any removal activity, or if proposed removal actions involve specified industrial activities. NPDES requirements regulate discharges of pollutants from any point source into waters of the United States.
41	Federal Water Pollution Control Act (Clean Water Act) (33 USC § 1344, 40 CFR § 230.10)	Applicable	This section of the Clean Water Act prohibits certain activities with respect to on-site wetlands and waterways. No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed activity which would have less adverse impact to the aquatic ecosystem. Minimization measures will be implemented to minimize impacts to wetland and non-wetland waters of the United States within the PAAs. All efforts will be taken to avoid jurisdictional resources to the extent practicable. Although the USACE did not provide a list of measures that may be taken to reduce impacts to jurisdictional waters and wetlands for the Topock groundwater remedy, the CDFW requires compliance with Avoidance and Minimization Measures (AMMs) in lieu of a Lake or Streambed Alteration Agreement pursuant to CERCLA Section 121(e) for all work conducted in CDFW jurisdictional washes (CDFW, 2013). Any soil removal action in CDFW jurisdictional washes will adhere to the same AMMs.
42	Endangered Species Act (16 USC § 1531, et seq., 50 CFR Part 402)	Applicable	The Endangered Species Act and its implementing regulations makes it unlawful to remove or “take” threatened and endangered plants and animals and protects their habitats by prohibiting certain activities. Examples of endangered species in or around the Topock Site may include, but are not limited to, southwestern willow flycatcher, desert tortoise, Colorado pikeminnow, razorback sucker, and bonytail chub. Removal action selected for the Site will not result in the take of, or adverse impacts to, threatened and endangered species or their habitats, as determined based on consultation with the U.S. Fish and Wildlife Service under section 7 of the Endangered Species Act. Mitigation measures will be implemented in accordance with the Programmatic Biological Assessment (CH2M, 2007b) and the Bird Impact Avoidance and Minimization Plan (BIAMP) (CH2M, 2014d) to avoid project-related risks to endangered species that could result from removal actions.
43	Migratory Bird Treaty Act (16 USC §§ 703-712)	Applicable	This Act makes it unlawful to “take, capture, kill" or otherwise impact a migratory bird or any nest or egg of a migratory bird. The Havasu National Wildlife Refuge, part of which makes up the Topock Site, was created as a refuge and breeding ground for migratory birds and other wildlife; therefore, there is potential for contact with migratory birds during proposed removal activities. The BIAMP specifies measures to avoid project-related risks to avian wildlife that could result from project activities. The BIAMP will be implemented during removal action.
44	Executive Order 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds	TBC	This Order directs executive departments and agencies to take certain actions to further implement the Migratory Bird Treaty Act, including supporting the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions.

Item No.	ARARs or TBCs and Citation	Determination	Description and Applicability
45	California Code of Regulations (CCR) Title 27, Environmental Protection	Applicable	Title 27 regulates discharges of wastewater to land, including but not limited to, evaporation ponds, percolation ponds, or subsurface leach fields. Any disposal of wastewater to the existing TCS evaporation ponds must meet the Waste Discharge Requirements (WDRs) Order No. R7-2018-0022. If it becomes necessary to amend the WDRs for the ponds to accept wastewater from the proposed removal action, a revised Report of Waste Discharge (ROWD) would be required.
46	Hazardous Waste Control Law and Regulations (22 CCR Division 4.5, Chapters 11, 12, 14, 18)	Applicable	The California Hazardous Waste Control Law and Regulations establish requirements for hazardous waste generators; operators of hazardous waste treatment, storage, or disposal units; and for corrective action taken in response to releases of hazardous waste from regulated units. Hazardous waste generators must determine if their waste is hazardous, manage the waste in accordance to specified requirements for accumulation in tanks and containers, use a hazardous waste manifest for offsite transportation of hazardous waste, send hazardous waste to an appropriately permitted offsite treatment or disposal facility, and retain specified records. These requirements will apply to all hazardous waste generated by onsite remedial activities. Units constructed to treat hazardous waste as part of the remediation must comply with additional operational and closure requirements. The management of excavated or displaced materials will be in accordance with the Groundwater Remedy Soil Management Plan (CH2M, 2015b).
47	Mohave Desert Air Quality Management District, Rule 403 – Fugitive Dust	Applicable	This rule sets the standards to minimize fugitive dust emissions from remedial actions. For example, • Must take "every reasonable precaution" to minimize dust emissions from soil disturbing activities (e.g., excavation, grading, land clearing). • Must take "every reasonable precaution" to keep their operations from depositing visible particulate matter on public roadways (clean equipment prior to travel on paved streets, remove any deposited material promptly. • If peak winds are less than 25 miles per hour (mph) and 15-minute average wind speed is less than 15 mph: – Must not conduct transport, handling, construction or storage activities that cause fugitive dust that remains visible beyond the property line, and – Must not cause PM concentrations in excess of 100 micrograms per cubic meter, measured as the difference between upwind and downwind samples collected on high volume samplers at the property line for a minimum of 5 hours.
48	Requirement for Land Use Covenants (22 CCR § 67391.1)	Relevant and Appropriate	This regulation requires appropriate restrictions on use of property in the event that a proposed remedial alternative results in hazardous materials remaining at the property at levels that are not suitable for unrestricted use of the land. This is an ARAR with respect to privately-owned land at the Topock Site. A Land Use Covenant and Agreement was made between PG&E and DTSC for PG&E property (APN 0650-161-08) at the Site. Removal action selected for the Site will be conducted in compliance with the Environmental Restrictions of the Covenant.
49	Clean Air Act (42 USC §§ 7401, et seq.) National Ambient Air Quality Standards (40 CFR § 50)	Relevant and Appropriate	These ambient air quality standards define levels of air quality to protect the public health. National Ambient Air Quality Standards are not enforceable in and of themselves, but they may be used as guidance if removal activities create potential air quality impacts.
50	Federal Noxious Weed Act of 1974 Public Law 93-629 (7 USC 2801, et seq.)	Applicable	Requires the use of integrated management systems to control or contain undesirable plant species. Applicable to on-Site response activities to control, eradicate, or prevent or retard the spread of such weeds.
51	Executive Order 13112 – Management of Invasive Species	TBC	Requires that each Federal agency whose action may affect the status of invasive species to take certain actions to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.

AMM = Avoidance and Minimization Measures
ARAR = applicable or relevant and appropriate requirements
BIAMP = Bird Impact Avoidance and Minimization Plan
BLM = U.S. Bureau of Land Management
CCR = California Code of Regulations
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = Code of Federal Regulations
COPC = constituent of potential concern
CrVI – hexavalent chromium
DOI = U.S. Department of the Interior
DTSC = California Department of Toxic Substance Control
ECV = ecological comparison values
ESL = environmental screening level
FLPMA = Federal Land Policy and Management Act
HERO = DTSC Human and Ecological Risk Office
HHRA = human health and risk assessment
HNWR = Havasu National Wildlife Refuge
mph = miles per hour
NCP = National Oil and Hazardous Substance Pollution Contingency Plan
NPDES = National Pollutant Discharge Elimination System
PAH = polycyclic aromatic hydrocarbons
PG&E = Pacific Gas and Electric Company
RBRG = risk-based remediation goals
RCRA = Resource Conservation and Recovery Act
ROWD = Report of Waste Discharge
TBC = to-be-considered
TCS = Topock Compressor Station
TEQ = toxicity equivalent
USC = U.S. Code
USEPA = U.S. Environmental Protection Agency
USFWS = U.S. Fish and Wildlife Service
WDR = Waste Discharge Requirements

Table 4-1. Individual Analysis of Alternatives

Soil Engineering Evaluation/Cost Analysis

PG&E Topock Compressor Station, Needles, California

Criteria	Alternative 1: No Action	Alternative 2: Excavation and Offsite Disposal of All Material	Alternative 3: Excavation, Mechanical Separation, Offsite Disposal of Fines, Reuse of Coarse Material	Alternative 4: Excavation, Mechanical Separation, Offsite Disposal of Fines, Soil Washing of Coarse Material, Reuse of Washed Coarse Material	Alternative 5: Removal of Visible Hazardous Surface Debris
EFFECTIVENESS					
Overall Protection of Human Health and the Environment	Will not be protective of human health and the environment. Current risks to human health and the environment would not be mitigated.	Protective. Alternative 2 was designed to meet RAOs protective of human health and the environment. Current risks to human health and the environment would be mitigated.	Protective. Alternative 3 was designed to meet RAOs protective of human health and the environment. Current risks to human health and the environment would be mitigated.	Protective. Alternative 4 was designed to meet RAOs protective of human health and the environment. Current risks to human health and the environment would be mitigated.	Will not be protective of human health and the environment. Alternative 5 does not meet RAOs 1 or 2 and only partially meets RAO 3. Current risks to human health and the environment would not be mitigated.
Compliance with ARARs and Other Criteria, Advisories, and Guidance	No chemical-specific ARARs were identified, however, TBC criteria will not be met.	Alternative 2 was developed to be compliant with location-, and action-specific ARARs, and certain chemical-specific TBCs.	Alternative 3 was developed to be compliant with location-, and action-specific ARARs, and certain chemical-specific TBCs.	Alternative 4 was developed to be compliant with location-, and action-specific ARARs, and certain chemical-specific TBCs.	No chemical-specific ARARs were identified, however, TBC criteria will not be met.
Long-term Effectiveness and Permanence					
Magnitude of Residual Risk	No reduction in risk will be achieved.	Soil will be removed to meet RAOs. Risk calculations, confirmation sampling, and visual observation will be performed to ensure RAOs 1 through 3 are met.	Soil will be removed and mechanically separated to meet RAOs. Coarse material greater than 3/8 inch diameter will be returned to the excavated areas with a balance of clean fill to match original contours. Coarse material that has significant residual staining or colored encrustation will be removed for offsite disposal. Separated coarse material available for backfill will be placed in the bottom of the excavation areas and the remaining excavation will be backfilled with native material and potentially appropriately sized excess soil from the soil processing yard (SPY). Other sources of backfill will be considered during the development of the Removal Action Work Plan. Site related contaminants associated with soil fines (dust) may remain adhered to the large, coarse soil fraction separated after excavation; residual contaminants, if present, are not anticipated to pose significant exposure or migration risk. Risk calculations, confirmation sampling, and visual observation will be performed to ensure RAOs 1 through 3 are met.	Soil will be removed and mechanically separated to meet RAOs. Coarse material greater than 3/8 inch diameter will be washed to remove most site-related contaminants that may remain in dust adhered to the larger size materials. After washing soil will be returned to the excavated areas with a balance of clean fill to match original contours. Coarse material that has significant residual staining or colored encrustation will be removed for offsite disposal. Separated coarse material available for backfill will be placed in the bottom of the excavation areas and the remaining excavation will be backfilled with native material and potentially appropriately sized excess soil from the SPY. Other sources of backfill will be considered during the development of the Removal Action Work Plan. Residual contaminants, if present, are not anticipated to pose significant exposure or migration risk. Risk calculations, confirmation sampling, and visual observation will be performed to ensure RAOs 1 through 3 are met.	No reduction in risk will be achieved.
Adequacy and Reliability of Controls	No controls will be implemented.	Excavation will adequately meet RAOs. Excavation itself has no controls to be maintained.	Excavation and size separation will adequately meet RAOs. Excavation itself has no controls to be maintained.	Excavation, size separation, and soil washing will adequately meet RAOs. Excavation itself has no controls to be maintained.	Removal of visible debris associated with hazardous substances will partially meet RAO 3. Removal itself has no controls to be maintained.
Reduction in Toxicity, Mobility, and Volume through Treatment					
Treatment Process Used and Materials Treated	No treatment processes will be implemented.	Excavation will remove soil to meet RAOs. Excavated soil will not be treated before disposal.	Excavation and mechanical separation will remove and treat soil to meet RAOs. Excavated soil will be mechanically separated into fine and coarse fractions. The fine fraction will be disposed offsite without treatment. The coarse fraction, which is not anticipated to exceed RAOs, will be reused as fill material.	Excavation, mechanical separation, and soil washing will remove and treat soil to meet RAOs. The soil will be mechanical separated into the fine and coarse fraction. The fine fraction will disposable disposed offsite. The coarse fraction will be washed with water to remove adhered fine soil and reused as fill material. Wash water will be discharged to on-site wastewater ponds (the TCS evaporation ponds).	Removal of removal of visible debris associated with hazardous substances will partially meet RAO 3. Removed material will not be treated before disposal.
Amount of Hazardous Material Destroyed	No hazardous materials will be destroyed.	No hazardous materials will be destroyed; destructive treatment technologies will not adequately meet RAOs.	No hazardous materials will be destroyed; destructive treatment technologies will not adequately meet RAOs.	No hazardous materials will be destroyed; destructive treatment technologies will not adequately meet RAOs.	No hazardous materials will be destroyed.
Degree of Expected Reductions in Toxicity, Mobility, and Volume through Treatment	No reduction in toxicity, mobility, and volume will be achieved.	No reduction in toxicity, mobility, or volume will be achieved. All excavated soil will be appropriately disposed offsite.	The volume of impacted soil will be reduced through mechanical size separation, which will concentrate contaminants in the fine fraction. This will reduce the volume of impacted soil by approximately half.	The volume of impacted soil will be reduced through mechanical size separation, which will concentrate contaminants in the fine fraction. This will reduce the volume of impacted soil by approximately half. Soil washing will generate waste water that will require disposal.	No reduction in toxicity, mobility, or volume will be achieved. All debris removed will be appropriately disposed offsite.
Degree to Which Treatment is Irreversible	No treatment will be implemented.	Excavation and offsite disposal will be irreversible.	Excavation, mechanical separation, and offsite disposal will be irreversible.	Excavation, mechanical separation, soil washing, and offsite disposal will be irreversible.	Debris removal and offsite disposal will be irreversible.

Criteria	Alternative 1: No Action	Alternative 2: Excavation and Offsite Disposal of All Material	Alternative 3: Excavation, Mechanical Separation, Offsite Disposal of Fines, Reuse of Coarse Material	Alternative 4: Excavation, Mechanical Separation, Offsite Disposal of Fines, Soil Washing of Coarse Material, Reuse of Washed Coarse Material	Alternative 5: Removal of Visible Hazardous Surface Debris
Type and Quantity of Residuals or Untreated Wastes Remaining After Treatment	Existing waste will remain in place.	Excavation and disposal will meet RAOs. All soil not meeting RAOs will be removed from the potential action areas. Risk calculations, confirmation sampling, and visual observation will be performed to ensure RAOs 1 through 3 are met.	Excavation and disposal or treatment will meet RAOs. All soil not meeting RAOs will be removed from the potential action areas, mechanically size separated, and the coarse material reused as fill material. It is possible that site-related contaminants that may be associated with dust adhered to the large, coarse soil fraction will remain in place. There is no way of reliably and reproducibly measuring this fraction; however, the mass and corresponding mass concentration are anticipated to be insignificant. Risk calculations, confirmation sampling, and visual observation will be performed to ensure RAOs 1 through 3 are met.	Excavation and disposal or treatment will meet RAOs. All soil not meeting RAOs will be removed from the potential action areas, mechanically size separated, and the coarse material reused as fill material after washing. Site related contaminants potentially associated with dust adhered to the large, coarse soil fraction will be removed from the soil through soil washing and transferred to the soil washing wastewater. It is assumed that wastewater will be discharged to existing TCS evaporation ponds, as appropriate. Disposal of wastewater to the ponds must meet requirements specified in the action-specific ARARs. Risk calculations, confirmation sampling, and visual observation will be performed to ensure RAOs 1 through 3 are met.	Existing waste except debris removed will remain in place.
Short-term Effectiveness					
Protection of Community During Removal Actions	Because there is no action taken, there will be no construction-related impacts on the community due to removal action implementation. Existing threats will remain.	The public can be protected using BMPs including fugitive dust suppression and perimeter air monitoring. Some risk to the public is associated with transportation of hazardous material offsite.	The public can be protected using BMPs including fugitive dust suppression and air monitoring and appropriate material transportation requirements. Some risk to the public is associated with transportation of hazardous material (less hazardous material will be transported offsite than in Alternative 2).	The public can be protected using BMPs including fugitive dust suppression and air monitoring and appropriate material transportation requirements. Some risk to the public is associated with transportation of hazardous material (less hazardous material will be transported offsite than in Alternative 2).	The public can be protected using BMPs including fugitive dust suppression and perimeter air monitoring. Some risk to the public is associated with transportation of hazardous material offsite.
Protection of Workers During Removal Actions	Because there is no action taken, there will be no construction related impacts to workers due to removal action implementation. Existing threats will remain.	Some risk to workers will be encountered during excavation and transportation of contaminated soil; however, workers can be protected by following requirements and protocols in project-specific health and safety plans.	Some risk to workers will be encountered during excavation and transportation of contaminated soil; however, workers can be protected by following requirements and protocols in project-specific health and safety plans. Dust generated during mechanical separation of soil will also pose some risk to workers, but again, workers can be protected using normal health and safety protocols.	Some risk to workers will be encountered during excavation and transportation of contaminated soil; however, workers can be protected by following requirements and protocols in project-specific health and safety plans. Dust generated during mechanical separation of soil will also pose some risk to workers, but again, workers can be protected using normal health and safety protocols.	Some risk to workers will be encountered during removal and transportation of debris; however, workers can be protected by following requirements and protocols in project-specific health and safety plans.
Environmental Impacts	Because there is no action taken, there will be no construction related impacts to the environment. Existing threats will remain.	Coordination with USFWS and CDFW will occur to ensure applicable management measures are implemented during the removal action to avoid and protect sensitive habitats and wildlife in the work areas. The removal action will comply with all applicable measures and stipulations of the PA, PA Amendment, and the Cultural and Historic Property Management Plan (CHPMP). BMPs including engineered controls, if needed, implemented during removal action activities will control and minimize potential spills and releases into the environment. Removal action activities will use energy and produce greenhouse gas emissions and air emissions of criteria pollutants (NO_x, SO_x, PM_{10}). This alternative will result in transportation of a greater volume of waste (and associated energy inputs and emissions) than Alternatives 3 and 4. Once initial construction activities are completed, the alternative will not require any additional energy inputs.	Coordination with USFWS and CDFW will occur to ensure applicable management measures are implemented during the removal action to avoid and protect sensitive habitats and wildlife in the work areas. The removal action will comply with all applicable measures and stipulations of the PA, PA Amendment, and the CHPMP. BMPs including engineered controls, if needed, implemented during removal action activities will control and minimize potential spills and releases into the environment. Removal action activities will use energy and produce greenhouse gas emissions and air emissions of criteria pollutants (NO_x, SO_x, PM_{10}). This alternative will require less transportation of waste than Alternative 2 but will require energy inputs related to mechanical separation. Once initial construction activities are completed, the alternative will not require any additional energy inputs.	Coordination with USFWS and CDFW will occur to ensure applicable management measures are implemented during the removal action to avoid and protect sensitive habitats and wildlife in the work areas. The removal action will comply with all applicable measures and stipulations of the PA, PA Amendment, and the CHPMP. BMPs including engineered controls, if needed, implemented during removal action activities will control and minimize potential spills and releases into the environment. Removal action activities will use energy and produce greenhouse gas emissions and air emissions of criteria pollutants (NO_x, SO_x, PM_{10}). This alternative will require less transportation of waste than Alternative 2 but will require energy inputs and water usage related to mechanical separation and soil washing. Once initial construction activities are completed, the alternative will not require any additional energy inputs.	Coordination with USFWS and CDFW will occur to ensure applicable management measures are implemented during the removal action to avoid and protect sensitive habitats and wildlife in the work areas. The removal action will comply with all applicable measures and stipulations of the PA, PA Amendment, and the CHPMP. BMPs including engineered controls, if needed, implemented during removal action activities will control and minimize potential spills and releases into the environment. Removal action activities will use energy and produce greenhouse gas emissions and air emissions of criteria pollutants (NO_x, SO_x, PM_{10}). This alternative will result in transportation of less waste (and associated energy inputs and emissions) than Alternatives 2 through 4. Once initial construction activities are completed, the alternative will not require any additional energy inputs.
Time Until RAOs are Met	The RAOs will not be met.	Approximately 4 months.	Approximately 5 months.	Approximately 5 months.	The RAOs will not be met.
IMPLEMENTABILITY					
Technical Feasibility					
Ability to Construct and Operate the Technology	Not applicable. No additional construction or operation will be required.	Excavation is a proven technology that has been implemented at Topock.	Excavation and mechanical separation are proven technologies that have been implemented at Topock.	Excavation and mechanical separation are proven technologies that have been implemented at Topock. Soil washing is well understood but requires relatively more steps including washing and separation of washed material from wastewater.	Removal is a proven technology that has been implemented at Topock.

Criteria	Alternative 1: No Action	Alternative 2: Excavation and Offsite Disposal of All Material	Alternative 3: Excavation, Mechanical Separation, Offsite Disposal of Fines, Reuse of Coarse Material	Alternative 4: Excavation, Mechanical Separation, Offsite Disposal of Fines, Soil Washing of Coarse Material, Reuse of Washed Coarse Material	Alternative 5: Removal of Visible Hazardous Surface Debris
Reliability of the Technology	Not applicable.	Excavation is a reliable technology.	Excavation and mechanical separation are reliable technologies. The addition of mechanical separation may add some risk of schedule delays related to equipment malfunction.	Excavation, mechanical separation, and soil washing are reliable technologies. The addition of mechanical separation and soil washing may add some risk of schedule delays related to equipment malfunction.	Removal is a reliable technology.
Ease of Undertaking Additional Removal or Remedial Actions, if Necessary	Alternative offers a high ease of undertaking additional actions.	Alternative offers a high ease of undertaking additional actions.	Alternative offers a high ease of undertaking additional actions.	Alternative offers a high ease of undertaking additional actions.	Alternative offers a high ease of undertaking additional actions.
Ability to Monitor Effectiveness of the Removal or Remedial Action	Alternative offers a high ability to monitor remedy effectiveness.	Alternative offers a very high ability to monitor removal action effectiveness. Risk calculations, confirmation sampling, and visual observation will be performed to ensure RAOs 1 through 3 are met.	Alternative offers a very high ability to monitor removal action effectiveness. Risk calculations, confirmation sampling, and visual observation will be performed to ensure RAOs 1 through 3 are met.	Alternative offers a very high ability to monitor removal action effectiveness. Risk calculations, confirmation sampling, and visual observation will be performed to ensure RAOs 1 through 3 are met.	Alternative offers a high ability to monitor remedy effectiveness. Visual observation will be performed to ensure all visible debris associated with hazardous substances is removed.
Administrative Feasibility					
Ease of Coordinating with Other Offices, Agencies, and Third-Parties	No coordination necessary.	All alternatives require review by the current land owners/managers (BLM, Caltrans, USFWS) and other stakeholders (including the Tribes). This alternative will result in the greatest volume of soil removed from the Site. The Tribes have expressed a preference for minimizing the volume of soil removed due to the cultural and historical significance of the Site. Selection of an appropriate staging area will require consultation and agreement with landowners and other stakeholders. Excavation activities in AOC 14 are within the Caltrans right-of-way and will require a lane closure of I-40 for equipment access. Lane closure will require Caltrans approval and coordination with the California Highway Patrol. Access will also need to be coordinated with BNSF for any personnel and equipment to cross over BNSF tracks. Excavation activities will require closure of specific areas to hikers and other recreators. This closure would need to be coordinated with land owners/managers.	All alternatives require review by the current land owners (BLM, Caltrans, USFWS) and other stakeholders (including the Tribes). This alternative minimizes the volume of soil removed from the Site. Selection of an appropriate staging and processing areas will require consultation and agreement with landowners and other stakeholders. Excavation activities in AOC 14 are within the Caltrans right-of-way and will require a lane closure of I-40 for equipment access. Lane closure will require Caltrans approval and coordination with the California Highway Patrol. Access will also need to be coordinated with BNSF for any personnel and equipment to cross over BNSF tracks. Excavation activities will require closure of specific areas to hikers and other recreators. This closure would need to be coordinated with land owners/managers.	All alternatives require review by the current land owners (BLM, Caltrans, USFWS) and other stakeholders (including the Tribes). This alternative minimizes the volume of soil removed from the Site. Wastewater generated during soil washing will require disposal. This EE/CA assumes wastewater will be disposed in the TCS evaporation ponds. Discharge to the TCS evaporation ponds must meet Waste Discharge Requirements Order No. R7-2018-0022. If it becomes necessary to amend the WDRs for the ponds to accept wastewater from the proposed removal action, a revised ROWD would be required. Selection of an appropriate staging and processing areas will require consultation and agreement with landowners and other stakeholders. Excavation activities in AOC 14 are within the Caltrans right-of-way and will require a lane closure of I-40 for equipment access. Lane closure will require Caltrans approval and coordination with the California Highway Patrol. Access will also need to be coordinated with BNSF for any personnel and equipment to cross over BNSF tracks. Excavation activities will require closure of specific areas to hikers and other recreators. This closure would need to be coordinated with land owners/managers.	All alternatives require review by the current land owners (BLM, Caltrans, USFWS) and other stakeholders (including the Tribes). This alternative does not include any volume of soil removed from the Site. Selection of appropriate staging areas will require consultation and agreement with landowners and other stakeholders. Removal activities in AOC 14 are within the Caltrans right-of-way and will require a lane closure of I-40 for equipment access. Lane closure will require Caltrans approval and coordination with the California Highway Patrol. Access will also need to be coordinated with BNSF for any personnel and equipment to cross over BNSF tracks. Removal activities will require closure of specific areas to hikers and other recreators. This closure would need to be coordinated with land owners/managers.
Availability of Services and Materials					
Availability of Offsite Treatment, Storage, and Disposal Services and Capacity	Not applicable.	Offsite disposal is available.	Offsite disposal is available.	Offsite disposal is available.	Offsite disposal is available.
Availability of Necessary Equipment and Specialists	None required.	Necessary equipment and specialists for the alternative are highly available.	Necessary equipment and specialists for the alternative are available but limited.	Necessary equipment and specialists for the alternative are available but limited.	Necessary equipment and specialists for the alternative are highly available.
Availability of Prospective Technologies	None required.	All prospective technologies are highly available.	All prospective technologies are highly available.	All prospective technologies are highly available.	All prospective technologies are highly available.
COST					
Total Capital Cost	Not applicable.	$5,281,000	$4,626,000	$5,159,000	Not applicable.

ARAR = applicable or relevant and appropriate requirements
AOC = area of concern
BLM = U.S. Bureau of Land Management
BMP = best management practice
BNSF = BNSF Railway
Caltrans = California Department of Transportation
CDFW = California Department of Fish and Wildlife
CHPMP = Cultural and Historic Property Management Plan
EE/CA = Engineering Evaluation/Cost Analysis
I-40 = Interstate 40
NO_x = nitrogen oxides
PA = Programmatic Agreement
PAA = potential action area
PM_{10} = particulate matter 10 micrometers or less
RAO = removal action objectives
ROWD = Report of Waste Discharge
SO_x = sulfur oxides
TCS = Topock Compressor Station
USFWS = U.S. Fish and Wildlife Service
WDR = Waste Discharge Requirements

Figures

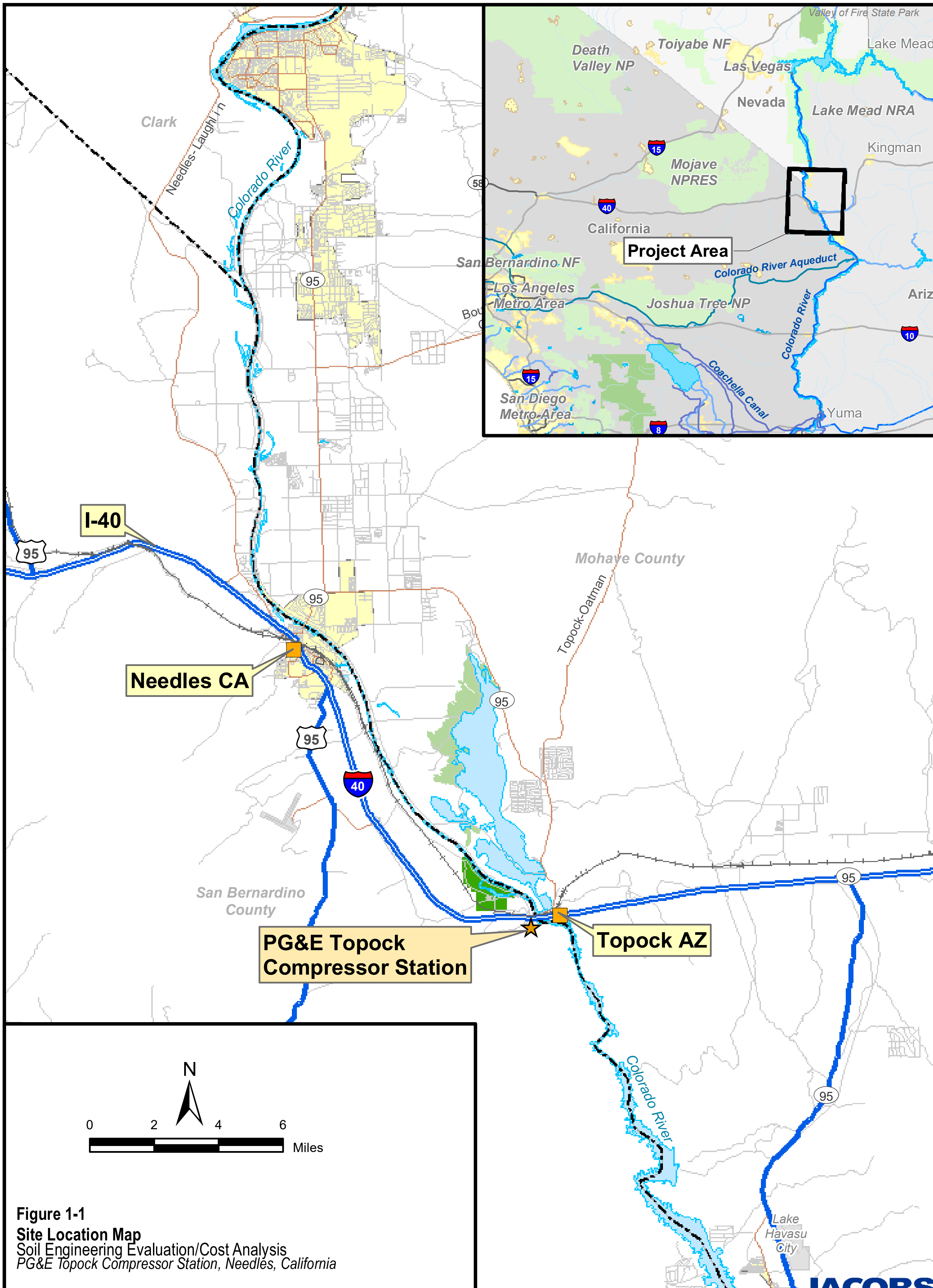

Figure 1-1
Site Location Map
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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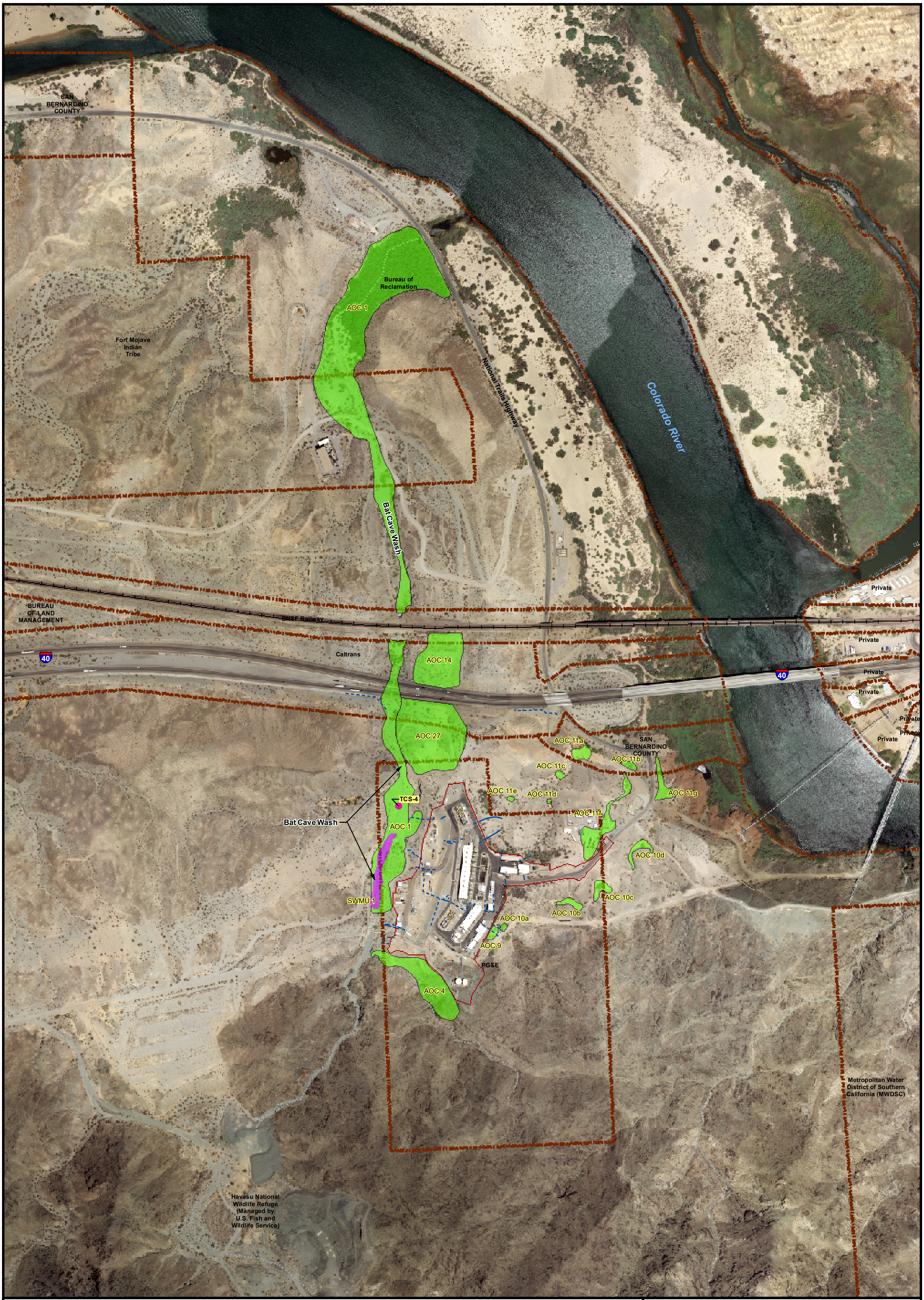


LEGEND

- Area of Concern (AOC)
- Solid Waste Management Unit (SWMU)
- Stormwater Piping Below Ground
- Stormwater Piping Above Ground
- Topock Compressor Station Fence Line
- Parcel Boundaries

Notes:
RFI/RI = Resource Conservation and Recovery Act Facility Investigation/Remedial Investigation

N

0 430 860 Feet

Figure 2-1
RFI/RI Investigation Areas Evaluated
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

JACOBS

\\BROOKSIDEFILES\GIS_SHARE\ENBG\00_PROJ\P\PGE\TOPOCK\MAPFILES\2019\EECA\FIG2-1_SWMU_AOC.MXD GMOON 2/7/2020

LEGEND

Jurisdictional Waters and Wetlands

Parcel Boundaries

Topock Compressor Station Fence Line

Potential Action Area

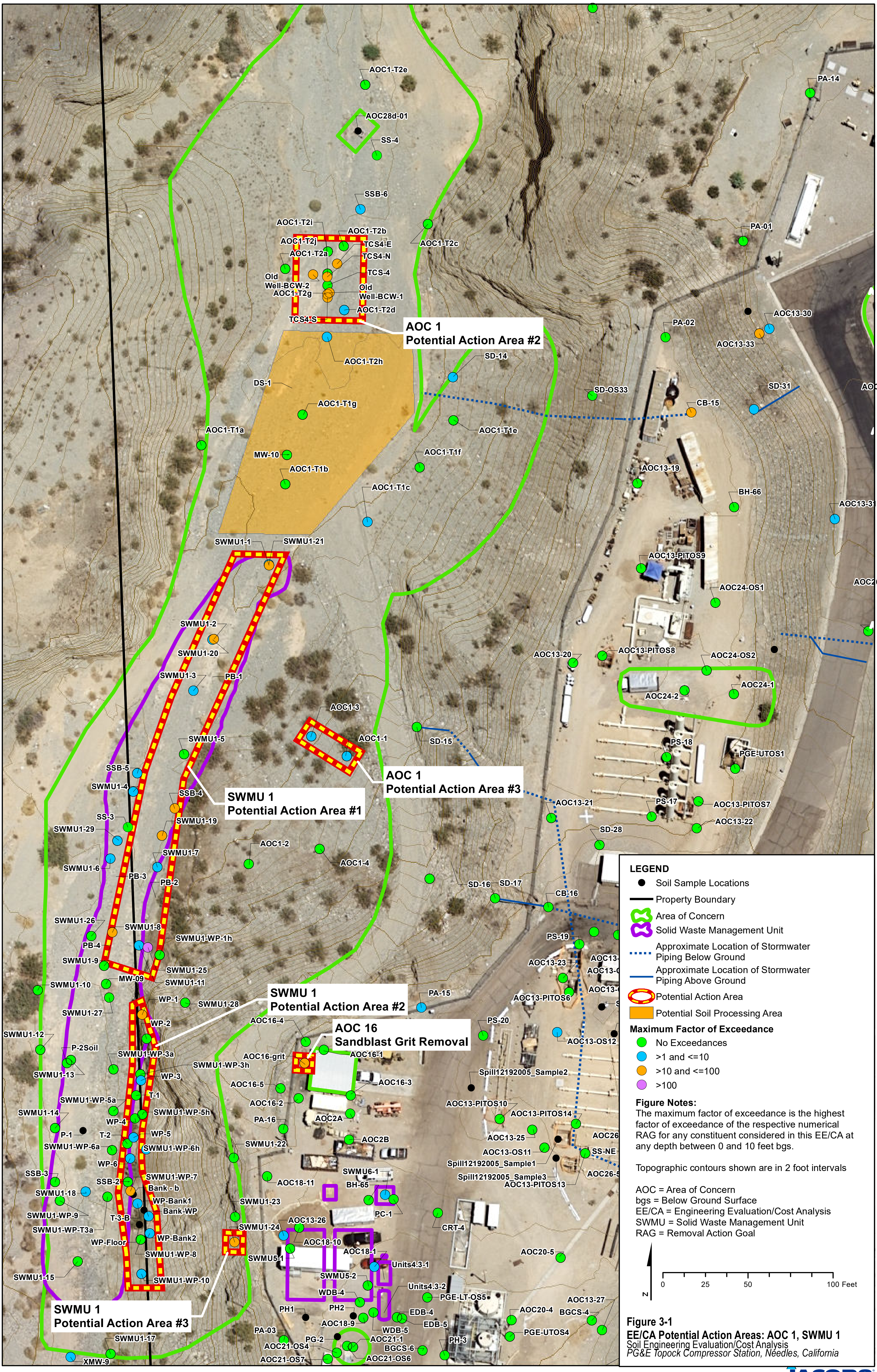
N

0 425 850 Feet

Figure 2-2
Jurisdictional Waters and Wetlands
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

JACOBS

\\BROOKSIDEFILES\GIS_SHARE\ENBG\00_PROJ\P\PGE\TOPOCK\MAPFILES\2019\EECA\FIG2-2_JURISDICTIONALWATERS.MXD GMOON 2/7/2020



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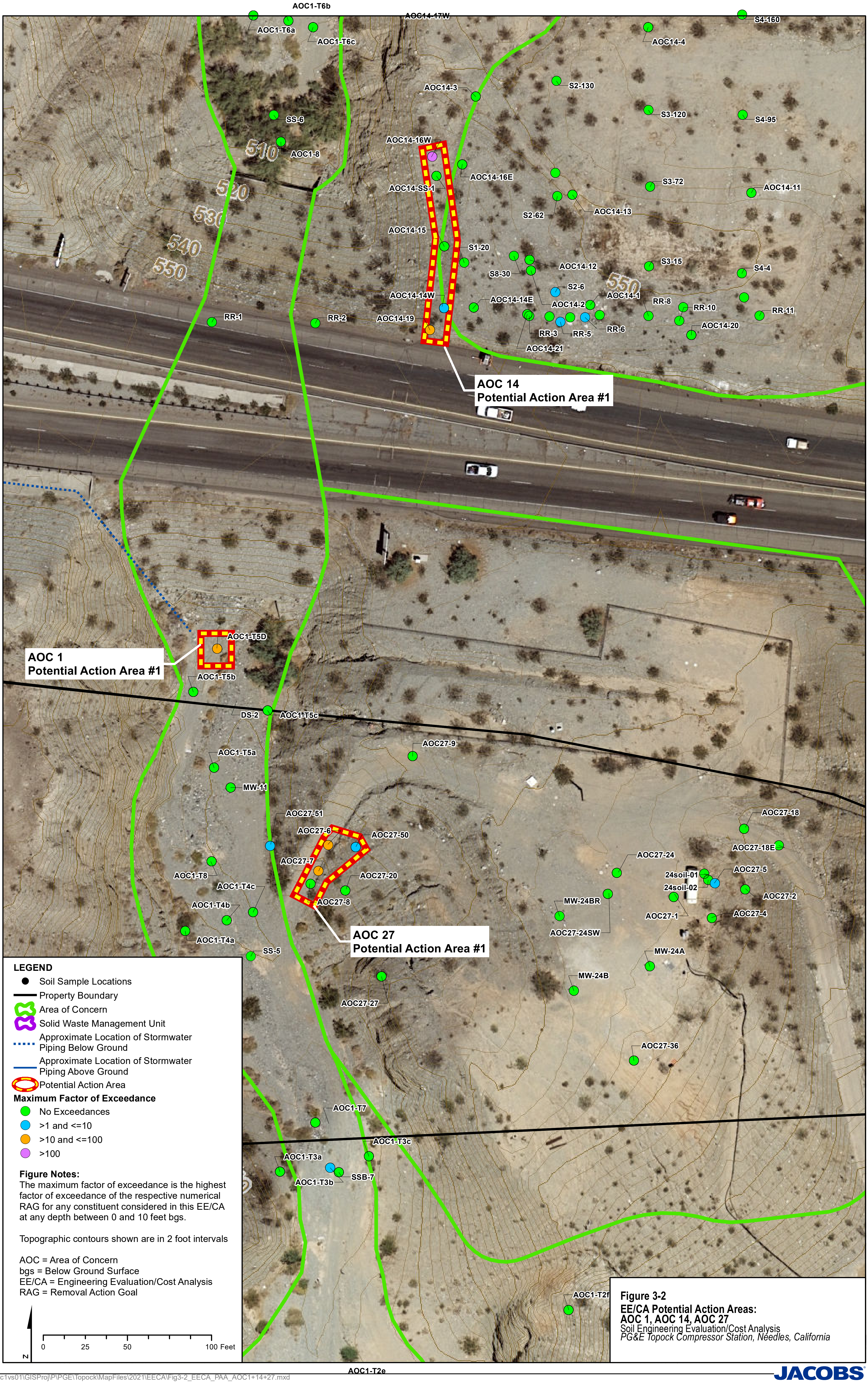

LEGEND

- Soil Sample Locations
- Property Boundary
- Area of Concern
- Solid Waste Management Unit
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Potential Action Area

Maximum Factor of Exceedance

- No Exceedances
- >1 and <=10
- >10 and <=100
- >100

Figure Notes:
The maximum factor of exceedance is the highest factor of exceedance of the respective numerical RAG for any constituent considered in this EE/CA at any depth between 0 and 10 feet bgs.

Topographic contours shown are in 2 foot intervals

AOC = Area of Concern
bgs = Below Ground Surface
EE/CA = Engineering Evaluation/Cost Analysis
RAG = Removal Action Goal

Figure 3-2
EE/CA Potential Action Areas:
AOC 1, AOC 14, AOC 27
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

\\dc1vs01\GISProj\P\PGE\Topock\MapFiles\2021\EECA\Fig3-2_EECA_PAA_AOC1+14+27.mxd

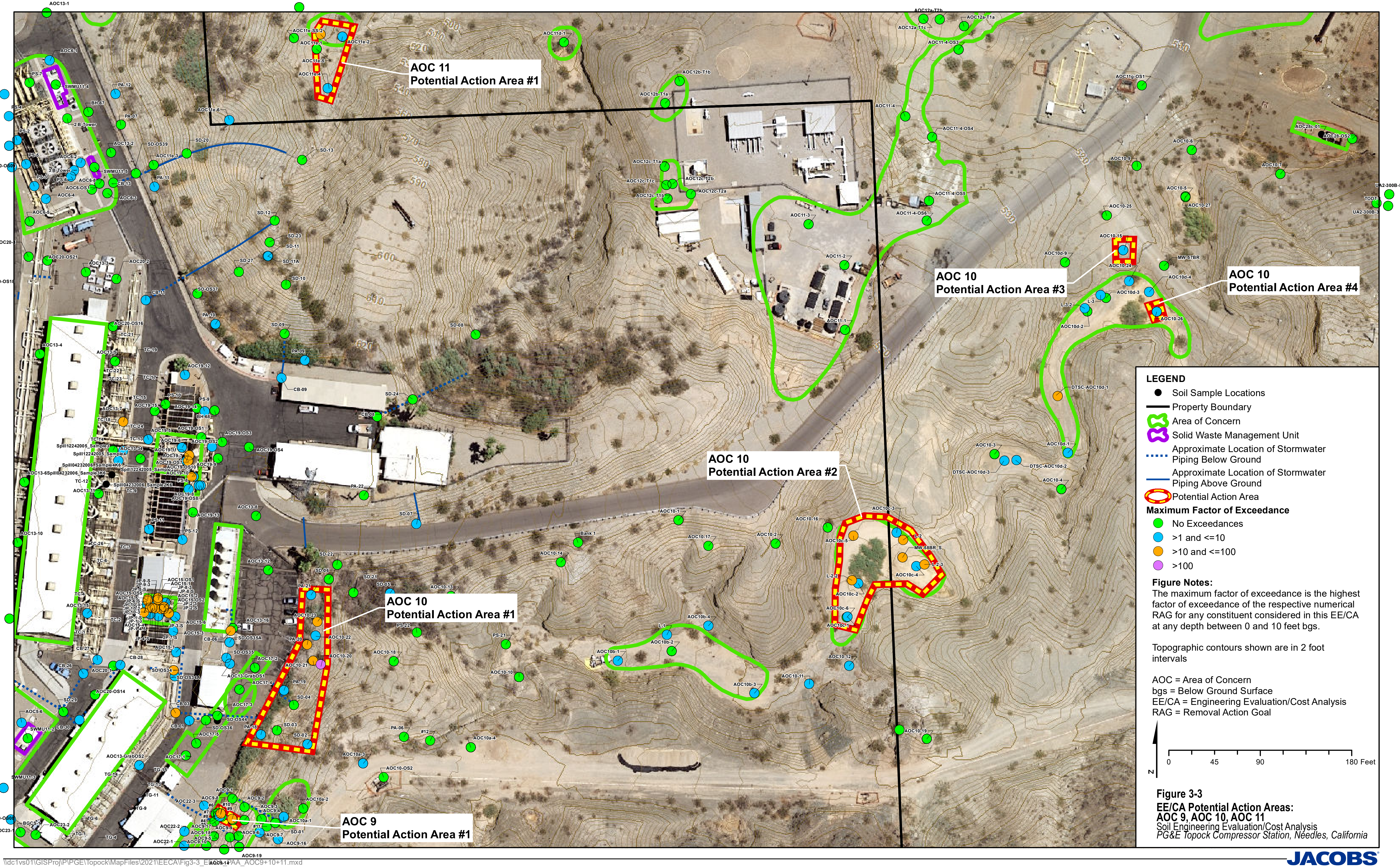

Figure 3-3
EE/CA Potential Action Areas:
AOC 9, AOC 10, AOC 11
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

\\dc1vs01\GISProj\P\PGE\Topock\MapFiles\2021\EECA\Fig3-3_EECA_PAA_AOC9+10+11.mxd

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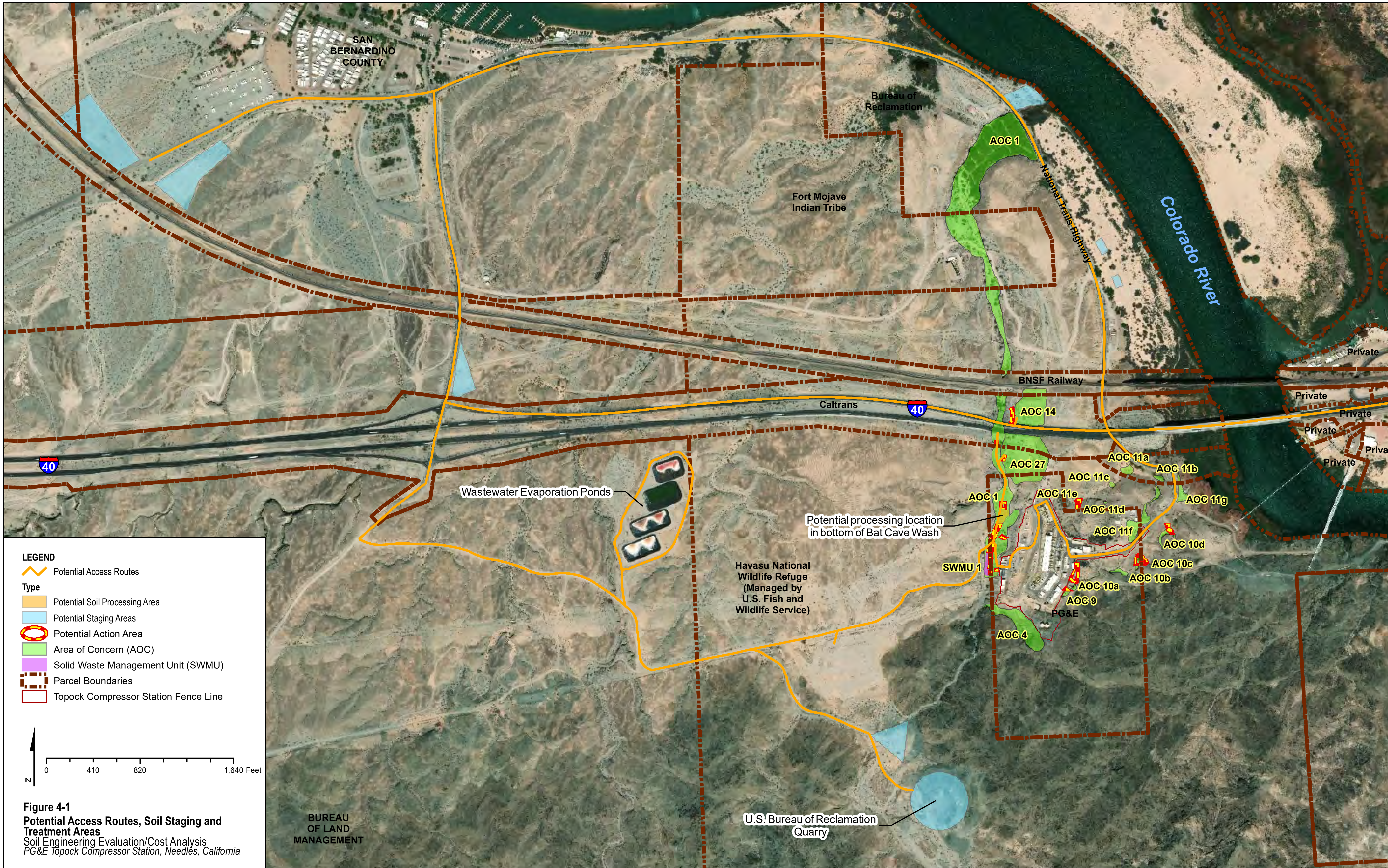

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Appendix A
Signed Approval Memorandum for an Engineering Evaluation/Cost Analysis at the PG&E Topock Compressor Station, San Bernardino County, CA

Memorandum

To: Michaela E. Noble, Director
Office of Environmental Policy & Compliance

Through: Amy Lueders, Director
U.S. Fish and Wildlife Service, Southwest Region

Through: William Lodder, ECLM Team Lead
Office of Environmental Policy & Compliance

From: Pamela Innis, CHF Remedial Project Manager

Subject: Approval Memorandum for an Engineering Evaluation/Cost Analysis at the Pacific Gas and Electric Topock Compressor Station, San Bernardino County, CA

The purpose of this memorandum is to request approval to proceed with an Engineering Evaluation/Cost Analysis (EE/CA) to evaluate non-time critical removal action alternatives at the Pacific Gas and Electric (PG&E) Topock Compressor Station Remediation Site (Site) to address contaminated soil at Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) within the Site. At this time, the Department of the Interior (DOI) expects PG&E to prepare the EE/CA and, if warranted, to implement any removal action that the DOI subsequently selects based on the findings of the EE/CA and subject to the DOI oversight.

I. Site Background

Investigative and remedial activities at the Site date to the 1980s with the identification of solid waste management units through a RCRA facility assessment. Since 1996, there have been multiple phases of investigation at the Topock site to collect soil data to evaluate the nature and extent of contamination at up to forty SWMUs, AOCs, and Undesignated Areas. Soil investigation activities were completed in 2017. Eleven areas are located on or adjacent to Federal lands, of which five areas contain contaminant concentrations significantly above background values, ecological comparison values, and/or residential human screening levels. Below are descriptions and background information for those five areas.

AOC 1 and SWMU 1 – Former percolation bed and surrounding area

AOC 1 and SWMU 1 are located outside the facility fence line west of the compressor station within Bat Cave Wash (Figure 1). AOC 1 comprises a portion of Bat Cave Wash adjacent to the station including SWMU 1, as well as the portion of Bat Cave Wash extending to the north of SWMU 1 toward the Colorado River. SWMU 1 is the former percolation bed located in Bat Cave Wash. From about 1964 to approximately 1971, the facility discharged wastewater to the percolation bed (SWMU 1) and allowed water to percolate into the ground and/or evaporate. Historical aerial photos indicate that, prior to the establishment of the bermed percolation bed, discharges to Bat Cave Wash may have extended as far downstream as the railroad tracks (just of Figure 1 to the north). Further north, near the mouth of Bat Cave Wash, the thick vegetation, widening of the channel, and blockage of flow by National Trails Highway greatly reduces the energy of flow during runoff events, resulting in deposition of entrained soil within the vegetated area at the lower end of Bat Cave Wash. The area is heavily vegetated, predominately with salt cedar (also known as tamarisk), which is an aggressive, non-native plant species. This heavily vegetated portion of Bat Cave Wash is a long-term depositional area that existed before the compressor station was built, although the depositional history and patterns within this area are not well known. AOC 1 is located partially on PG&E property, the Havasu National Wildlife Refuge (HNWR), Bureau of Reclamation property (managed by Bureau of Land Management), BNSF Railway Company (BNSF) property, and Fort Mojave Indian Tribe property with PG&E as an easement holder. SWMU 1 is located on both PG&E property and the HNWR.

AOC 10 – East Ravine

AOC 10 is located outside the facility fence line southeast of the compressor station in a small ravine known as east ravine. The ravine runs eastward toward the Colorado River. AOC 10 generally includes all of east ravine as well as the specific areas shown on Figure 2. The ravine is approximately 1,600 feet long and is bisected by three constructed berms. Due to the berms, surface flow within the ravine does not typically reach the Colorado River. AOC 10 likely received runoff from the compressor station, the access road to the compressor station, and AOC 9; discharge from stormwater drain pipes; surface debris on the slopes of the ravine; and incidental overflows of wastewater via the former trench drain at the top of the station access road. AOC 10 is located on both PG&E property and the HNWR.

AOC 14 – Railroad Debris Site

AOC 14 is located outside the facility fence line approximately 1,000 feet north of the compressor station and is currently bounded by the BNSF railway tracks to the north, Interstate 40 to the south, Bat Cave Wash to the west, and a former access road to the east (Figure 1). AOC 14 currently contains miscellaneous construction debris related to construction of the rail line including chunks of asphalt, railroad ties, and piping. Asbestos-containing material and burned material have also been identified within AOC 14. Former compressor station employees reported that water softening (lime) sludge was disposed of in this area. An asbestos removal action was completed in 1999. Surface water runoff along the western side of AOC 14 flows into Bat Cave Wash (AOC 1). AOC 14 is located on property owned by BNSF, Bureau of Land Management, HNWR, and CalTrans Right-of-Way.

AOC 27 – MW-24 Bench

AOC 27 is located outside the facility fence line north of the compressor station, south of Interstate 40, and east of Bat Cave Wash (AOC 1) shown on Figure 1. A former PG&E Topock Compressor Station Employee indicated that AOC 27, informally known as MW-24 bench, was used as a waste disposal area. Miscellaneous construction debris and burned material are present in AOC 27. The burned debris occurs along the eastern edge of the road cut on the road from AOC 27 to Bat Cave Wash (AOC 1). Runoff from AOC 27 likely flowed into Bat Cave Wash (AOC 1). AOC 27 is located on HNWR and the Caltrans Right-of-Way.

II. Threat to Public Health, Welfare, or the Environment

Metals and dioxins and furans were detected at concentrations significantly exceeding background values, ecological comparison values (ECVs) and/or residential human health screening levels in certain locations within AOC 1, SWMU 1, AOC 10, AOC 14, and AOC 27. For the purposes of this memorandum, those locations that are located on Federal land or have the potential to migrate to Federal land are called "potential action areas", and are discussed below.

Metals with elevated concentrations include total chromium, copper, lead, mercury, molybdenum, and zinc. Dioxins and furans toxicity equivalent (TEQ) values are calculated from 17 individual dioxin and furan congeners for human/mammal and avian receptors.

Contaminant Information for AOC 1 and SWMU 1

Total chromium and dioxins and furan TEQs were detected at concentrations significantly exceeding background value/ecological comparison values and/or residential human screening levels at several locations within AOC 1 and SWMU 1. Four potential action areas (one in SWMU 1 and three in AOC 1) have been identified within AOC1 and SWMU that contain soil samples with high factors of exceedance of total chromium and dioxin and furans (See Figure 1). These areas are located on Federal land or have the potential to migrate to Federal land. Figure 1 presents TEQ-avian concentrations compared to the TEQ avian ECV of 16 nanograms per kilogram (ng/kg). Locations with elevated total chromium concentrations generally correspond to the locations with elevated dioxin and furan concentrations.

Table 1 presents the soil sample concentrations in AOC 1 and SWMU 1 potential action areas compared to respective screening levels and the factors of exceedance of each screening level.

Summary of exceedances:

- Total chromium concentrations range from 41 to 4,400 milligrams per kilogram (mg/kg); maximum detected concentration was in AOC 1, potential action area #2 at Old Well-BCW-2 (4 to 5 feet below ground surface (bgs)). The total chromium background value is 39.8 mg/kg.
- TEQ-avian concentrations range from 20 to 11,000 ng/kg; maximum detected concentration was in SWMU 1, potential action area #1 at SWMU1-25 (0 to 1 foot bgs). The TEQ-avian ECV is 16 ng/kg.
- TEQ-human concentrations range from 51 to 12,000 nanograms per kilogram (ng/kg; maximum detected concentration was also at SWMU1-25 (0 to 1 foot bgs). The TEQ-human residential screening level is 50 ng/kg.
- TEQ-mammal concentrations range from 6.4 to 12,000 ng/kg; maximum detected concentration was again at SWMU1-25 (0 to 1 foot bgs). The TEQ-mammal screening level is based on a background concentration of 5.58 ng/kg.

Contaminant Information for AOC 10

Copper, total chromium, lead, mercury, and dioxins and furans were detected at concentrations significantly exceeding background value/ecological comparison values and/or residential human screening levels at several locations within AOC 10. Five proposed action areas have been identified within AOC 10 that contain soil samples with high factors of exceedance of metals and dioxin and furans (See Figure 2). These areas are located on Federal land or have the potential to migrate to Federal land. Figure 2 presents TEQ-avian concentrations compared to the TEQ avian ECV of 16 ng/kg. Locations with elevated metals concentrations generally correspond to the locations with elevated dioxin and furan concentrations.

Table 2 presents the soil sample concentrations in AOC 10 proposed action areas compared to respective screening levels, and the factors of exceedance of each screening level.

Summary of exceedances:

- Total chromium concentrations range from 41 to 4,000 mg/kg; maximum detected concentration was in proposed action area #2 at MW-58BR_S (1.5 to 2 feet bgs). The total chromium background value is 39.8 mg/kg.
- Copper concentrations range from 17 to 3,100 mg/kg; maximum detected concentration was in proposed action area #1 at AOC10-21 (0 to 0.5 foot bgs). The copper background value is 16.8 mg/kg.
- Lead concentrations range from 8.9 to 920 mg/kg; maximum detected concentration was also at AOC10-21 (0 to 0.5 foot bgs). The lead background value is 8.39 mg/kg.

- Mercury concentrations range from 0.12 to 35 mg/kg; maximum detected concentration was also at AOC10-21 (0 to 0.5 foot bgs). The mercury ECV is 0.0125 mg/kg.
- TEQ-avian concentrations range from 27 to 1,100 ng/kg; maximum detected concentration was in proposed action area #1 at PA-20 (0 to 1 foot bgs). TEQ-avian ECV is 16 ng/kg.
- TEQ-human concentrations range from 53 to 1,600 ng/kg; maximum detected concentration was also at PA-20 (0 to 1 foot bgs). TEQ-human residential screening level is 50 ng/kg.
- TEQ-mammal concentrations range from 8.8 to 1,600 ng/kg; maximum detected concentration was also at PA-20 (0 to 1 foot bgs). The TEQ-mammal screening level is based on a background concentration of 5.58 ng/kg.

Contaminant Information for AOC 14

Lead and dioxins and furans were detected at concentrations significantly exceeding background value/ecological comparison values and/or residential human screening levels at several locations within AOC 14. One proposed action area has been identified within AOC 14 that contain soil samples with high factors of exceedance of lead and dioxin and furans (See Figure 1). These areas are located on Federal land or have the potential to migrate to Federal land. Figure 1 presents TEQ-avian concentrations compared to the TEQ avian ECV of 16 ng/kg. Locations with elevated lead concentrations correspond to the locations with elevated dioxin and furan concentrations.

Table 3 presents the soil sample concentrations in AOC 14 proposed action areas compared to respective screening levels, and the factors of exceedance of each screening level.

Summary of exceedances:

- Lead concentrations range from 15 to 1,600 mg/kg and the maximum detected concentration was in proposed action area #1 at AOC14-19 (2 to 3 feet bgs). The lead background value is 8.39 mg/kg.
- TEQ-avian concentrations range from 21 to 780 ng/kg; maximum detected concentration was in proposed action area #1 at AOC14-14W (5 to 5.5 feet bgs). TEQ-avian ECV is 16 ng/kg.
- TEQ-human concentrations range from 140 to 480 ng/kg; maximum detected concentration was also at AOC14-14W (5 to 5.5 feet bgs). TEQ-human residential screening level is 50 ng/kg.
- TEQ-mammal concentrations range from 6 to 480 ng/kg; maximum detected concentration was also at AOC14-14W (5 to 5.5 feet bgs). The TEQ-mammal screening level is based on a background concentration of 5.58 ng/kg.

Contaminant Information for AOC 27

Copper, lead, mercury, zinc, and dioxins and furans were detected at concentrations significantly exceeding background value/ecological comparison values and/or residential human screening levels at several locations within AOC 27.

One proposed action area has been identified within AOC 27 that contain soil samples with high factors of exceedance of metals and dioxin and furans (See Figure 1). These areas are located on Federal land. Figure 1 presents TEQ-avian concentrations compared to the TEQ avian ECV of 16 ng/kg. Locations with elevated metals concentrations correspond to the locations with elevated dioxin and furan concentrations.

Table 4 presents the soil sample concentrations in AOC 27 proposed action area compared to respective screening levels, and the factors of exceedance of each screening level.

Summary of exceedances:

- Copper concentrations ranged from 18 to 1,000 mg/kg; maximum detected concentration was in proposed action area #1 at AOC27-7 (2 to 3 feet bgs). The copper background value is 16.8 mg/kg.
- Lead concentrations ranged from 8.4 to 630 mg/kg; maximum detected concentration was in proposed action area #1 at AOC27-6 (0 to 1 foot bgs). The lead background value is 8.39 mg/kg.
- Detected mercury concentrations ranged from 0.12 to 0.95 mg/kg (the reporting limit exceeded the screening level); maximum detected concentration was also at AOC27-7 (2 to 3 feet bgs). The mercury ECV is 0.0125 mg/kg.
- Zinc concentrations ranged from 74 to 1,300 mg/kg; maximum detected concentration was also at AOC27-7 (2 to 3 feet bgs). The zinc background value is 58 mg/kg.
- TEQ-avian concentrations range from 32 to 260 ng/kg; maximum detected concentration was also at AOC27-7 (2 to 3 feet bgs). TEQ-avian ECV is 16 ng/kg.
- TEQ-human concentrations range from 57 to 230 ng/kg; maximum detected concentration was also at AOC27-7 (2 to 3 feet bgs). TEQ-human residential screening level is 50 ng/kg.
- TEQ-mammal concentrations range from 5.8 to 230 ng/kg; maximum detected concentration was also at AOC27-7 (2 to 3 feet bgs). The TEQ-mammal screening level is based on a background concentration of 5.58 ng/kg.

Evaluation of Threat

Sufficient evidence exists to justify the preparation of an EE/CA. The goals of the EE/CA are to identify removal action objectives for the AOCs; analyze the effectiveness, implementability, and cost of various alternatives that satisfy these objectives; and recommend a removal action alternative. The primary concerns are potential impacts to ecological receptors and specific human exposures. Several AOC locations are within active wash areas where ephemeral discharges could move contamination toward the Colorado River. If this removal action is not taken, then necessary cleanup work will be delayed until after completion of a site-wide Remedial Investigation/ Feasibility Study and Record of Decision (ROD), during which time contaminant migration and unacceptable exposures will continue to occur. It is anticipated that the ROD will be completed in 2022, at the earliest.

III. Statutory Basis for Action

The information presented in this memorandum indicates that actual or threatened releases of hazardous substances from these sites present a substantial threat to public health and the environment. Based on this information, further evaluation, in the form of an EE/CA, is warranted to evaluate alternatives that may be necessary to address such risks. The results of this EE/CA will provide the basis for the selection of a removal action to prevent, minimize, or mitigate risks to public health and the environment.

IV. Factors for Determining Appropriateness of a Removal Action Section

The National Contingency Plan (NCP) provides factors for determining the appropriateness of a removal action. Factors found in 40 C.F.R. § 300.415(b)(2) most applicable to current conditions at the TCS AOCs include: the actual or potential contamination of drinking water supplies or sensitive ecosystems; actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants; high levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate; and weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released. In accordance with 40 C.F.R. § 300.415(b)(4) of the NCP, the DOI has determined that a planning period of at least six months exists before on-site activities could be initiated; therefore; an EE/CA must be conducted prior to selecting a non-time critical removal action.

V. Enforcement/Proposed Actions/Cost Estimates

The DOI has entered into an Administrative Order on Consent (AOC) with PG&E to conduct this work. Pursuant to this AOC, PG&E will prepare the EE/CA and implement any subsequent removal action selected by the DOI. The DOI estimates that the approximate cost of proposed removal actions could range from ten to forty million dollars.

VI. Public Involvement

The DOI will issue the EE/CA for public comment in accordance with section 300.415(n)(4) and anticipates the EE/CA will be available for public comment in 2019. The DOI will also comply with (former) Section 106 of the National Historic Preservation Act, 54 U.S.C. § 300101 et. seq.

VII. Approval/Disapproval

The conditions at the PG&E Topock Compressor Station Remediation Site AOCs and SWMUs meet the NCP criteria for undertaking an EE/CA that will provide the basis for the selection of a removal action, if warranted. Therefore, I am requesting approval to proceed with an EE/CA. Your approval or disapproval should be indicated below.

Director, Office of Environmental Policy and Compliance

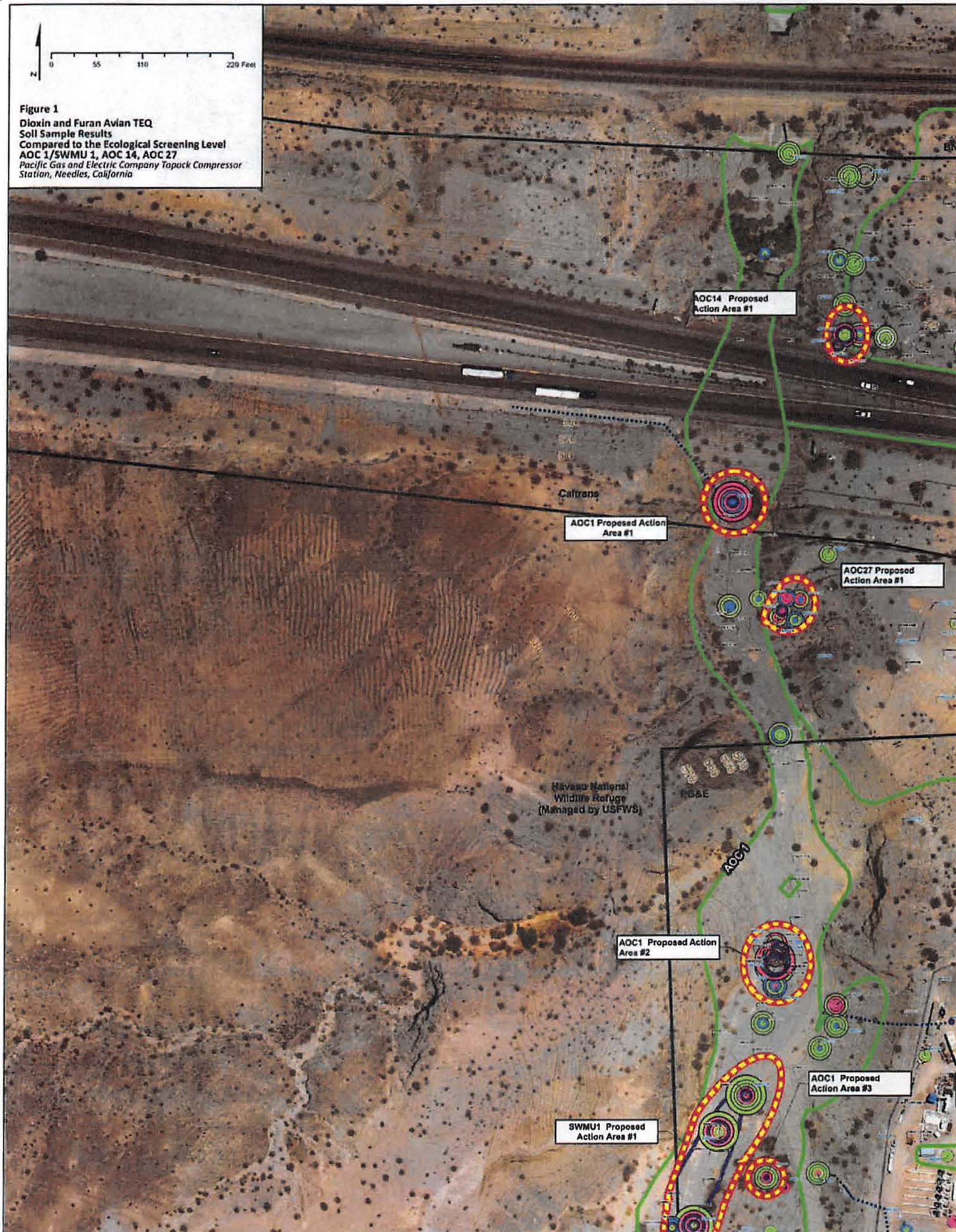
Approve: ________________________ Date: 10/18/18

Disapprove: ________________________ Date: ______________

U.S. Fish and Wildlife Service

Approve: Richard Meyers Date: 10/16/2018

Disapprove: ________________________ Date: ______________



N
0
55
110
220 Feet
Figure 1
Dioxin and Furan Avian TEQ
Soil Sample Results
Compared to the Ecological Screening Level
AOC 1/SWMU 1, AOC 14, AOC 27
Pacific Gas and Electric Company Topock Compressor Station, Needles, California
AOC14 Proposed Action Area #1
Caltrans
AOC1 Proposed Action Area #1
AOC27 Proposed Action Area #1
Havasu National Wildlife Refuge (Managed by USFWS)
PG&E
AOC1
AOC1 Proposed Action Area #2
AOC1 Proposed Action Area #3
SWMU1 Proposed Action Area #1

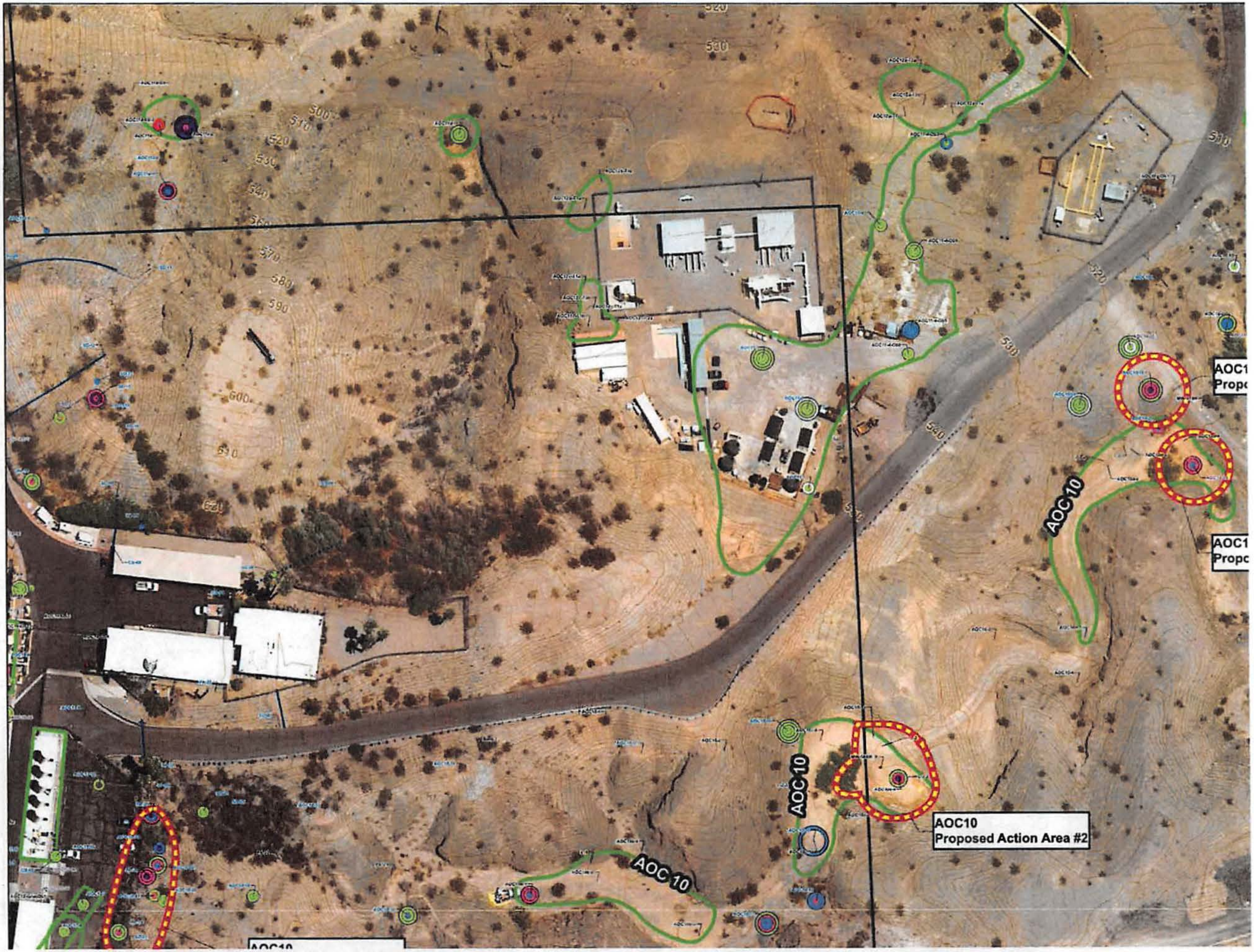

AOC10
Proposed Action Area #2
AOC 10
AOC 10
AOC 10
510
520
530
540
570
580
590
600
610
620

TABLE 1

Proposed Action Areas, AOC 1 and SWMU 1

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

		Chromium, Total			TEQ Avian		TEQ Human			TEQ Mammals		
Screening Level Type			BKG	ECV		ECV		RES	COM		BKG	ECV
Screening Level Value [a]			39.80	36.3		16		50	200		5.58	1.6
Location [b]	**Depth (feet bgs)**	**Result (mg/kg)**	**Factor of Exceedance**		**Result (ng/kg)**	**Factor of Exceedance**	**Result (ng/kg)**	**Factor of Exceedance**		**Result (ng/kg)**	**Factor of Exceedance**	
AOC 1 Potential Action Area #1												
AOC1-T5b	0 - 0.5	26										
	2 - 3	41	*1*	*1*								
	5 - 6	61	*2*	*2*								
AOC1-T5D	0 - 1	23			7.4		10			10	*2*	*6*
	2 - 3	69	*2*	*2*	600	*38*	1100	*22*	*5.5*	1100	*197*	*688*
	5 - 6	80	*2*	*2*	58	*4*	92	*2*		92	*16*	*58*
	9 - 10	23			15		21			21	*4*	*13*
Samples Exceeding SL (%)		-	50%	50%	-	50%	-	50%	25%	-	100%	100%
Total # of Samples		8			4		4			4		

TABLE 1

Proposed Action Areas, AOC 1 and SWMU 1

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

		Chromium, Total			TEQ Avian		TEQ Human			TEQ Mammals		
Screening Level Type			BKG	ECV		ECV		RES	COM		BKG	ECV
Screening Level Value [a]			39.80	36.3		16		50	200		5.58	1.6
Location [b]	Depth (feet bgs)	Result (mg/kg)	Factor of Exceedance		Result (ng/kg)	Factor of Exceedance	Result (ng/kg)	Factor of Exceedance		Result (ng/kg)	Factor of Exceedance	
AOC 1 Proposed Action Area #2												
AOC1-T2b	0 - 0.5	26										
	2 - 3	26										
	5 - 6	53	*1*	*1*								
	9 - 10	18										
AOC1-T2d	0 - 0.5	46	*1*	*1*								
	2 - 3	970	*24*	*27*								
	5 - 6	370	*9*	*10*								
	9 - 10	140	*4*	*4*								
AOC1-T2g	9 - 10	2100	*53*	*58*	89	*6*	130	*3*		130	*23*	*81*
AOC1-T2h	0 - 1	100	*3*	*3*	21	*1*	34			34	*6*	*21*
	2 - 3	24			12		19			19	*3*	*12*
	5 - 6	200	*5*	*6*	1.2		1.9			1.9		*1*
	9 - 10	28			16		21			21	*4*	*13*
AOC1-T2i	0 - 1	28			15		25			25	*4*	*16*
	2 - 3	25			7.9		14			14	*3*	*9*
	5 - 6	16			0.75		0.91			0.91		
	9 - 10	40	*1*	*1*	20	*1*	32			32	*6*	*20*
AOC1-T2j	0 - 1	31			2.2		4.8			4.8		*3*
	2 - 3	21			8.6		13			13	*2*	*8*
	5 - 6	18			3.6		4.8			4.8		*3*
	9 - 10	16			0.65		0.71			0.71		
Old Well-BCW-1	7 - 8	4200	*106*	*116*	250	*16*	350	*7*	*1.75*	350	*63*	*219*
Old Well-BCW-2	4 - 5	4400	*111*	*121*	100	*6*	230	*5*	*1.15*	230	*41*	*144*
TCS4-E	4 - 5	3400	*85*	*94*	600	*38*	870	*17*	*4.35*	870	*156*	*544*
	5 - 6	13			3		4.6			4.6		*3*
TCS4-N	4 - 5	3400	*85*	*94*	74	*5*	110	*2*		110	*20*	*69*
	5 - 6	3300	*83*	*91*	150	*9*	210	*4*	*1.05*	210	*38*	*131*
TCS4-S	4 - 5	840	*21*	*23*	130	*8*	180	*4*		180	*32*	*113*
	5 - 6	2200	*55*	*61*	34	*2*	47			47	*8*	*29*
Samples Exceeding SL (%)		-	48%	48%	-	48%	-	33%	19%	-	71%	90%
Total # of Samples		33			21		21			21		

TABLE 1

Proposed Action Areas, AOC 1 and SWMU 1

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

		Chromium, Total			TEQ Avian		TEQ Human			TEQ Mammals		
Screening Level Type			BXG	ECV		ECV		RES	COM		BXG	ECV
Screening Level Value [a]			39.80	36.3		16		50	200		5.58	1.6
Location [b]	**Depth (feet bgs)**	**Result (mg/kg)**	**Factor of Exceedance**		**Result (ng/kg)**	**Factor of Exceedance**	**Result (ng/kg)**	**Factor of Exceedance**		**Result (ng/kg)**	**Factor of Exceedance**	
SWMU 1 Proposed Action Area #1												
SSB-4	3	1520	*38*	*42*								
	1	10.1										
	10	201	*5*	*6*								
	6	297	*7*	*8*								
SSB-5	3	1440	*36*	*40*								
	1	521	*13*	*14*								
	10	31.6										
	6	617	*16*	*17*								
SWMU1-1	0 - 0.5	44	*1*	*1*								
	2 - 3	67	*2*	*2*								
	5 - 6	3200	*80*	*88*								
	9 - 10	55	*1*	*2*								
SWMU1-11	0 - 0.5	200	*5*	*6*								
	2 - 3	840	*21*	*23*								
SWMU1-19	0 - 1	1400	*35*	*39*	3		3.9			3.9		*2*
	2 - 3	23			850	*53*	1100	*22*	*5.5*	1100	*197*	*688*
	5 - 6	680	*17*	*19*	25	*2*	41			41	*7*	*26*
	9 - 10	2100	*53*	*58*	170	*11*	210	*4*	*1.05*	210	*38*	*131*
SWMU1-2	0 - 0.5	26										
	2 - 3	36										
	5 - 6	44	*1*	*1*								
	9 - 10	2000	*50*	*55*								
SWMU1-20	1 - 1.5				3.4		5.5			5.5		*3*
	2 - 3				2.8		3.7			3.7		*2*
	5 - 6				78	*5*	110	*2*		110	*20*	*69*
	9 - 10				780	*49*	950	*19*	*4.75*	950	*170*	*594*
SWMU1-21	0 - 1				65	*4*	190	*4*		190	*34*	*119*
	2 - 3				580	*36*	870	*17*	*4.35*	870	*156*	*544*
	5 - 6				23	*1*	41			41	*7*	*26*
	9 - 10				0.57		1.8			1.8		*1*

TABLE 1

Proposed Action Areas, AOC 1 and SWMU 1

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

		Chromium, Total			TEQ Avian		TEQ Human			TEQ Mammals		
Screening Level Type			BKG	ECV		ECV		RES	COM		BKG	ECV
Screening Level Value [a]			39.80	36.3		16		50	200		5.58	1.6
Location [b]	Depth (feet bgs)	Result (mg/kg)	Factor of Exceedance		Result (ng/kg)	Factor of Exceedance	Result (ng/kg)	Factor of Exceedance		Result (ng/kg)	Factor of Exceedance	
SWMU 1 Proposed Action Area #1 (Continued)												
SWMU1-25	0 - 1	2000	*50*	*55*	11000	*688*	12000	*240*	*60*	12000	*2151*	*7500*
	2 - 3	450	*11*	*12*	5.4		9.9			9.9	*2*	*6*
	5 - 6	200	*5*	*6*	4.2		6.4			6.4	*1*	*4*
	9 - 10	17			1.9		2.6			2.6		*2*
SWMU1-29	0 - 0.5	19			5		7.8			7.8	*1*	*5*
	2 - 3	1100	*28*	*30*	250	*16*	320	*6*	*1.6*	320	*57*	*200*
	5 - 6	270	*7*	*7*	15		19			19	*3*	*12*
	9 - 10	98	*2*	*3*	9.3		15			15	*3*	*9*
SWMU1-3	0 - 0.5	28										
	2 - 3	41	*1*	*1*								
	5 - 6	1300	*33*	*36*								
	9 - 10	96	*2*	*3*								
SWMU1-4	0 - 0.5	17										
	2 - 3	870	*22*	*24*								
	5 - 6	100	*3*	*3*								
	7 - 8	40	*1*	*1*								
SWMU1-5	9 - 10	47	*1*	*1*								
SWMU1-6	0 - 0.5	220	*6*	*6*								
	2 - 3	270	*7*	*7*								
SWMU1-7	0 - 0.5	27										
	2 - 3	630	*16*	*17*								
	5 - 6	330	*8*	*9*								
	9 - 10	51	*1*	*1*								
SWMU1-8	0 - 0.5	120	*3*	*3*								
	2 - 3	970	*24*	*27*								
	5 - 6	1600	*40*	*44*								
	9 - 10	15										
Samples Exceeding SL (%)		-	70%	70%	-	50%	-	40%	30%	-	75%	100%
Total # of Samples		54			20		20			20		

TABLE 1

Proposed Action Areas, AOC 1 and SWMU 1

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

		Chromium, Total			TEQ Avian		TEQ Human			TEQ Mammals		
Screening Level Type			**BKG**	**ECV**		**ECV**		**RES**	**COM**		**BKG**	**ECV**
Screening Level Value [a]			39.80	36.3		16		50	200		5.58	1.6
Location [b]	**Depth (feet bgs)**	**Result (mg/kg)**	**Factor of Exceedance**		**Result (ng/kg)**	**Factor of Exceedance**	**Result (ng/kg)**	**Factor of Exceedance**		**Result (ng/kg)**	**Factor of Exceedance**	
AOC 1 Proposed Action Area #3												
AOC1-3	0 - 0.5	410	*10*	*11*	250	*16*	330	*7*	*1.65*	330	*59*	*206*
	2 - 3	210	*5*	*6*	130	*8*	180	*4*		180	*32*	*113*
Samples Exceeding SL (%)		-	100%	100%	-	100%	-	100%	50%	-	100%	100%
Total # of Samples		2			2		2			2		

[a] Screening levels are presented in the same units shown for the results.

[b] For simplicity, some locations/depths without exceedances are not shown. The number of samples reflects the full dataset.

bgs = below ground surface

BKG = Background Level

COM = Commercial Screening Level

ECV = Ecological Screening Level

FoE = Factor of exceedance

RES = Residential Screening Level

SL = Screening level

TEQ = toxicity equivalent

mg/kg = milligrams per kilogram

ng/kg = nanograms per kilogram

TABLE 2

Proposed Action Areas, AOC 10

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

		Chromium, Total			Copper					Lead					Mercury				TEQ Avian		TEQ Human			TEQ Mammals		
Screening Level Type			BKG	ECV		BKG	ECV	RES	COM		BKG	ECV	RES	COM		ECV	RES	COM		ECV		RES	COM		BKG	ECV
Screening Level Value [a]			39.80	36.3		16.8	20.6	3100	47000		8.39	0.0166	80	320		0.0125	1	4.5		16		50	200		5.58	1.6
Location	Depth (feet bgs)	Result (mg/kg)	Factor of Exceedance		Result (mg/kg)	Factor of Exceedance				Result (mg/kg)	Factor of Exceedance				Result (mg/kg)	Factor of Exceedance			Result (ng/kg)	Factor of Exceedance	Result (ng/kg)	Factor of Exceedance		Result (ng/kg)	Factor of Exceedance	
AOC 10 Proposed Action Area #1																										
AOC10-21	0 - 0.5	270	*7*	*7*	3100	*185*	*150*			920	*110*	*55422*	*12*	*3*	35	*2800*	*35*	*8*	33	*2*	53	*1*		53	*9*	*33*
	2 - 3	8.1			5					2.9		*175*			0.099				0.33		0.22			0.22		
AOC10-23	0 - 1	72	*2*	*2*	140	*8*	*7*			30	*4*	*1807*			0.24	*19*			440	*28*	1100	*22*	*6*	1100	*197*	*688*
	1 - 2	130	*3*	*4*	22	*1*	*1*			22	*3*	*1325*			0.1				6.3		8.8			8.8	*2*	*6*
	2 - 3	5.5			4.2					2.2		*133*			0.1				9.7		17			17	*3*	*11*
PA-19	0 - 1	34			160	*10*	*8*			30	*4*	*1807*			0.12				150	*9*	220	*4*	*1*	220	*39*	*138*
	2 - 3																		0.95		0.62			0.62		
	5 - 6																		1.5		0.89			0.89		
PA-20	0 - 1	33			11					23	*3*	*1386*			0.1				1100	*69*	1600	*32*	*8*	1600	*287*	*1000*
	2 - 3																		27	*2*	53	*1*		53	*9*	*33*
	5 - 6																		63	*4*	130	*3*		130	*23*	*81*
PA-21	0 - 1	49			26	*2*	*1*			32	*4*	*1928*			0.1				320	*20*	580	*12*	*3*	580	*104*	*363*
	2 - 3																		9.5		14			14	*3*	*9*
	5 -6																		38	*2*	73	*1*		73	*13*	*46*
SD-04	0 - 1	10			5.1					2.7		*163*			0.1											
	2 - 3	8			4.4					2.5		*151*			0.1											
Samples Exceeding SL (%)		-	30%	30%	-	50%	50%	0%	0%	-	60%	100%	10%	10%	-	20%	10%	10%	-	57%	-	57%	29%	-	79%	79%
Total # of Samples		10			10					10					10				14		14			14		
AOC 10 Proposed Action Area #2																										
AOC10c-4	0 - 0.5	120	*3*	*3*	46	*3*	*2*			36	4	*2169*			0.1				220	*14*	360	*7*	*2*	360	*65*	*225*
	2 - 3	90	*2*	*2*	19	*1*				8.9	1	*536*			0.1				44	*3*	66	*1*		66	*12*	*41*
	5 - 6	27			14					2.6		*157*			0.1				2.3		3.1			3.1		*2*
	9 - 10	92	*2*	*3*	25	*1*	*1*			13	2	*783*			0.1											
L-2	2	3360	*84*	*93*	211	*13*	*10*																			
	0	86.8	*2*	*2*	42.7	*3*	*2*																			
L-2-3	- 2	2740	*69*	*75*	288	*17*	*14*																			
MW-S88R_S	1.5 - 2	4000	*101*	*110*	300	*18*	*15*			160	19	*9639*	*2*		0.33	*26*										
Samples Exceeding SL (%)		-	88%	88%	-	88%	75%	0%	0%	-	80%	100%	20%	0%	-	20%	0%	0%	-	67%	-	67%	33%	-	67%	100%
Total # of Samples		8			8					5					5				3		3			3		
AOC 10 Proposed Action Area #3																										
AOC10-15	0 - 1	70	*2*	*2*	27	*2*	*1*			21	3	*1265*			0.1				180	*11*	290	*6*	*1*	290	*52*	*181*
	2 - 3	41	*1*	*1*	22	*1*	*1*			17	2	*1024*			0.1				74	*5*	110	*2*		110	*20*	*69*
	5 - 6	33			14					7.6		*458*			0.1				49	*3*	77	*2*		77	*14*	*48*
	9 - 10	17			11					1.5		*90*			0.1				3.2		2.9			2.9		*2*
Samples Exceeding SL (%)		-	50%	50%	-	50%	50%	0%	0%	-	50%	100%	0%	0%	-	0%	0%	0%	-	75%	-	75%	25%	-	75%	100%
Total # of Samples		4			4					4					4				4		4			4		
AOC 10 Proposed Action Area #4																										
AOC10-26	0 - 0.5																		7.8		9.5			9.5	*2*	*6*
	2 - 3																		140	*9*	180	*4*		180	*32*	*113*
	2.5 - 2.7	340	*9*	*9*	40	*2*	*2*			18	2	*1084*			0.15	*12*			300	*19*	410	*8*	*2*	410	*73*	*256*
	4.5 - 5																		86	*5*	100	*2*		100	*18*	*63*
AOC10d-4	0 - 0.5	29			25	*1*	*1*			25	3	*1506*			0.1											
	2 - 3	130	*3*	*4*	27	*2*	*1*			26	3	*1566*			0.11											
	5 - 6	66	*2*	*2*	21	*1*	*1*			17	2	*1024*			0.1											
	9 - 10	32			16					5.2		*313*			0.1											
Samples Exceeding SL (%)		-	60%	60%	-	80%	80%	0%	0%	-	80%	100%	0%	0%	-	20%	0%	0%	-	75%	-	75%	25%	-	100%	100%
Total # of Samples		5			5					5					5				4		4			4		

TABLE 2

Proposed Action Areas, AOC 10

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

		Chromium, Total			Copper					Lead				
Screening Level Type			BKG	ECV		BKG	ECV	RES	COM		BKG	ECV	RES	COM
Screening Level Value *			39.80	36.3		16.8	20.6	3100	47000		8.39	0.0166	80	320
Location	**Depth (feet bgs)**	**Result (mg/kg)**	**Factor of Exceedance**		**Result (mg/kg)**	**Factor of Exceedance**				**Result (mg/kg)**	**Factor of Exceedance**			
AOC 10 Proposed Action Area #3														
AOC10c-3	0 - 0.5	110	*3*	*3*	42	*3*	*2*			32	4	*1928*		
	2 - 3	690	*17*	*19*	60	*4*	*3*			31	4	*1867*		
	5 - 6	29			9					4.5		*271*		
	9 - 10	22			11					2.7		*163*		
Samples Exceeding SL (%)		-	50%	50%	-	50%	50%	0%	0%	-	50%	100%	0%	0%
Total # of Samples		4			4					4				

		Mercury				TEQ Avian		TEQ Human			TEQ Mammals		
Screening Level Type			ECV	RES	COM		ECV		RES	COM		BKG	ECV
Screening Level Value *			0.0125	1	4.5		16		50	200		5.58	1.6
Location	**Depth (feet bgs)**	**Result (mg/kg)**	**Factor of Exceedance**			**Result (ng/kg)**	**Factor of Exceedance**	**Result (ng/kg)**	**Factor of Exceedance**		**Result (ng/kg)**	**Factor of Exceedance**	
AOC 10 Proposed Action Area #3													
AOC10c-3	0 - 0.5	0.1											
	2 - 3	0.1											
	5 - 6	0.1											
	9 - 10	0.1											
Samples Exceeding SL (%)		-	0%	0%	0%	-	#DIV/0!	-	#DIV/0!	#DIV/0!	-	#DIV/0!	#DIV/0!
Total # of Samples		4				0		0			0		

* Screening levels are presented in the same units shown for the results.

bgs = below ground surface

BKG = Background Level

COM = Commercial Screening Level

ECV = Ecological Screening Level

FoE = Factor of exceedance

RES = Residential Screening Level

SL = Screening level

TEQ = toxicity equivalent

mg/kg = milligrams per kilogram

ng/kg = nanograms per kilogram

TABLE 3

Proposed Action Area, AOC 14

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

		Lead					TEQ Avian		TEQ Human			TEQ Mammals		
Screening Level Type			BKG	ECV	RES	COM		ECV		RES	COM		BKG	ECV
Screening Level Value [a]			8.39	0.0166	80	320		16		50	200		5.58	1.6
Location	Depth (feet bgs)	Result (mg/kg)	Factor of Exceedance				Result (ng/kg)	Factor of Exceedance	Result (ng/kg)	Factor of Exceedance		Result (ng/kg)	Factor of Exceedance	
AOC 14 Proposed Action Area #1														
AOC14-14E	0 - 1	7.2		*434*			2.6		4.6			4.6		*3*
	2 - 3	3.5		*211*			7.4		14			14	*3*	*9*
	5 - 5.5	2.1		*127*			21	*1*	32			32	*6*	*20*
	6 - 7	2.1		*127*			1.8		2.5			2.5		*2*
	9 - 10	2.6		*157*			3.5		6.6			6.6	*1*	*4*
AOC14-14W	0 - 1	15	*2*	*904*			2.5		3.5			3.5		*2*
	2 - 3	3.4		*205*			1.1		1.1			1.1		
	5 - 5.5	160	*19*	*9639*	*2*		780	*49*	480	*10*	*2*	480	*86*	*300*
	6 - 7	70	*8*	*4217*			33	*2*	27			27	*5*	*17*
	9 - 10	2.6		*157*			3.4		6			6	*1*	*4*
AOC14-19	2 - 3	1600	*191*	*96386*	*20*	*5*	210	*13*	140	*3*		140	*25*	*88*
	3 - 4	6.3		*380*			1.3		1.2			1.2		
Samples Exceeding SL (%)		-	33%	100%	17%	8%	-	33%	-	17%	8%	-	58%	83%
Total # of Samples		12					12		12			12		

[a] Screening levels are presented in the same units shown for the results.

bgs = below ground surface

BKG = Background Level

COM = Commercial Screening Level

ECV = Ecological Screening Level

FoE = Factor of exceedance

RES = Residential Screening Level

SL = Screening level

TEQ = toxicity equivalent

mg/kg = milligrams per kilogram

ng/kg = nanograms per kilogram

TABLE 4

Proposed Action Area, AOC 27

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

		Copper					Lead					Mercury			
Screening Level Type			BKG	ECV	RES	COM		BKG	ECV	RES	COM		ECV	RES	COM
Screening Level Value *			16.8	20.6	3100	47000		8.39	0.0166	80	320		0.0125	1	4.5
Location	**Depth (feet bgs)**	**Result (mg/kg)**	**Factor of Exceedance**				**Result (mg/kg)**	**Factor of Exceedance**				**Result (mg/kg)**	**Factor of Exceedance**		
AOC 27 Proposed Action Area #1															
AOC27-20	0 - 1	9.2					8.4	*1*	*506*			0.1			
	2 - 3	9.7					4.6		*277*			0.1			
	5 - 6	27	*2*	*1*			15	*2*	*904*			0.13	*10*		
	9 - 10	11					2.7		*163*			0.1			
AOC27-50	0 - 1	25	*1*	*1*			73	*9*	*4398*			0.13	*10*		
	2 - 3	100	*6*	*5*			190	*23*	*11446*	*2*		0.47	*38*		
	5 - 6	7.9					2.1		*127*			0.13	*10*		
	9 - 10	9.1					2.1		*127*			0.12	*10*		
AOC27-6	0 - 1	500	*30*	*24*			630	*75*	*37952*	*8*	*2*	0.51	*41*		
	2 - 3	76	*5*	*4*			37	*4*	*2229*			0.26	*21*		
	5 - 6	18	*1*				51	*6*	*3072*			0.14	*11*		
AOC27-7	0 - 1	580	*35*	*28*			170	*20*	*10241*	*2*		0.32	*26*		
	2 - 3	1000	*60*	*49*			570	*68*	*34337*	*7*	*2*	0.95	*76*		
	5 - 6	9.8					2.6		*157*			0.1			
AOC27-8	1 - 2	29	*2*	*1*			24	*3*	*1446*			0.17	*14*		
	5 - 6	15					6.1		*367*			0.1			
Samples Exceeding SL (%)		-	56%	50%	0%	0%	-	63%	100%	25%	13%	-	69%	0%	0%
Total # of Samples		16					16					16			

		Zinc					TEQ Avian		TEQ Human			TEQ Mammals		
Screening Level Type			BKG	ECV	RES	COM		ECV		RES	COM		BKG	ECV
Screening Level Value *			58	0.164	23000	350000		16		50	200		5.58	1.6
Location	**Depth (feet bgs)**	**Result (mg/kg)**	**Factor of Exceedance**				**Result (ng/kg)**	**Factor of Exceedance**	**Result (ng/kg)**	**Factor of Exceedance**		**Result (ng/kg)**	**Factor of Exceedance**	
AOC 27 Proposed Action Area #1														
AOC27-20	0 - 1	38		*232*			13		19			19	*3*	*12*
	2 - 3	42		*256*			4		5.8			5.8	*1*	*4*
	5 - 6	74	*1*	*451*			8		10			10	*2*	*6*
	9 - 10	41		*250*										
AOC27-50	0 - 1	250	*4*	*1524*			13		12			12	*2*	*8*
	2 - 3	330	*6*	*2012*			59	*4*	57	*1*		57	*10*	*36*
	5 - 6	39		*238*			0.5		0.41			0.41		
	9 - 10	38		*232*										
AOC27-6	0 - 1	700	*12*	*4268*			120	*8*	120	*2*		120	*22*	*75*
	2 - 3	130	*2*	*793*			32	*2*	32			32	*6*	*20*
	5 - 6	92	*2*	*561*			6.2		6.9			6.9	*1*	*4*
AOC27-7	0 - 1	420	*7*	*2561*			110	*7*	110	*2*		110	*20*	*69*
	2 - 3	1300	*22*	*7927*			260	*16*	230	*5*	*1*	230	*41*	*144*
	5 - 6	38		*232*			4.1		4.3			4.3		*3*
AOC27-8	1 - 2	93	*2*	*567*			36	*2*	33			33	*6*	*21*
	5 - 6	45		*274*			2.9		2.8			2.8		*2*
Samples Exceeding SL (%)		-	56%	100%	0%	0%	-	43%	-	29%	7%	-	79%	93%
Total # of Samples		16					14		14			14		

* Screening levels are presented in the same units shown for the results.

bgs = below ground surface

BKG = Background Level

COM = Commercial Screening Level

ECV = Ecological Screening Level

FoE = Factor of exceedance

RES = Residential Screening Level

SL = Screening level

TEQ = toxicity equivalent

mg/kg = milligrams per kilogram

ng/kg = nanograms per kilogram

Appendix B
Nature and Extent of Contamination

TABLE B-1a
Sample Results: Metals
SWMU 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
Category 1																					
MW-09	06/30/97	1	N	---	---	---	---	---	ND (0.05)	15	---	7.2	---	---	---	7.6	---	---	---	---	19.7
	06/30/97	3.5	N	---	---	---	---	---	0.06	4.1	---	3.1	---	---	---	3.6	---	---	---	---	11.8
	06/30/97	3.5	FD	---	---	---	---	---	0.21	7.6	---	3.5	---	---	---	3.7	---	---	---	---	12.6
	06/30/97	6	N	---	---	---	---	---	ND (0.05)	11.8	---	6.4	---	---	---	7.7	---	---	---	---	21
	07/01/97	10	N	---	---	91		---	ND (0.05)	42.2	---	6.8	2.7	---	ND (0.2)	9.7	---	---	---	21.8	29
	06/30/97	20	N	---	---	---	---	---	ND (0.05)	9	---	7.1	---	---	---	9.1	---	---	---	---	21.7
	07/01/97	30	N	---	---	28.8	---	---	ND (0.05)	16.3	---	12.4	3.9	---	ND (0.2)	15.3	---	---	---	31	29.4
	06/30/97	40	N	---	---	---	---	---	ND (0.05)	9.7	---	7.5	---	---	---	9	---	---	---	---	22.5
	07/01/97	50	N	---	---	83.8	---	---	ND (0.05)	11.7	---	14.7	3.2	---	ND (0.2)	11.3	---	---	---	20.3	23.3
	06/30/97	60	N	---	---	---	---	---	ND (0.05)	28.8	---	17.4	---	---	---	20.2	---	---	---	---	34.4
	06/30/97	70	N	---	---	---	---	---	ND (0.05)	8.9	---	10	---	---	---	10.2	---	---	---	---	19
	07/01/97	87	N	---	---	94		---	ND (0.05)	9.8	---	10.2	8.4	---	ND (0.2)	11.6	---	---	---	33	126
	07/01/97	87	FD	---	---	---	---	---	0.06	11.9	---	11.4	---	---	---	11.7	---	---	---	---	121
SWMU1-1	10/16/08	0 - 0.5	N	ND (2.4) J*	3.5	120	ND (1.2) *	ND (1.2) *	0.524	44	11	12	4.2	ND (0.12) *	ND (1.2)	16	ND (1.2)	ND (1.2)	ND (2.4) *	38	41
	10/16/08	2 - 3	N	ND (2.1) *	3	110	ND (1) *	ND (1)	0.462	67	7.5	9.4	3	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	32	37
	10/16/08	5 - 6	N	ND (2.1) *	ND (1)	94	ND (1) *	ND (1)	14.1	3,200	7.3	9.5	4.5	ND (0.1) *	7.8	12	ND (1)	ND (1)	ND (2.1) *	45	76
	10/16/08	9 - 10	N	ND (2.1) *	2.2	83	ND (1) *	ND (1)	0.907	55	6.9	8.6	1.7	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2.1) *	27	89
SWMU1-2	10/15/08	0 - 0.5	N	ND (2) *	4.7	110	ND (1) *	ND (1)	ND (0.401)	26	7.3	22	6.5	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	35	37
	10/15/08	2 - 3	N	ND (2) *	2.6	110	ND (1) *	ND (1)	ND (0.404)	36	9.3	10	3.7	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2) *	33	38
	10/15/08	5 - 6	N	ND (2) *	3.2	120	ND (1) *	ND (1)	ND (0.404)	44	8.9	12	6.1	ND (0.1) *	3	16	ND (1)	ND (1)	ND (2) *	33	38
	10/15/08	9 - 10	N	ND (2.1) *	ND (1)	130	ND (1) *	ND (1)	22.8	2,000	10	15	4	ND (0.1) *	2.8	16	ND (1)	ND (1)	ND (2.1) *	41	100
SWMU1-3	10/06/08	0 - 0.5	N	ND (2) *	2.7	94	ND (1) *	ND (1)	ND (0.405)	28	9.9	11	3.9	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2) *	37	33
	10/06/08	2 - 3	N	ND (2.1) *	2.5	130	ND (1) *	ND (1)	ND (0.413)	41	9.2	9.4	2.3	ND (0.1) *	1.5	16	ND (1)	ND (1)	ND (2.1) *	35	38
	10/06/08	2 - 3	FD	ND (2) *	2.8	120	ND (1) *	ND (1)	ND (0.41)	38	8.6	9	2.9	ND (0.1) *	1.4	14	ND (1)	ND (1)	ND (2) *	34	37
	10/06/08	5 - 6	N	ND (2.1) *	ND (1)	140	ND (1) *	ND (1)	22.7	1,300	8.9	11	3.8	ND (0.1) *	4.2	12	ND (1)	ND (1)	ND (2.1) *	37	78
	10/06/08	9 - 10	N	ND (2.1) *	3	60	ND (1) *	ND (1)	1.55 J	96	9.4	11	2.7	ND (0.11) *	ND (1)	18	ND (1)	ND (1)	ND (2.1) *	32	140
	10/06/08	19 - 20	N	ND (2.1) *	5.6	250	ND (2.1) *	ND (1)	ND (0.416)	20	9.1	10	2.9	ND (0.1) *	ND (2.1) *	13	ND (1)	ND (2.1)	ND (4.1) *	34	39
	10/06/08	29 - 30	N	ND (2.1) *	10	59	ND (5.3) *	ND (1.1) *	ND (0.424)	21	8.8	15	2.4	ND (0.1) *	ND (5.3) *	16	ND (1.1)	ND (5.3) *	ND (11) *	32	38
	10/06/08	39 - 40	N	ND (2.1) *	5.3	45	ND (2.1) *	ND (1)	ND (0.424)	22	8.6	8.5	2.7	ND (0.1) *	ND (2.1) *	14	ND (1)	ND (2.1)	ND (4.2) *	31	35
	10/06/08	49 - 50	N	ND (2.1) *	5.6	63	ND (2.1) *	ND (1.1) *	ND (0.405)	25	9.8	12	3.2	ND (0.11) *	ND (2.1) *	17	ND (1.1)	ND (2.1)	ND (4.3) *	35	39
	10/06/08	59 - 60	N	ND (2.1) *	5.3	99	ND (2.1) *	ND (1)	ND (0.418)	38	9.6	14	3	ND (0.1) *	2.1	20	ND (1)	ND (2.1)	ND (4.1) *	37	36
	10/07/08	69 - 70	N	ND (2.1) *	5.2	64	ND (2.1) *	ND (1)	ND (0.42)	29	9.9	14	2.6	ND (0.1) *	ND (2.1) *	19	ND (1)	ND (2.1)	ND (4.2) *	38	38
	10/07/08	79 - 80	N	ND (2.2) *	6.6	350	ND (2.2) *	ND (1.1) *	ND (0.427)	20	8.3	13	3.1	ND (0.11) *	ND (2.2) *	14	ND (1.1)	ND (2.2)	ND (4.5) *	35	39
	10/07/08	79 - 80	FD	ND (2.3) *	5.1	340	ND (1.1) *	ND (1.1) *	ND (0.441)	21	7.3	15	2.6	ND (0.11) *	1.3	14	ND (1.1)	ND (1.1)	ND (2.3) *	31	34
SWMU1-4	10/15/08	0 - 0.5	N	ND (2) J*	2.9	75	ND (1) *	ND (1)	ND (0.401)	17	5.6	6.8	2.6	ND (0.1) *	ND (1)	9.5	ND (1)	ND (1)	ND (2) *	34	26
	10/15/08	2 - 3	N	ND (2.1) *	ND (1)	130	ND (1) *	ND (1)	4.95	870	7.3	11	3.6	ND (0.1) *	1.7	13	ND (1)	ND (1)	ND (2.1) *	36	72
	10/15/08	5 - 6	N	ND (2.1) *	1.8	100	ND (1) *	ND (1)	1.39	100	7.6	10	1.8	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2.1) *	36	170
	10/15/08	7 - 8	N	ND (2.1) *	2.1	89	ND (1) *	ND (1)	ND (0.415)	40	7.5	7.6	1.6	ND (0.1) *	ND (1)	9.8	ND (1)	ND (1)	ND (2.1) *	31	120
	10/15/08	9 - 10	N	ND (2.1) *	2.1	95	ND (1) *	ND (1)	ND (0.414)	23	7.5	7.9	1.7	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2.1) *	33	110
	10/15/08	13 - 14	N	ND (2.1) *	2.4	110	ND (1) *	ND (1)	ND (0.413)	18	7.4	7.1	1.7	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2.1) *	31	67

TABLE B-1a
Sample Results: Metals
SWMU 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
SWMU1-5	10/15/08	9 - 10	N	ND (2.1) *	2.6	71	ND (1) *	ND (1)	0.874	47	7	8.3	2.1	ND (0.1) *	ND (1)	9.9	ND (1)	ND (1)	ND (2.1) *	28	100
	10/15/08	13 - 14	N	ND (2.1) *	5.4	58	ND (2.1) *	ND (1)	ND (0.42)	21	8.3	7.9	2.8	ND (0.1) *	ND (2.1) *	13	ND (1)	ND (2.1)	ND (4.2) *	30	42
	10/15/08	13 - 14	FD	ND (2.1) *	5.8	48	ND (2.1) *	ND (1)	ND (0.423)	21	8	8	2.9	ND (0.1) *	ND (2.1) *	13	ND (1)	ND (2.1)	ND (4.2) *	31	44
	10/15/08	15 - 16	N	ND (2.1) *	5.4	63	ND (2.1) *	ND (1)	ND (0.414)	21	8.1	9.1	2.8	ND (0.1) *	ND (2.1) *	13	ND (1)	ND (2.1)	ND (4.1) *	31	34
	10/15/08	19 - 20	N	ND (2.1) *	4.3	180	ND (1.1) *	ND (1.1) *	ND (0.423)	19	8.6	11	3.1	ND (0.11) *	1.5	12	ND (1.1)	ND (1.1)	ND (2.1) *	32	37
SWMU1-6	10/15/08	0 - 0.5	N	ND (2) *	2.4	110	ND (1) *	ND (1)	1.32	220	8.8	11	3.3	ND (0.1) *	1.2	12	ND (1)	ND (1)	ND (2) *	41	42
	10/15/08	2 - 3	N	ND (2) *	2.1	95	ND (1) *	ND (1)	2.15	270	8.1	12	2.6	ND (0.1) *	1.9	13	ND (1)	ND (1)	ND (2) *	39	46
	10/15/08	5 - 6	N	ND (2) *	2.6	81	ND (1) *	ND (1)	ND (0.405)	32	7.7	10	2.6	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	34	29
	10/15/08	9 - 10	N	ND (2) *	2.4	79	ND (1) *	ND (1)	0.531	33	8.3	8.6	1.7	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	33	88
SWMU1-7	10/15/08	0 - 0.5	N	ND (2) *	3.3	98	ND (1) *	ND (1)	ND (0.403)	27	8.7	13	6.6	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2) *	37	38
	10/15/08	2 - 3	N	ND (2) *	ND (1)	97	ND (1) *	ND (1)	6.45	630	9	14	3.6	ND (0.1) *	1.7	15	ND (1)	ND (1)	ND (2) *	36	130
	10/15/08	5 - 6	N	ND (2.1) *	1.2	100	ND (1) *	ND (1)	5.3	330	8.1	20	2.8	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	35	190
	10/15/08	9 - 10	N	ND (2) *	2.4	100	ND (1) *	ND (1)	0.517	51	8.2	9.2	1.9	ND (0.1) *	ND (1)	14 J	ND (1)	ND (1)	ND (2) *	34	150
	10/15/08	9 - 10	FD	ND (2) *	2.4	99	ND (1) *	ND (1)	0.554	47	7.9	8.3	1.6	ND (0.1) *	ND (1)	11 J	ND (1)	ND (1)	ND (2) *	32	150
SWMU1-8	10/15/08	0 - 0.5	N	ND (2) *	2.9	86	ND (1) *	ND (1)	0.618	120	8.2	9.1	4.7	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	38	36
	10/15/08	2 - 3	N	ND (2.1) *	1.5	100	ND (1) *	ND (1)	22.3	970	8.2	11	3.5	ND (0.1) *	2.2	14	ND (1)	ND (1)	ND (2.1) *	36	160
	10/15/08	5 - 6	N	ND (2.1) *	ND (1)	120	ND (1) *	ND (1)	9.25	1,600	9.2	22	3.3	ND (0.1) *	3.2	16	ND (1)	ND (1)	ND (2.1) *	46	120
	10/15/08	9 - 10	N	ND (2.2) *	3.9	39	ND (1.1) *	ND (1.1) *	ND (0.433)	15	7	7.1	2.8	ND (0.11) *	ND (1.1)	11	ND (1.1)	ND (1.1)	ND (2.2) *	28	32
SWMU1-9	10/14/08	0 - 0.5	N	ND (2.1) *	2.9	110	ND (1) *	ND (1)	0.697	87	8.7	10	2.9	ND (0.11) *	1.4	16	ND (1)	ND (1)	ND (2.1) *	36	37
	10/14/08	2 - 3	N	ND (2.1) *	5.6	140	ND (1) *	ND (1)	ND (0.42)	13	4.5	5.9	5	ND (0.11) *	ND (1)	8.6	ND (1)	ND (1)	ND (2.1) *	21	26
	10/14/08	5 - 6	N	ND (2.1) *	5.8	45	ND (2.1) *	ND (1)	ND (0.417)	26	8.9	8.1	3.1	ND (0.1) *	ND (2.1) *	15	ND (1)	ND (2.1)	ND (4.1) *	34	39
	10/14/08	9 - 10	N	ND (2.1) *	4.3	150	ND (1.1) *	ND (1.1) *	ND (0.425)	22	9	11	3.2	ND (0.1) *	ND (1.1)	16	ND (1.1)	ND (1.1)	ND (2.1) *	35	38
SWMU1-10	10/14/08	0 - 0.5	N	ND (2) *	2.8	91	ND (1) *	ND (1)	ND (0.401)	19	7.8	11	2.6	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	30	32
	10/14/08	2 - 3	N	ND (2) *	2.5	100	ND (1) *	ND (1)	ND (0.403)	26	8.8	13	2.2	ND (0.1) *	1.8	13	ND (1)	ND (1)	ND (2) *	31	33
	10/14/08	5 - 6	N	ND (2.1) *	3.9	44	ND (1) *	ND (1)	ND (0.413)	21	10	8.4	2.9	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	36	42
	10/14/08	5 - 6	FD	ND (2.1) *	3.4	48	ND (1) *	ND (1)	ND (0.413)	22	9.4	10	2.9	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	36	41
	10/14/08	9 - 10	N	ND (2.1) *	4.9	51	ND (1.1) *	ND (1.1) *	ND (0.431)	25	9.6	15	3.6	ND (0.11) *	ND (1.1)	17	ND (1.1)	ND (1.1)	ND (2.1) *	37	44
SWMU1-11	10/15/08	0 - 0.5	N	ND (2.1) *	3.6	61	ND (1.1) *	ND (1.1) *	1.81	200	8.4	11	3.8	ND (0.11) *	1.2	15	ND (1.1)	ND (1.1)	ND (2.1) *	34	65
	10/15/08	2 - 3	N	ND (2.1) *	2.2	92	ND (1.1) *	ND (1.1) *	8.82	840	8.1	11	4.3	ND (0.11) *	4	13	ND (1.1)	ND (1.1)	ND (2.1) *	34	120
	10/15/08	5 - 6	N	ND (2.1) *	5.7	37	ND (2.1) *	ND (1.1) *	ND (0.431)	34	9.3	12	3.2	ND (0.11) *	ND (2.1) *	16	ND (1.1)	ND (2.1)	ND (4.3) *	35	96
	10/15/08	9 - 10	N	ND (2.1) *	4.7	36	ND (1.1) *	ND (1.1) *	ND (0.432)	22	9	10	3.4	ND (0.11) *	ND (1.1)	15	ND (1.1)	ND (1.1)	ND (2.1) *	35	43
SWMU1-12	10/14/08	0 - 0.5	N	ND (2) *	2.8	100	ND (1) *	ND (1)	ND (0.403)	19	8	8.5	2.7	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	32	31
	10/14/08	2 - 3	N	ND (2) *	4.6	88	ND (2) *	ND (1)	ND (0.406)	24	9.5	11	2.3	ND (0.1) *	ND (2) *	16	ND (1)	ND (2)	ND (4) *	34	37
	10/14/08	5 - 6	N	ND (2) *	5.5	57	ND (2) *	ND (1)	ND (0.412)	20	9.6	13	2.7	ND (0.1) *	ND (2) *	15	ND (1)	ND (2)	ND (4.1) *	35	40
	10/14/08	9 - 10	N	ND (2.1) *	10	42	ND (5.2) *	ND (1)	ND (0.419)	21	9.7	11	3.1	ND (0.1) *	ND (5.2) *	16	ND (1)	ND (5.2) *	ND (10) *	34	41
SWMU1-13	10/14/08	0 - 0.5	N	ND (2) J*	3.3	120	ND (1) *	ND (1)	ND (0.407)	23	7.1	14	5.3	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	33	35
	10/14/08	2 - 3	N	ND (2) *	9.7	160	ND (5.1) *	ND (1)	ND (0.409)	28	9.3	11	3.5	ND (0.1) *	ND (5.1) *	15	ND (1)	ND (5.1)	ND (10) *	36	39
	10/14/08	2 - 3	FD	ND (2) *	9.3	170	ND (5.1) *	ND (1)	ND (0.411)	27	8.7	11	3.5	ND (0.1) *	ND (5.1) *	14	ND (1)	ND (5.1)	ND (10) *	34	39
	10/14/08	5 - 6	N	ND (2.1) *	6.4	85	ND (2.1) *	ND (1)	ND (0.416)	34	11	13	2.8	ND (0.1) *	ND (2.1) *	20	ND (1)	ND (2.1)	ND (4.1) *	40	44
	10/14/08	9 - 10	N	ND (2.1) *	5.7	49	ND (1) *	ND (1)	ND (0.426)	30	12	16	3.5	ND (0.1) *	ND (1)	20	ND (1)	ND (1)	ND (2.1) *	43	45

TABLE B-1a
Sample Results: Metals
SWMU 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
SWMU1-14	10/14/08	0 - 0.5	N	ND (2) *	2.3	96	ND (1) *	ND (1)	ND (0.404)	20	8.8	8.2	2.6	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	33	33
	10/14/08	2 - 3	N	ND (2) *	2.8	120	ND (1) *	ND (1)	ND (0.408)	19	7.9	14	2.3	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	31	33
	10/14/08	5 - 6	N	ND (2) *	5.8	73	ND (2) *	ND (1)	ND (0.413)	28	11	17	3.4	ND (0.1) *	ND (2) *	20	ND (1)	ND (2)	ND (4.1) *	40	42
	10/14/08	9 - 10	N	ND (2.1) *	5.6	67	ND (1) *	ND (1)	ND (0.415)	52	13	35	3.9	ND (0.1) *	ND (1)	32	ND (1)	ND (1)	ND (2.1) *	48	45
SWMU1-15	09/22/08	0 - 0.5	N	ND (2) J*	2.6	130	ND (1) *	ND (1)	1.14	25	8.7	12	4.1	ND (0.1) *	1.9	15	ND (1)	ND (1)	ND (2) *	34	36
	09/22/08	2 - 3	N	ND (2.1) *	2.8	130	ND (1.1) *	ND (1.1) *	ND (0.422)	23	9.3	11	3	ND (0.11) *	1.2	17	ND (1.1)	ND (1.1)	ND (2.1) *	32	34
	09/22/08	5 - 6	N	ND (2.1) *	4.5	100	ND (2.1) *	ND (1.1) *	ND (0.424)	41	12	18	4.5	ND (0.11) *	ND (2.1) *	28	ND (1.1)	ND (2.1)	ND (4.3) *	44	46
	09/22/08	9 - 10	N	ND (2.1) *	4.7	230	ND (2.1) *	ND (1)	ND (0.419)	58	15	24	4.4	ND (0.11) *	ND (2.1) *	43	ND (1)	ND (2.1)	ND (4.1) *	55	50
	09/22/08	9 - 10	FD	ND (2.1) *	5.1	190	ND (2.1) *	ND (1)	ND (0.42)	60	15	23	4.5	ND (0.1) *	ND (2.1) *	44	ND (2.1) *	ND (2.1)	ND (4.1) *	53	50
	09/22/08	19 - 20	N	ND (2.1) *	5.5	81	ND (2.1) *	ND (1.1) *	ND (0.425)	51	14	41	4.5	ND (0.11) *	ND (2.1) *	37	ND (1.1)	ND (2.1)	ND (4.2) *	53	50
	09/22/08	29 - 30	N	ND (2.1) *	7.4	110	ND (5.3) *	ND (1.1) *	ND (0.433)	54	14	23	5.4	ND (0.11) *	ND (5.3) *	39	ND (1.1)	ND (5.3) *	ND (11) *	51	54
	09/22/08	39 - 40	N	ND (2.1) *	4	56	ND (1) *	ND (1)	ND (0.422)	40	12	23	3	ND (0.1) *	ND (1)	27	ND (1)	ND (1)	ND (2.1) *	48	47
	09/22/08	49 - 50	N	ND (2.2) *	6.7	160	ND (2.2) *	ND (1.1) *	ND (0.439)	55	13	25	5.4	ND (0.11) *	ND (2.2) *	39	ND (1.1)	ND (2.2)	ND (4.3) *	57	59
	09/22/08	59 - 60	N	ND (2.1) *	8.4	110	ND (5.3) *	ND (1.1) *	ND (0.449)	47	14	23	3	ND (0.1) *	ND (5.3) *	34	ND (1.1)	ND (5.3) *	ND (11) *	51	49
	09/22/08	59 - 60	FD	ND (2.1) *	5.6	110	ND (2.1) *	ND (1.1) *	ND (0.411)	44	15	24	4.3	ND (0.1) *	ND (2.1) *	31	ND (1.1)	ND (2.1)	ND (4.2) *	52	47
	09/22/08	69 - 70	N	ND (2.1) *	6.1	47	ND (1.1) *	ND (1.1) *	ND (0.43)	39	13	25	3.8	ND (0.11) *	ND (1.1)	27	ND (1.1)	ND (1.1)	ND (2.1) *	42	53
	09/22/08	79 - 80	N	ND (2.1) *	4.4	94	ND (1.1) *	ND (1.1) *	ND (0.43)	28	11	20	3.2	ND (0.11) *	ND (1.1)	19	ND (1.1)	ND (1.1)	ND (2.1) *	38	60
	09/23/08	89 - 90	N	ND (4) *	3.7	560	ND (2) *	ND (2) *	ND (0.4)	6.5	6.2	ND (4)	ND (2)	ND (0.1) *	ND (2) *	7	ND (2) *	ND (2)	ND (4) *	15	21
SWMU1-16	09/21/08	0 - 0.5	N	ND (2) *	2.6	83	ND (1) *	ND (1)	ND (0.405)	10	4.5	5.2	2.3	ND (0.099) *	ND (1)	6.8	ND (1)	ND (1)	ND (2) *	20	21
	09/21/08	2 - 3	N	ND (2) *	1.7	99	ND (1) *	ND (1)	ND (0.408)	18	7.9	8.3	2	ND (0.1) *	1	11	1.1	ND (1)	ND (2) *	32	34
	09/21/08	5 - 6	N	ND (2) *	1.6	110	ND (1) *	ND (1)	ND (0.406)	18	7.8	8.9	2	ND (0.1) *	ND (1)	11	1.6	ND (1)	ND (2) *	32	35
SWMU1-17	09/21/08	0 - 0.5	N	ND (2) *	3.7	210	ND (2) *	ND (1)	ND (0.403)	27	11	16	3.5	ND (0.1) *	ND (2) *	19	ND (2) *	ND (2)	ND (4) *	47	46
	09/21/08	2 - 3	N	ND (2) *	4.3	180	ND (2) *	ND (1)	ND (0.405)	29	10	12	3.9	ND (0.1) *	ND (2) *	20	ND (1)	ND (2)	ND (4) *	40	40
	09/21/08	5 - 6	N	ND (2) *	2.8	130	ND (2) *	ND (1)	ND (0.407)	29	10	12	3.1	ND (0.1) *	2.4	18	ND (1)	ND (2)	ND (4) *	39	44
	09/21/08	9 - 10	N	ND (2) *	3.9	110	ND (2) *	ND (1)	ND (0.408)	43 J	13	26	4.4	ND (0.1) *	ND (2) *	32	ND (2) *	ND (2)	ND (4) *	46	41
	09/21/08	9 - 10	FD	ND (2) *	4.1	110	ND (2) *	ND (1)	ND (0.408)	53 J	14	24	4.7	ND (0.1) *	ND (2) *	37	ND (1)	ND (2)	ND (4) *	51	46
SWMU1-18	01/07/16	0 - 1	N	ND (2.2) *	1.7	93	ND (1.1) *	ND (1.1) *	2.6	16	7.7	7.4	2	0.28	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.2) *	29	30
	01/07/16	2 - 3	N	ND (2.1) *	2.9	150	ND (1.1) *	ND (1.1) *	ND (0.22)	26	9.4	20	2.5	0.27	ND (1.1)	21	ND (1.1)	ND (1.1)	ND (2.1) *	38	40
	01/07/16	5 - 6	N	ND (2.2) *	1.5	83	ND (1.1) *	ND (1.1) *	ND (0.22)	110	7	8.5	2.1	0.3	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.2) *	26	130
	01/07/16	9 - 10	N	ND (2.1) *	3.5	55	ND (1.1) *	ND (1.1) *	ND (0.21)	41	12	17	2.6	0.34	ND (1.1)	27	ND (1.1)	ND (1.1)	ND (2.1) *	47	43
	01/07/16	14 - 15	N	ND (2.1) *	2.9	62 J	ND (1.1) *	ND (1.1) *	ND (0.21)	48	12	19 J	2.4	0.35	ND (1.1)	38	ND (1.1)	ND (1.1)	ND (2.1) *	45	41
	01/07/16	14 - 15	FD	ND (2.1) *	3.2	94 J	ND (1.1) *	ND (1.1) *	ND (0.21)	50	12	25 J	3.5	0.29	ND (1.1)	40	ND (1.1)	ND (1.1)	ND (2.1) *	48	44
	01/07/16	19 - 20	N	ND (2.2) *	3.4	110	ND (1.1) *	ND (1.1) *	ND (0.22)	50	14	21	3.6	0.33	ND (1.1)	41	ND (1.1)	ND (1.1)	ND (2.2) *	53	49
	01/07/16	29 - 30	N	ND (2.1) *	2.5	59	ND (1.1) *	ND (1.1) *	ND (0.21)	29	8.9	22	2	0.29	ND (1.1)	23	ND (1.1)	ND (1.1)	ND (2.1) *	33	33
	01/07/16	39 - 40	N	ND (2.2) *	3.3	96	ND (1.1) *	ND (1.1) *	ND (0.21)	42	12	19	2.9	0.29	ND (1.1)	28	ND (1.1)	ND (1.1)	ND (2.2) *	50	44
	01/08/16	49 - 50	N	ND (2.4) J*	4.6	66 J	ND (1.2) *	ND (1.2) *	ND (0.24)	33 J	11	19	4.2	0.27	ND (1.2)	28	ND (1.2) J	ND (1.2)	ND (2.4) *	47	46 J
	01/08/16	59 - 60	N	ND (2.6) *	5.6	84	ND (1.3) *	ND (1.3) *	ND (0.26)	27	10	16	5.6	0.31	ND (1.3)	22	ND (1.3)	ND (1.3)	ND (2.6) *	44	54
	01/08/16	69 - 70	N	ND (2.3) *	2.8	72	ND (1.1) *	ND (1.1) *	ND (0.23)	21	9.1	13	2.5	ND (0.12) *	ND (1.1)	16	ND (1.1)	ND (1.1)	ND (2.3) *	37	41
	01/08/16	79 - 80	N	ND (2.5) *	3.2	41	ND (1.3) *	ND (1.3) *	ND (0.25)	28	9	17	2.1	ND (0.13) *	ND (1.3)	22	ND (1.3)	ND (1.3)	ND (2.5) *	37	37

TABLE B-1a
Sample Results: Metals
SWMU 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
SWMU1-19	01/09/16	0 - 1	N	ND (2.1) *	7.8	86	ND (1) *	ND (1)	1.3	1,400	5.7	10	3.5	ND (0.1) *	1.1	7.7	ND (1)	ND (1)	ND (2.1) *	34	160
	01/09/16	2 - 3	N	ND (2.1) *	1.9	89	ND (1.1) *	ND (1.1) *	22	23	6.6	8.8	1.8	ND (0.11) *	ND (1.1)	16	ND (1.1)	ND (1.1)	ND (2.1) *	26	34
	01/09/16	5 - 6	N	ND (2.1) *	3.5	74	ND (1) *	ND (1)	4.9	680	5.7	9.9	1.8	ND (0.1) *	ND (1)	8.9	ND (1)	ND (1)	ND (2.1) *	32	87
	01/09/16	9 - 10	N	ND (2) *	3.8	110	ND (1) *	ND (1)	22	2,100	6.1	18	2.4	ND (0.1) *	ND (1)	9.2	ND (1)	ND (1)	ND (2) *	37	120
	01/09/16	14 - 15	N	ND (2.1) *	1.6	67	ND (1) *	ND (1)	6.8	240	6.3	23	1.6	ND (0.1) *	ND (1)	9.7	ND (1)	ND (1)	ND (2.1) *	27	150
	01/09/16	19 - 20	N	ND (2.2) *	5.2	53	ND (1.1) *	ND (1.1) *	ND (0.21)	24 J	8	12	3.3	ND (0.11) *	ND (1.1)	17	ND (1.1)	ND (1.1)	ND (2.2) *	34	120
	01/09/16	19 - 20	FD	ND (2.1) *	2.5	64	ND (1.1) *	ND (1.1) *	ND (0.21)	31 J	8.5	11	1.9	ND (0.11) *	ND (1.1)	19	ND (1.1)	ND (1.1)	ND (2.1) *	38	110
	01/09/16	29 - 30	N	ND (2.1) *	2.4	33	ND (1.1) *	ND (1.1) *	ND (0.21)	19	9.1	59	1.8	ND (0.11) *	ND (1.1)	20	ND (1.1)	ND (1.1)	ND (2.1) *	34	35
	01/09/16	39 - 40	N	ND (2.1) *	2.5	22	ND (1) *	ND (1)	ND (0.21)	16	7.1	14	1.7	ND (0.1) *	ND (1)	16	ND (1)	ND (1)	ND (2.1) *	29	33
	01/09/16	49 - 50	N	ND (2.1) *	2.7	87	ND (1.1) *	ND (1.1) *	ND (0.21)	32	11	28	2.2	ND (0.1) *	ND (1.1)	23	ND (1.1)	ND (1.1)	ND (2.1) *	43	40
	01/09/16	59 - 60	N	ND (2.1) *	2.7	66	ND (1.1) *	ND (1.1) *	ND (0.21)	29	8.9	16	2.5	0.24	ND (1.1)	18	ND (1.1)	ND (1.1)	ND (2.1) *	34	38
	01/10/16	69 - 70	N	ND (2.1) *	3.6	130	ND (1) *	ND (1)	ND (0.21)	22	9.2	17	2.6	0.23	ND (1)	18	ND (1)	ND (1)	ND (2.1) *	36	38
	01/10/16	79 - 80	N	ND (2.1) *	2.5	85	ND (1.1) *	ND (1.1) *	ND (0.21)	16	8.2	10	1.6	0.27	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.1) *	31	34
SWMU1-20	01/13/16	14 - 15	N	ND (2.1) *	1.9	68	ND (1) *	ND (1)	8.9	190	8.2	12	1.6	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	30	110
	01/13/16	14 - 15	FD	ND (2.1) *	1.7	76	ND (1) *	ND (1)	7.9	200	9.7	9.9	2.2	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	32	98
	01/13/16	19 - 20	N	ND (2.1) *	2.2	69	ND (1) *	ND (1)	ND (0.21)	23	7.9	8	1.8	ND (0.11) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	31	37
	01/13/16	29 - 30	N	ND (2.1) *	2	63	ND (1) *	ND (1)	ND (0.21)	14	9	11	1.2	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2.1) *	27	30
	01/14/16	39 - 40	N	ND (2.1) *	2.4	29	ND (1) *	ND (1)	ND (0.21)	18	8.6	13	1.7	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	32	36
	01/14/16	49 - 50	N	ND (2.2) *	2.3	28	ND (1.1) *	ND (1.1) *	ND (0.22)	15	8.6	8	2	ND (0.11) *	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.2) *	31	37
	01/14/16	59 - 60	N	ND (2.1) *	2.1	32	ND (1) *	ND (1)	ND (0.21)	21	7.7	38	1.2	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	29	32
	01/14/16	69 - 70	N	ND (2) *	1.9	56	ND (1) *	ND (1)	ND (0.2)	23	9.4	10	1.2	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	34	34
	01/14/16	79 - 80	N	ND (2.1) *	2.5	100	ND (1) *	ND (1)	ND (0.21)	27	10	11	1.7	ND (0.1) *	ND (1)	16	ND (1)	ND (1)	ND (2.1) *	39	41
SWMU1-21	01/26/16	14 - 15	N	ND (2.1) *	1.9	64	ND (1) *	ND (1)	0.5	19	7.5	13	1.4	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2.1) *	31	78
	01/26/16	19 - 20	N	ND (2) *	ND (1)	77	ND (1) *	ND (1)	0.3	16	7.4	8.7	ND (1)	ND (0.1) *	ND (1)	9.1	ND (1)	ND (1)	ND (2) *	29	69
	01/27/16	29 - 30	N	ND (2.1) *	2.5	50	ND (1) *	ND (1)	ND (0.21)	16	8	11	1.3	ND (0.1) *	ND (1)	12	ND (1) J	ND (1)	ND (2.1) *	28	34
	01/27/16	39 - 40	N	ND (2.1) *	2.3	35	ND (1) *	ND (1)	ND (0.21)	14	8.1	7.9	1.3	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2.1) *	29	37
	01/27/16	49 - 50	N	ND (2.1) *	2.6	26	ND (1) *	ND (1)	ND (0.21)	14	7.7	9	1.5	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	27	33
	01/27/16	59 - 60	N	ND (2.1) *	3.1	45	ND (1.1) *	ND (1.1) *	ND (0.21)	22	9.6	12	1.7	ND (0.1) *	ND (1.1)	17	ND (1.1)	ND (1.1)	ND (2.1) *	32	41
	01/27/16	69 - 70	N	ND (2.1) *	2.6	54	ND (1) *	ND (1)	ND (0.21)	23	9.2	10	1.5	ND (0.1) *	ND (1)	17	ND (1)	ND (1)	ND (2.1) *	34	40
	01/27/16	79 - 80	N	ND (2.2) *	3.1	330 J	ND (1.1) *	ND (1.1) *	ND (0.22)	19	7.6	16	1.2	ND (0.11) *	ND (1.1)	15	ND (1.1)	ND (1.1)	ND (2.2) *	29	32
	01/27/16	79 - 80	FD	ND (2.2) *	3.4	120 J	ND (1.1) *	ND (1.1) *	ND (0.22)	17	7.5	11	1.3	ND (0.11) *	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.2) *	29	35
SWMU1-22	12/17/15	0 - 1	N	ND (2) *	3.6	140	ND (1) *	ND (1)	ND (0.2)	18	---	12	6.5	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	26	33
SWMU1-23	12/17/15	0 - 1	N	ND (2) *	2.7	120	ND (1) *	ND (1)	0.36	23	7.2	11	7.5	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	31	39
SWMU1-24	12/17/15	0 - 1	N	ND (2) *	3.5	170	ND (1) *	ND (1)	1.6	55	7.1	13	6.5	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2) *	29	44
SWMU1-25	01/26/16	0 - 1	N	18	14	210	ND (1) *	ND (1)	42	2,000	7.6	12	4.4	ND (0.1) *	20	12	ND (1)	ND (1)	ND (2.1) *	38	60
	01/26/16	2 - 3	N	2.4	2.7	53	ND (1.1) *	ND (1.1) *	9.5	450	8.5	13	1.6	ND (0.11) *	ND (1.1)	18	ND (1.1)	ND (1.1)	ND (2.1) *	35	200
	01/26/16	5 - 6	N	ND (2.1) *	2.5	30	ND (1.1) *	ND (1.1) *	2.3	200	7.4	14	1.6	ND (0.11) *	ND (1.1)	12	ND (1.1)	ND (1.1)	ND (2.1) *	29	170
	01/26/16	9 - 10	N	ND (2.1) *	3.1	24	ND (1.1) *	ND (1.1) *	ND (0.21)	17	8.5	11	2.1	ND (0.11) *	ND (1.1)	12	ND (1.1)	ND (1.1)	ND (2.1) *	29	37

TABLE B-1a
Sample Results: Metals
SWMU 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Date	Depth (ft bgs)	Sample Type	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium, Hexavalent	Chromium, total	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
SWMU1-28	02/14/17	0 - 0.5	N	ND (2) *	1.7	140	ND (1) *	1.3	ND (0.2)	15	7.1	9.1	1.6	ND (0.1) *	ND (1)	9.7	ND (1) J	ND (1) J	ND (2) J*	27	31
	02/14/17	0 - 0.5	FD	ND (2) *	1.9	140	ND (1) *	1.4	ND (0.2)	16	7.7	13	1.5	ND (0.1) *	ND (1)	10	ND (1) J	ND (1) J	ND (2) J*	28	34
	02/14/17	2 - 3	N	ND (2) *	1.4	97	ND (1) *	1.2	ND (0.2)	13	6.6	8.3	3	ND (0.1) *	ND (1)	8.3	ND (1) J	ND (1) J	ND (2) J*	24	31
SWMU1-29	02/16/17	0 - 0.5	N	ND (2) *	ND (1)	70	ND (1) *	1.5	ND (0.2)	19	7.3	8.5	1.2	ND (0.1) *	ND (1)	9.9	ND (1) J	ND (1) J	ND (2) J*	33	28 J
	02/16/17	2 - 3	N	13	7.2	89	ND (1) *	1.1	17	1,100	5.6	8.7	2.3	ND (0.1) *	1.2	8	ND (1) J	ND (1) J	ND (2.1) J*	29	41
	02/16/17	5 - 6	N	2.6	1.6	73	ND (1) *	1.2	5.6	270	7.2	11	ND (1)	ND (0.1) *	ND (1)	11	ND (1) J	ND (1) J	ND (2.1) J*	26	33
	02/16/17	9 - 10	N	ND (2.1) *	ND (1)	54	ND (1) *	1.2	1.4	98	7.2	13	1.1	ND (0.1) *	ND (1)	9.7	ND (1) J	ND (1) J	ND (2.1) J*	27	140
SWMU1-WP-1h	10/07/08	0 - 0.5	N	ND (2.1) *	4.5	53	ND (1) *	ND (1)	ND (0.418)	25	8.3	11	3.9	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	32	38
	10/07/08	2 - 3	N	ND (2.1) *	4.4	40	ND (1) *	ND (1)	ND (0.418)	17	7.2	8.9	2.8	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	30	34
	10/07/08	5 - 6	N	ND (2.1) *	3.7	23	ND (1.1) *	ND (1.1) *	ND (0.417)	15	7	7.1	2.5	ND (0.11) *	ND (1.1)	11	ND (1.1)	ND (1.1)	ND (2.1) *	26	39
	10/07/08	9 - 10	N	ND (2.1) *	3.8	29	ND (1) *	ND (1)	ND (0.422)	28	8	8.7	2.9	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	29	58
SWMU1-WP-3a	10/14/08	0 - 0.5	N	ND (2.1) *	3.1	100	ND (1.1) *	ND (1.1) *	ND (0.419)	27	7.4	11	3.6	ND (0.11) *	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.1) *	33	40
	10/14/08	2 - 3	N	ND (2.1) *	2.3	100	ND (1) *	ND (1)	ND (0.419)	20	8	9.4	2.3	ND (0.11) *	1.1	11	ND (1)	ND (1)	ND (2.1) *	38	34
	10/14/08	5 - 6	N	ND (2.1) *	6	68	ND (2.1) *	ND (1.1) *	ND (0.425)	27	14	15	6.2	ND (0.11) *	ND (2.1) *	17	ND (1.1)	ND (2.1)	ND (4.2) *	37	45
	10/14/08	7 - 8	N	ND (2.1) *	6	69	ND (2.1) *	ND (1)	ND (0.417)	23	9.3	11	3.4	ND (0.1) *	ND (2.1) *	18	ND (1)	ND (2.1)	ND (4.1) *	36	39
	10/14/08	9 - 10	N	ND (2.1) *	12	120	ND (5.1) *	ND (1)	ND (0.415)	66	14	21	2.8	ND (0.1) *	ND (5.1) *	45	ND (1)	ND (5.1)	ND (10) *	51	46
	10/14/08	9 - 10	FD	ND (2.1) *	12	120	ND (5.1) *	ND (1)	ND (0.414)	66	15	22	2.7	ND (0.1) *	ND (5.1) *	45	ND (1)	ND (5.1)	ND (10) *	52	47
	10/14/08	11 - 12	N	ND (2.1) *	5.1	56	ND (1) *	ND (1)	ND (0.421)	30	12	27	4	ND (0.1) *	ND (1)	23	ND (1)	ND (1)	ND (2.1) *	40	40
	10/14/08	13 - 14	N	ND (2.1) *	5.5	40	ND (1) *	ND (1)	ND (0.426)	28	10	31	3.8	ND (0.1) *	ND (1)	21	ND (1)	ND (1)	ND (2.1) *	39	40
SWMU1-WP-3h	10/07/08	0 - 0.5	N	ND (2.1) *	5.1	40	ND (2.1) *	ND (1.1) *	ND (0.433)	17	7.4	6.3	1.8	ND (0.11) *	ND (2.1) *	11	ND (1.1)	ND (2.1)	ND (4.3) *	25	33
	10/07/08	2 - 3	N	ND (2) *	2.4	89	ND (1) *	ND (1)	ND (0.404)	17	7.6	8.6	2.1	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	30	34
	10/07/08	5 - 6	N	ND (2) *	2.8	92	ND (1) *	ND (1)	ND (0.404)	21	8.7	7.8	2.4	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2) *	31	36
SWMU1-WP-5a	10/05/08	0 - 0.5	N	ND (2) J*	2.4	91	ND (1) *	ND (1)	ND (0.405)	19	8	11	3.9	ND (0.1) *	1	11	ND (1)	ND (1)	ND (2) *	36	35
	10/05/08	2 - 3	N	ND (2) *	2.3	100	ND (1) *	ND (1)	ND (0.408)	19	8.9	9.2	2.4	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	33	35
	10/05/08	5 - 6	N	ND (2.1) *	6.7	120	ND (2.1) *	ND (1)	ND (0.419)	53	13	17	3.9	ND (0.1) *	ND (2.1) *	38	ND (1)	ND (2.1)	ND (4.1) *	52	42
	10/05/08	5 - 6	FD	ND (2.1) *	12	120	ND (5.2) *	ND (1)	ND (0.42) J	58	15	19	3.5	ND (0.1) *	ND (5.2) *	42	ND (1)	ND (5.2) *	ND (10) *	56	46
	10/05/08	7 - 8	N	ND (2.1) *	6.6	100	ND (2.1) *	ND (1)	ND (0.416)	53	12	18	4.1	ND (0.1) *	ND (2.1) *	37	ND (1)	ND (2.1)	ND (4.1) *	44	41
	10/05/08	9 - 10	N	ND (2.1) *	6.4	76	ND (2.1) *	ND (1)	ND (0.421)	43	13	21	4.2	ND (0.1) *	ND (2.1) *	33	ND (1)	ND (2.1)	ND (4.2) *	47	47
	10/05/08	11 - 12	N	ND (2.1) *	6.8	50	ND (2.1) *	ND (1)	ND (0.416)	36	11	26	3.5	ND (0.1) *	ND (2.1) *	26	ND (1)	ND (2.1)	ND (4.1) *	43	42
	10/05/08	13 - 14	N	ND (2.1) *	4.9	92	ND (1) *	ND (1)	ND (0.422)	27	11	13	3.5	ND (0.1) *	ND (1)	20	ND (1)	ND (1)	ND (2.1) *	40	52
SWMU1-WP-5h	10/07/08	0 - 0.5	N	ND (2.2) J*	3.4	73	ND (1.1) *	ND (1.1) *	ND (0.43)	14	12	12	2.7	ND (0.11) *	ND (1.1)	9.5	ND (1.1)	ND (1.1)	ND (2.2) *	23	31
	10/07/08 ⊖	2 - 3	N	ND (2.1) *	5.3	130	ND (2.1) *	ND (1.1) *	ND (0.435)	33	8.7	12	4.9	ND (0.11) *	ND (2.1) *	14	ND (1.1)	ND (2.1)	ND (4.3) *	31	46
	10/07/08	5	N	ND (2.1) *	3.2	110	ND (1) *	ND (1)	ND (0.415)	23	8.5	11	3.3	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	33	40

TABLE B-1a
Sample Results: Metals
SWMU 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
SWMU1-WP-6a	10/05/08	0 - 0.5	N	ND (2) *	2.9	100	ND (1) *	ND (1)	ND (0.405)	32	9.3	10	7.2	ND (0.1) *	2.5	15	ND (1)	ND (1)	ND (2) *	30	35
	10/05/08	2 - 3	N	ND (2) *	2.3	81	ND (1) *	ND (1)	ND (0.404)	19	8.8 J	10	2.3	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	34	35
	10/05/08	2 - 3	FD	ND (2) *	2.4	82	ND (1) *	ND (1)	ND (0.403)	19	11 J	9.2	2.2	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	34	33
	10/05/08	5 - 6	N	ND (2.1) *	6.2	180	ND (2.1) *	ND (1)	ND (0.413)	41	12	19	3.2	ND (0.1) *	ND (2.1) *	27	ND (1)	ND (2.1)	ND (4.1) *	43	44
	10/05/08	7 - 8	N	ND (2.1) *	6	66	ND (2.1) *	ND (1)	ND (0.414)	35	10	18	3.5	ND (0.1) *	ND (2.1) *	24	ND (1)	ND (2.1)	ND (4.1) *	40	38
	10/05/08	9 - 10	N	ND (2) *	11	98	ND (5.1) *	ND (1)	ND (0.412)	26	11	14	2.4	ND (0.1) *	ND (5.1) *	19	ND (1)	ND (5.1)	ND (10) *	40	39
	10/05/08	11 - 12	N	ND (2) *	4.3	71	ND (1) *	ND (1)	ND (0.411)	51	10	17	3.1	ND (0.1) *	3.6	22	ND (1)	ND (1)	ND (2) *	38	35
	10/05/08	13 - 14	N	ND (2) *	6.7	110	ND (2) *	ND (1)	ND (0.41)	60	14	15	3.6	ND (0.1) *	ND (2) *	43	ND (1)	ND (2)	ND (4.1) *	55	43
SWMU1-WP-6h	10/06/08 ⊖	0 - 0.5	N	ND (2) *	4.7	150	ND (2) *	ND (1)	4.98	130	8.8	15	5.5	ND (0.1) *	ND (2) *	17	ND (1)	ND (2)	ND (4.1) *	37	87
	10/06/08	2 - 3	N	ND (2.1) *	5.5	70	ND (1) *	ND (1)	0.538	23	19	61	6.6	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	36	34
	10/06/08	5 - 6	N	ND (2) *	2.7	100	ND (1) *	ND (1)	ND (0.406)	19	8	10	2.4	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	34	36
	10/06/08	5 - 6	FD	ND (2) *	2.7	100	ND (1) *	ND (1)	ND (0.405)	20	8.1	12	2.3	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	32	37
	10/06/08	9 - 10	N	ND (2.1) *	4.1	100	ND (1.1) *	ND (1.1) *	ND (0.409)	41	9.4	23	3.5	ND (0.11) *	ND (1.1)	27	ND (1.1)	ND (1.1)	ND (2.1) *	36	39
SWMU1-WP-7	10/06/08	0 - 0.5	N	ND (2.1) *	ND (5.3)	160	ND (5.3) *	ND (1.1) *	0.566	2,600	7.2	11	13	ND (0.11) *	7.1	15	ND (1.1)	ND (5.3) *	ND (11) *	35	88
	10/06/08 ⊖	2 - 3	N	ND (2.2) *	6	190	ND (2.2) *	ND (1.1) *	18.2	1,200	7.4	16	5.7	ND (0.11) *	3.4	17	ND (1.1)	ND (2.2)	ND (4.4) *	35	56
	10/06/08	5 - 6	N	ND (2.1) *	3	110	ND (1) *	ND (1)	6.17	21	8	11	2.7	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	31	34
	10/06/08	9 - 10	N	ND (2.1) *	3	82	ND (1) *	ND (1)	ND (0.417)	23	7.2	15	2.7	ND (0.11) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	30	31
SWMU1-WP-8	10/06/08	0 - 0.5	N	ND (2) *	5.4	150	ND (2) *	ND (1)	ND (0.402)	35	7.5	13	6.9	ND (0.1) *	ND (2) *	16	ND (1)	ND (2)	ND (4.1) *	31	47
	10/06/08	2 - 3	N	ND (2.1) *	5.1	160	ND (2.1) *	ND (1.1) *	0.541	26	7.9	10	4.1	ND (0.1) *	ND (2.1) *	17	ND (1.1)	ND (2.1)	ND (4.2) *	32	32
	10/06/08	5 - 6	N	ND (2) *	2.7	130	ND (1) *	ND (1)	ND (0.407)	19	8.3	10	2.7	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	34	38
	10/06/08	9 - 10	N	ND (2) J*	2.9	120	ND (1) *	ND (1)	ND (0.411)	22	7.9	9.8	2.6	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	38	38
SWMU1-WP-9	09/21/08	0 - 0.5	N	ND (2) *	2.4	100	ND (1) *	ND (1)	ND (0.406)	26	7.6	8.2	2.9	ND (0.1) *	2.1	12	ND (1)	ND (1)	ND (2) *	30	33
	09/21/08	2 - 3	N	ND (2) *	2.7	150 J	ND (1) *	ND (1)	ND (0.407)	34 J	9.5 J	15	2.3	ND (0.1) *	1.2	20 J	2.5	ND (1)	ND (2) *	35	34
	09/21/08	2 - 3	FD	ND (2.1) *	2.1	1,900 J	ND (1) *	ND (1)	ND (0.409)	20 J	5.9 J	10	2.7	ND (0.1) *	ND (1)	12 J	ND (1)	ND (1)	ND (2.1) *	32	34
	09/21/08	5 - 6	N	ND (2) *	4.2	75	ND (2) *	ND (1)	ND (0.416)	39	13	15	3.2	ND (0.1) *	ND (2) *	26	1.3	ND (2)	ND (4.1) *	49	43
	09/21/08	7 - 8	N	ND (2.1) *	4.8	58	ND (2.1) *	ND (1)	ND (0.416)	28	10	14	3.5	ND (0.1) *	ND (2.1) *	20	ND (1)	ND (2.1)	ND (4.1) *	39	45
	09/21/08	9 - 10	N	ND (2) *	4.7	77	ND (2) *	ND (1)	ND (0.411)	37	12	15	3.3	ND (0.1) *	ND (2) *	28	ND (1)	ND (2)	ND (4.1) *	43	43
	09/21/08	11 - 12	N	ND (2.1) *	7.1	88	ND (5.2) *	ND (1)	ND (0.422)	68	16	23	4	ND (0.11) *	ND (5.2) *	51	ND (1)	ND (5.2) *	ND (10) *	56	56
	09/21/08	13 - 14	N	ND (2.1) *	5.3	91	ND (2.1) *	ND (1)	ND (0.423)	60	15	22	4.9	ND (0.11) *	ND (2.1) *	46	ND (1)	ND (2.1)	ND (4.2) *	56	52
SWMU1-WP-10	10/05/08	0 - 0.5	N	ND (2.1) *	4.4	150	ND (2.1) *	ND (1)	6.64	540	7.1	11	8.3	ND (0.1) *	ND (2.1) *	15	ND (1)	ND (2.1)	ND (4.1) *	32	56
	10/05/08 ⊖	2 - 3	N	ND (2.1) *	5.3	180	ND (5.2) *	ND (1)	3.85	1,400	8.8	18	10	ND (0.1) *	ND (5.2) *	16	ND (1)	ND (5.2) *	ND (10) *	39	360
	10/05/08	5 - 6	N	ND (2.1) *	5.5	81	ND (2.1) *	ND (1.1) *	0.494 J	50	8	12	3.6	ND (0.11) *	ND (2.1) *	15	ND (1.1)	ND (2.1)	ND (4.3) *	33	53
	10/05/08	9 - 10	N	ND (2.1) *	4.8	110	ND (2.1) *	ND (1.1) *	2.31	250	9.4	11	5.4	ND (0.11) *	ND (2.1) *	18	ND (1.1)	ND (2.1)	ND (4.2) *	33	83

TABLE B-1a

Sample Results: Metals
SWMU 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
SWMU1-WP-T3a	10/05/08	0 - 0.5	N	ND (2) J*	2.6	110	ND (1) *	ND (1)	ND (0.41)	25	10	11	2.8	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	38	39
	10/05/08	2 - 3	N	ND (2) *	2	92	ND (1) *	ND (1)	ND (0.411)	18	9.2	12	2.9	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	32	35
	10/05/08	5 - 6	N	ND (2.1) *	4.1	82	ND (1.1) *	ND (1.1) *	ND (0.431)	26	11	16	3.4	ND (0.11) *	ND (1.1)	19	ND (1.1)	ND (1.1)	ND (2.1) *	38	40
	10/05/08	5 - 6	FD	ND (2.1) *	4.2	80	ND (1.1) *	ND (1.1) *	ND (0.438)	26	10	15	3.7	ND (0.11) *	1.1	19	ND (1.1)	ND (1.1)	ND (2.1) *	38	39
	10/05/08	7 - 8	N	ND (2.1) *	6.1	86	ND (2.1) *	ND (1.1) *	ND (0.429)	38	12	19	4.4	ND (0.11) *	ND (2.1) *	28	ND (1.1)	ND (2.1)	ND (4.3) *	43	44
	10/05/08	9 - 10	N	ND (2) *	5.1	140	ND (2) *	ND (1)	ND (0.406)	71	13	20	3.4	ND (0.1) *	6.4	29	ND (1)	ND (2)	ND (4.1) *	44	42
	10/05/08	11 - 12	N	ND (2.1) *	7.1	92	ND (2.1) *	ND (1)	ND (0.42)	50	15	17	4.5	ND (0.1) *	ND (2.1) *	38	ND (1)	ND (2.1)	ND (4.2) *	54	42
	10/05/08	13 - 14	N	ND (2.1) *	11	100	ND (5.3) *	ND (1.1) *	ND (0.424)	62	14	30	3.8	ND (0.11) *	ND (5.3) *	45	ND (1.1)	ND (5.3) *	ND (11) *	53	51
SSB-2	06/30/97	1	N	---	---	---	---	---	ND (0.05)	48.7	---	7.4	---	---	---	7.9	---	---	---	---	27.3
	06/30/97	3	N	---	---	---	---	---	ND (0.05)	7.6	---	6.8	---	---	---	5.7	---	---	---	---	20.4
	06/30/97	6	N	---	---	---	---	---	ND (0.05)	10.1	---	9.4	---	---	---	7.9	---	---	---	---	27
	06/30/97	10	N	---	---	46.4	---	---	ND (0.05)	9.7	---	11	3.1	---	ND (0.2)	11.7	---	---	---	20.2	27.3
SSB-3	06/30/97	1	N	---	---	---	---	---	ND (0.05)	8.2	---	4.3	---	---	---	6	---	---	---	---	13.7
	06/30/97	3	N	---	---	---	---	---	ND (0.05)	13.2	---	9.5	---	---	---	10.4	---	---	---	---	21.4
	06/30/97	6	N	---	---	---	---	---	ND (0.05)	23.5	---	13.7	---	---	---	16.4	---	---	---	---	27.1
	06/30/97	10	N	---	---	70		---	ND (0.05)	7.1	---	13.4	2.3	---	ND (0.2)	7.7	---	---	---	15.5	19.2
SSB-4	06/30/97	1	N	---	---	---	---	---	ND (0.05)	10.1	---	3	---	---	---	3.9	---	---	---	---	11.9
	06/30/97	3	N	---	---	---	---	---	ND (0.05)	1,520	---	10.3	---	---	---	5.4	---	---	---	---	141
	06/30/97	6	N	---	---	---	---	---	ND (0.05)	297	---	12.4	---	---	---	6.9	---	---	---	---	130
	06/30/97	10	N	---	---	93.9	---	---	ND (0.05)	201	---	11.9	2.1	---	ND (0.2)	7.4	---	---	---	19.3	188
SSB-5	06/30/97	1	N	---	---	---	---	---	0.06	521	---	13.5	---	---	---	7.8	---	---	---	---	39.6
	06/30/97	3	N	---	---	---	---	---	ND (0.05)	1,440	---	16	---	---	---	4.2	---	---	---	---	128
	06/30/97	6	N	---	---	---	---	---	ND (0.05)	617	---	14.9	---	---	---	6.4	---	---	---	---	115
	06/30/97	10	N	---	---	89.6	---	---	ND (0.05)	31.6	---	7	1.75	---	ND (0.2)	7.7	---	---	---	18.7	107
WP-1	06/30/97	0	N	---	---	---	---	---	47.5	2,090	---	3.9	---	---	---	3.6	---	---	---	---	44.5
WP-2	09/18/97	0	N	---	---	---	---	---	ND (0.5)	25.9	---	22.8	---	---	---	9.9	---	---	---	---	80.1
WP-3	09/18/97	0.5	N	---	---	---	---	---	11.8	1,290	---	13.2	---	---	---	5.6	---	---	---	---	50.3
	09/18/97	2	N	---	---	---	---	---	0.41	273	---	18.6	---	---	---	18.3	---	---	---	---	50
WP-4	09/18/97	0	N	---	---	---	---	---	1.14	120	---	10.8	---	---	---	4	---	---	---	---	65.6
WP-5	09/18/97	0	N	---	---	---	---	---	3.51	511	---	16.8	---	---	---	13.2	---	---	---	---	50.4
	09/18/97	1	N	---	---	---	---	---	6.66	711	---	15.4	---	---	---	10.2	---	---	---	---	61.5
	09/18/97	2	N	---	---	---	---	---	8.97	421	---	15.8	---	---	---	12.9	---	---	---	---	51.9
	09/18/97	3	N	---	---	---	---	---	6.1	158	---	10.1	---	---	---	4.5	---	---	---	---	22.9
	09/18/97	4	N	---	---	---	---	---	10.2	113	---	24.4	---	---	---	20.6	---	---	---	---	41.9
WP-6	09/18/97	0	N	---	---	---	---	---	1.64	712	---	21.6	---	---	---	12.4	---	---	---	---	57.9
	09/18/97	1	N	---	---	---	---	---	9.46	1,030	---	18.2	---	---	---	5.8	---	---	---	---	46.5
	09/18/97	2	N	---	---	---	---	---	2.29	401	---	11.9	---	---	---	10.5	---	---	---	---	210
WP-Bank1	11/23/98	0	N	---	---	---	---	---	5.5	261	---	10.3	---	---	---	3.8	---	---	---	---	23.4
WP-Bank2	11/23/98	0	N	---	---	---	---	---	14	909	---	27.2	---	---	---	7.9	---	---	---	---	61.8
BANK-WP	11/13/98	Unknown	N	---	---	---	---	---	ND (0.51)	34.4	---	16.3	---	---	---	24.7	---	---	---	---	41.3

TABLE B-1a
Sample Results: Metals
SWMU 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
WP-Floor	11/23/98	Unknown	N	---	---	---	---	---	3.3	317	---	13.9	---	---	---	1.4 J	---	---	---	---	15.9 J
Bank - b	11/13/98	Unknown	N	---	---	---	---	---	0.7	20.1	---	15	---	---	---	18.2	---	---	---	---	38.2
T-1	11/13/98	Unknown	N	---	---	---	---	---	ND (0.53)	15.9	---	13.1	---	---	---	13.2	---	---	---	---	38.6
	11/13/98	Unknown	N	---	---	---	---	---	2.1	38.8	---	28	---	---	---	21.6	---	---	---	---	164
T-2	11/13/98	Unknown	N	---	---	---	---	---	ND (0.53)	21.2	---	12.4	---	---	---	16.2	---	---	---	---	44.7
	11/13/98	Unknown	N	---	---	---	---	---	0.6	44.4	---	14.2	---	---	---	13.1	---	---	---	---	43
T-3-B	11/13/98	0	N	---	---	---	---	---	3.1	619	---	19.6	---	---	---	7.9	---	---	---	---	673
P-1	11/13/98	Unknown	N	---	---	---	---	---	ND (0.52)	12	---	12.7	---	---	---	9.2	---	---	---	---	29.4
	11/13/98	Unknown	N	---	---	---	---	---	ND (0.53)	17.9	---	16.1	---	---	---	13.1	---	---	---	---	40.4
P-2Soil	11/13/98	- 3.5	N	---	---	---	---	---	ND (0.76)	33.2	---	6	---	---	---	5.6	---	---	---	---	6.4
	11/13/98	Unknown	N	---	---	---	---	---	ND (0.52)	15	---	9.7	---	---	---	8.1	---	---	---	---	36.1
Category 3																					
PB-1	06/24/88	0 - 3	N	---	---	---	---	---	ND (0.5)	45	---	---	---	---	---	---	---	---	---	---	---
PB-2	06/24/88	0 - 3	N	---	---	---	---	---	ND (0.5)	38	---	---	---	---	---	---	---	---	---	---	---
	06/24/88	0 - 3	FD	---	---	---	---	---	ND (0.5)	37	---	---	---	---	---	---	---	---	---	---	---
PB-3	06/24/88	0 - 3	N	---	---	---	---	---	7.1	270	---	---	---	---	---	---	---	---	---	---	---
PB-4	06/24/88	0 - 3	N	---	---	---	---	---	ND (0.5)	25	---	---	---	---	---	---	---	---	---	---	---

Notes:

Category 1: Validated data suitable for all uses, including risk assessment and remedial action decisions.
Category 2: Validated data suitable for use in characterization of the chemicals of potential concern at the facility and to help define the nature and extent of contamination.
Category 3: Validated data suitable only for use in qualitative characterization of the nature and extent of contamination.
Results greater than or equal to the interim screening level are circled; however, if the interim screening level is equal to the background value, only results greater than the interim screening level are circled.

ϴ	white powder sample.
*	Reporting limits greater than or equal to the interim screening level.
---	not analyzed
ft bgs	feet below ground surface
mg/kg	milligrams per kilogram
DTSC	California Department of Toxic Substances Control
DTSC-SL	DTSC Screening Levels
FD	field duplicate
J	concentration or reporting limit estimated by laboratory or data validation
N	primary sample
ND	not detected at the listed reporting limit
NE	not established
USEPA	United States Environmental Protection Agency

1 Interim screening level is background value. If background value is not available then the interim screening value is the lower of the Ecological Comparison Value , residential DTSC-SL, or USEPA residential regional screening value.
2 United States Environmental Protection Agency (USEPA). 2017. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. November.
3 California Department of Toxic Substances Control (DTSC). 2018. Human Health Risk Assessment (HHRA) Note Number 3. January.
4 ARCADIS. 2008. "Technical Memorandum 3: Ecological Comparison Values for Metals and Polycyclic Aromatic Hydrocarbons in Soil." May 28.
5 CH2M HILL. 2009. "Final Soil Background Technical Memorandum at Pacific Gas and Electric Company Topock Compressor Station, Needles, California." May.

TABLE B-1b

Sample Results: Dioxins and Furans
SWMU 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Date	Depth (ft bgs)	Sample Type	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDF	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDF	2,3,4,6,7,8-HxCDF	2,3,4,7,8-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	OCDD	OCDF	TEQ Avian	TEQ Human	TEQ Mammals
				Dioxin/Furans (ng/kg)																			
Interim Screening Level[1] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
Residential Regional Screening Levels[2] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
Residential DTSC-SL[3] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
Ecological Comparison Values[4] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
Background[5] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
Category 1																							
SWMU1-18	01/07/16	0 - 1	N	3,300	310	33	13	ND (0.53)	91	26	27	ND (0.61)	ND (2.4)	ND (0.37)	ND (1,500)	2.7 J	ND (0.44)	ND (0.13)	47,000	980	98	140	140
	01/07/16	2 - 3	N	4.7 J	ND (0.2)	ND (0.049)	ND (0.092)	ND (0.093)	ND (0.091)	ND (0.086)	ND (0.086)	ND (0.11)	ND (0.085)	ND (0.14)	ND (3.3)	ND (0.15)	ND (0.062)	ND (0.24)	49	0.97 J	0.47	0.37	0.37
	01/07/16	5 - 6	N	3.5 J	ND (0.13)	ND (0.16)	ND (0.09)	ND (0.12)	ND (0.089)	ND (0.11)	ND (0.084)	ND (0.5)	ND (0.041)	ND (0.048)	ND (0.57)	ND (0.052)	ND (0.079)	ND (0.24)	13 J	0.39 J	0.29	0.2	0.2
	01/07/16	9 - 10	N	3.5 J	ND (0.2)	ND (0.25)	ND (0.073)	ND (0.31)	ND (0.079)	ND (0.29)	ND (0.075)	ND (0.36)	ND (0.063)	ND (0.044)	ND (0.87)	ND (0.047)	ND (0.075)	ND (0.14)	23 J	ND (0.12)	0.27	0.23	0.23
SWMU1-19	01/09/16	0 - 1	N	80	4.5 J	ND (0.23)	ND (0.82)	ND (0.35)	3.3 J	ND (0.33)	ND (1.5)	ND (0.41)	ND (0.41)	ND (0.27)	ND (41)	ND (0.29)	ND (0.1)	ND (0.31)	450	11 J	3	3.9	3.9
	01/09/16	2 - 3	N	14,000	2,200	ND (41)	130	320	770	ND (24)	350	ND (30)	63	ND (2.7)	ND (12,000)	36	3.1 J	ND (0.91)	240,000	6,500	850	1,100	1,100
	01/09/16	5 - 6	N	1,100	79	ND (3.7)	4.3 J	ND (2.1)	31	ND (1.9)	10 J	ND (2.4)	ND (1.5)	ND (0.8)	ND (360)	ND (0.86)	ND (0.13)	ND (0.58)	16,000	230	25	41	41
	01/09/16	9 - 10	N	3,300	170	25	17	ND (15)	120	ND (14)	45	ND (18)	7.8 J	3 J	ND (2,600)	17	ND (0.97)	ND (0.59)	43,000	300	170	210	210
	01/09/16	14 - 15	N	1,100 J	100 J	9.1 J	ND (6.4) J	ND (6.2) J	40 J	ND (9.1) J	12 J	ND (7.1) J	3 J	ND (1.9) J	ND (700) J	5.6 J	ND (0.48) J	0.9 J	15,000 J	120 J	51	63	63
	01/09/16	19 - 20	N	25 J	ND (2.4) J	ND (2.8) J	ND (0.11) J	ND (0.11) J	ND (0.12) J	ND (0.24) J	ND (0.27) J	ND (0.13) J	ND (0.079) J	ND (0.087) J	ND (29) J	ND (0.13) J	ND (0.07) J	ND (0.046) J	340 J	1.7 J	1.7	2	2
SWMU1-20	01/13/16	1 - 1.5	N	170	10 J	ND (0.9)	ND (1.1)	ND (0.44)	7 J	ND (0.6)	ND (2.6)	ND (0.51)	ND (0.87)	ND (0.31)	ND (33)	ND (0.33)	ND (0.44)	ND (0.44)	1,100	25	3.4	5.5	5.5
	01/13/16	2 - 3	N	63	3.1 J	ND (0.5)	ND (1.7)	ND (0.62)	3.7 J	ND (0.81)	3.9 J	ND (0.19)	ND (1.5)	ND (0.33)	ND (20)	ND (0.36)	ND (0.18)	ND (0.15)	670	9.3 J	2.8	3.7	3.7
	01/13/16	5 - 6	N	2,200	220	16	23	ND (16)	100	ND (15)	69	ND (19)	20	8 J	ND (690)	ND (3.5)	1.2 J	ND (2.6)	24,000	380	78	110	110
	01/13/16	9 - 10	N	13,000	1,500	150	75	350	730	59	170	36	31	ND (2.5)	ND (11,000)	75	4.6 J	ND (0.5)	160,000	5,700	780	950	950
	01/13/16	14 - 15	N	1,900	160	ND (7.6)	11 J	ND (140)	67	ND (130)	21	ND (160)	ND (2.5)	ND (0.8)	ND (1,300)	12 J	ND (0.46)	ND (0.39)	46,000	200	110	140	140
	01/13/16	19 - 20	N	4.8 J	ND (0.16)	ND (0.19)	ND (0.079)	ND (0.21)	ND (0.068)	ND (0.18)	ND (0.069)	ND (0.24)	ND (0.047)	ND (0.069)	ND (2.7)	ND (0.069)	ND (0.034)	ND (0.066)	ND (71)	ND (0.57)	0.29	0.29	0.29
SWMU1-21	01/26/16	0 - 1	N	10,000	1,100	49 J	ND (12)	28	130 J	ND (9.3)	ND (12)	ND (12)	ND (2.6)	ND (7.9)	ND (220)	7.9 J	0.69 J	ND (1.3)	140,000	13,000	65	190	190
	01/26/16	2 - 3	N	19,000	ND (320)	ND (410)	160	89	1,000	150	350	ND (38)	92	ND (61)	ND (6,500)	ND (66)	3.5 J	ND (6.8)	200,000	10,000	580	870	870
	01/26/16	5 - 6	N	1,600	21	ND (10)	27	ND (1.9)	30	ND (1.8)	8.4 J	ND (2.2)	ND (0.67)	ND (5.2)	ND (260)	ND (5.6)	ND (0.28)	ND (0.26)	12,000	44	23	41	41
	01/26/16	9 - 10	N	130	ND (0.95)	ND (0.39)	ND (0.64)	ND (0.21)	ND (2.6)	ND (0.19)	ND (1.2)	ND (0.24)	ND (0.082)	ND (0.21)	ND (0.21)	ND (0.22)	ND (0.062)	ND (0.11)	500	ND (1.3)	0.57	1.8	1.8
	01/26/16	14 - 15	N	31	ND (0.2)	ND (0.23)	ND (0.18)	ND (0.17)	ND (0.15)	ND (0.15)	ND (0.16)	ND (0.2)	ND (0.077)	ND (0.091)	ND (3.7)	ND (0.21)	ND (0.05)	ND (0.084)	110	1.1 J	0.48	0.68	0.68
	01/26/16	19 - 20	N	12 J	ND (0.087)	ND (0.34)	ND (0.11)	ND (0.074)	ND (0.47)	ND (0.15)	ND (0.092)	ND (0.084)	ND (0.13)	ND (0.066)	ND (1.6)	ND (0.077)	ND (0.058)	ND (0.066)	110	ND (1.3)	0.3	0.39	0.39
SWMU1-22	12/17/15	0 - 1	N	240 J	17 J	ND (1.1) J	ND (1.9) J	ND (2.7) J	6.1 J	ND (2.3) J	ND (2.8) J	ND (3.2) J	ND (0.36) J	ND (0.99) J	ND (24) J	ND (0.64) J	ND (0.26) J	ND (1.5) J	2,100 J	31 J	3.9	6.2	6.2
SWMU1-23	12/17/15	0 - 1	N	480 J	39 J	2.6 J	3 J	3.9 J	13 J	2.7 J	5.8 J	ND (1.1) J	2.2 J	1.5 J	ND (71) J	ND (1.1) J	ND (0.38) J	ND (1.1) J	5,200 J	94 J	10	16	16
SWMU1-24	12/17/15	0 - 1	N	47,000 J	5,500 J	ND (71) J	ND (540) J	150 J	1,600 J	260 J	ND (470) J	ND (38) J	150 J	ND (80) J	ND (4,000) J	ND (81) J	18 J	7.4 J	360,000 J	5,000 J	650	1,300	1,300
SWMU1-25	01/26/16	0 - 1	N	140,000	ND (1,100)	ND (1,400)	1,900	ND (400)	14,000	1,600	2,900	ND (470)	910	ND (92)	ND (140,000)	1,600	67	89	540,000	160,000	11,000	12,000	12,000
	01/26/16	2 - 3	N	340	13	ND (1.8)	1.9 J	ND (0.89)	7.8 J	ND (0.82)	ND (2.5)	ND (1)	ND (0.21)	ND (0.35)	ND (71)	ND (0.38)	ND (0.16)	ND (0.22)	4,400	35	5.4	9.9	9.9
	01/26/16	5 - 6	N	210	ND (5.6)	ND (1.3)	2.5 J	ND (0.85)	6.1 J	ND (0.79)	1.9 J	ND (1)	ND (0.17)	ND (0.53)	ND (37)	ND (0.57)	ND (0.58)	0.65 J	2,200	13 J	4.2	6.4	6.4
	01/26/16	9 - 10	N	59	5.4 J	ND (0.42)	ND (0.39)	ND (0.85)	1.7 J	ND (1.1)	ND (0.49)	ND (0.4)	ND (0.19)	ND (0.16)	ND (24)	ND (0.18)	ND (0.097)	ND (0.14)	670	12 J	1.9	2.6	2.6

TABLE B-1b
Sample Results: Dioxins and Furans
SWMU 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Dioxin/Furans (ng/kg)																			
Interim Screening Level[1] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
Residential Regional Screening Levels[2] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
Residential DTSC-SL[3] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
Ecological Comparison Values[4] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
Background[5] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
Location	Date	Depth (ft bgs)	Sample Type	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDF	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDF	2,3,4,6,7,8-HxCDF	2,3,4,7,8-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	OCDD	OCDF	TEQ Avian	TEQ Human	TEQ Mammals
SWMU1-26	01/08/17	0 - 0.5	N	450 J	37	ND (9.4)	ND (0.39)	ND (2)	12 J	ND (1.8)	2.9 J	ND (2.3)	ND (0.25)	ND (0.98)	ND (93)	ND (0.79)	ND (0.14)	ND (0.62)	5,100 J	75	7.7	13	13
	01/08/17	0 - 0.5	FD	1,200 J	70	5.7 J	2.1 J	ND (3.4)	21	ND (3.1)	4 J	ND (4)	ND (0.39)	ND (0.38)	ND (140)	ND (1)	ND (0.11)	ND (0.71)	8,000 J	150	12	26	26
	01/08/17	2 - 3	N	46	ND (3.4)	ND (0.6)	ND (0.25)	ND (0.13)	ND (0.25)	ND (0.12)	ND (0.61)	ND (0.15)	ND (0.16)	ND (0.16)	ND (10)	ND (0.51)	ND (0.27)	ND (1.2)	390	8.7 J	1.7	1.5	1.5
	01/08/17	5 - 6	N	410	61	8.3 J	ND (1.4)	ND (1.4)	14	5.6 J	ND (2.6)	ND (1.7)	ND (0.68)	ND (3.2)	ND (420)	ND (3.3)	ND (0.12)	0.77 J	7,100	120	27	31	31
	01/08/17	9 - 10	N	11 J	ND (2.8)	ND (2)	ND (0.57)	0.66 J	ND (0.48)	ND (0.49)	0.99 J	ND (1.2)	0.33 J	0.47 J	ND (1.7)	ND (0.17)	ND (0.11)	0.74 J	80	ND (4.2)	1.7	1	1
	01/08/17	14 - 15	N	1.9 J	ND (0.64)	ND (0.45)	ND (0.11)	ND (0.11)	ND (0.1)	ND (0.096)	ND (0.14)	ND (0.19)	ND (0.1)	ND (0.11)	ND (0.5)	ND (0.11)	ND (0.084)	ND (0.31)	20 J	ND (0.26)	0.37	0.22	0.22
	01/08/17	19 - 20	N	ND (0.19)	ND (0.37)	ND (0.12)	ND (0.13)	ND (0.086)	ND (0.13)	ND (0.078)	ND (0.15)	ND (0.5)	ND (0.12)	ND (0.12)	ND (0.68)	ND (0.12)	ND (0.12)	ND (0.45)	11 J	ND (1)	0.49	0.26	0.26
SWMU1-27	01/07/17	0 - 0.5	N	210	22	ND (4.4)	ND (1.1)	ND (0.42)	ND (0.37)	ND (2.3)	3 J	ND (1.2)	ND (0.53)	ND (2.1)	ND (78)	ND (0.4)	ND (0.13)	ND (0.28)	2,100	56	5.9	7.9	7.9
	01/07/17	2 - 3	N	34	ND (2.7)	ND (0.23)	ND (0.42)	ND (0.42)	1.1 J	ND (0.1)	0.74 J	ND (0.13)	ND (0.13)	ND (0.18)	ND (5.9)	ND (0.18)	ND (0.12)	ND (0.6)	250	ND (4.6)	1	1.1	1.1
	01/07/17	5 - 6	N	150	17	ND (2.6)	ND (0.63)	ND (1.8)	4.2 J	ND (1.6)	2 J	ND (2.1)	ND (0.92)	ND (0.53)	ND (44)	ND (0.51)	ND (0.11)	ND (0.59)	1,600	35	4.3	5.9	5.9
	01/07/17	9 - 10	N	ND (1.8)	ND (0.36)	ND (0.064)	ND (0.081)	ND (0.071)	ND (0.08)	ND (0.065)	ND (0.26)	ND (0.17)	ND (0.11)	ND (0.093)	ND (0.69)	ND (0.098)	ND (0.11)	0.27 J	ND (22)	ND (0.78)	0.5	0.24	0.24
	01/07/17	14 - 15	N	ND (0.28)	ND (0.14)	ND (0.62)	0.21 J	ND (0.24)	ND (0.27)	ND (0.057)	ND (0.078)	ND (0.42)	ND (0.08)	ND (0.072)	ND (0.2)	ND (0.075)	ND (0.17)	ND (0.69)	ND (9.9)	ND (1.3)	0.58	0.26	0.26
	01/07/17	19 - 20	N	ND (1.1)	ND (0.45)	ND (0.37)	ND (0.048)	ND (0.093)	ND (0.047)	ND (0.085)	ND (0.075)	ND (0.11)	ND (0.092)	ND (0.033)	ND (0.096)	ND (0.15)	ND (0.09)	ND (0.29)	ND (12)	ND (0.76)	ND (0.34)	ND (0.17)	ND (0.17)
SWMU1-28	02/14/17	0 - 0.5	N	150	14	ND (1.9)	ND (0.55)	ND (0.2)	ND (2.6)	ND (1.1)	ND (1.7)	ND (0.3)	ND (0.27)	ND (0.2)	ND (25)	ND (0.21)	ND (0.073)	ND (0.22)	1,000	57	2.2	3.8	3.8
	02/14/17	0 - 0.5	FD	120	15	ND (1.9)	ND (0.43)	ND (0.56)	3.5 J	ND (0.46)	ND (0.42)	ND (0.51)	ND (0.13)	ND (0.41)	ND (26)	ND (0.43)	ND (0.071)	ND (0.1)	1,000	59	2.2	3.6	3.6
	02/14/17	2 - 3	N	33	6.4 J	ND (0.7)	ND (0.27)	ND (0.35)	1.3 J	ND (0.18)	0.87 J	ND (0.22)	ND (0.32)	ND (0.3)	ND (8.7)	ND (0.56)	ND (0.061)	ND (0.17)	230	ND (11)	1.3	1.5	1.5
SWMU1-29	02/16/17	0 - 0.5	N	240 J	21	ND (1.7)	ND (1.2)	1.6 J	8.1 J	ND (0.92)	2.8 J	ND (0.34)	ND (0.62)	ND (0.93)	ND (49)	ND (1.1)	ND (0.15)	ND (0.57)	2,400	56 J	5	7.8	7.8
	02/16/17	2 - 3	N	4,700	250	25	61	20	240	18	ND (110)	4.6 J	39	7.4 J	ND (3,400)	7.1 J	ND (0.16)	2 J	48,000 J	320	250	320	320
	02/16/17	5 - 6	N	400	29	2.7 J	3.2 J	ND (2.9)	14	ND (1.6)	7 J	ND (0.27)	ND (1.8)	ND (0.68)	ND (190)	1.3 J	ND (0.11)	0.59 J	4,700	48	15	19	19
	02/16/17	9 - 10	N	380	23	2.3 J	ND (1.6)	2.4 J	9.2 J	ND (0.64)	ND (3.8)	ND (0.4)	ND (0.94)	ND (0.16)	ND (130)	ND (0.45)	ND (0.13)	ND (0.39)	6,200	43	9.3	15	15

Notes:

Category 1: Validated data suitable for all uses, including risk assessment and remedial action decisions.
Category 2: Validated data suitable for use in characterization of the chemicals of potential concern at the facility and to help define the nature and extent of contamination.
Category 3: Validated data suitable only for use in qualitative characterization of the nature and extent of contamination.
Results greater than or equal to the Interim Screening Level are circled.

--	not analyzed
ft bgs	feet below ground surface
ng/kg	nanograms per kilogram
DTSC-SL	DTSC Screening Levels
DTSC	California Department of Toxic Substances Control
FD	Field Dupliicate
J	concentration or reporting limit estimated by laboratory or data validation
JR	estimated value, one or more input values is "R" qualified.
N	Primary Sample
NA	NA = not applicable
NE	not established

TABLE B-1b

Sample Results: Dioxins and Furans
SWMU 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

ND	not detected at the listed reporting limit
R	The result has been rejected; identification and/or quantitation could not be verified because critical QC specifications were not met (e.g., a non-detect result obtained for an archive sample following a hold time of greater than one year).
USEPA	USEPA = United States Environmental Protection Agency

1 For individual dioxins and furans, selected value is the lower of the ECV, residential DTSC-SL, or USEPA residential regional screening value, unless the background value is higher. For TEQ values, selected value is the DTSC-SL.

2 United States Environmental Protection Agency (USEPA). 2017. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. November.

3 California Department of Toxic Substances Control (DTSC). 2018. Human Health Risk Assessment (HHRA) Note Number 3. JanuaryCalifornia Department of Toxic Substances Control (DTSC). 2017. Human Health Risk Assessment (HHRA) Note 2, Soil Remedial Goals for Dioxins and Dioxin-like Compounds for Consideration at California Hazardous Waste Sites. April.

4 ARCADIS. 2008. "Technical Memorandum 3: Ecological Comparison Values for Metals and Polycyclic Aromatic Hydrocarbons in Soil." May 28. ARCADIS. 2009. "Topock Compression Station - Final Technical Memorandum 4: Ecological Comparison Values for Additional Dectected Chemicals in Soil." July 1.

5 CH2M. 2017. Revised Ambient Study of Dioxins and Furans at the Pacific Gas and Electric Company, Topock Compressor Station, Needles, California. October.

Calculations:

TEQ = Sum of Result xToxic equivalency factor (TEF), 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TEQ Avian = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TEQMammals = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

Teq Humans = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TABLE B-2a
Sample Results: Metals in Soil
AOC 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
Category 1																					
AOC1-BCW1	09/20/08	0 - 0.5	N	ND (2) *	4.3	160	ND (1) *	ND (1)	ND (0.401)	23	6.4	11	7.5	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	26	44
	09/20/08	2 - 3	N	ND (2) *	8.4	160	ND (1) *	ND (1)	ND (0.404)	25	9.4	15	2	ND (0.1) *	ND (1)	19	ND (1)	ND (1)	ND (2) *	40	28
AOC1-BCW2	10/04/08	0 - 0.5	N	ND (2) *	3.4	96	ND (1) *	ND (1)	ND (0.403)	21	6	7.6	3.7	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	23	40
	10/04/08	2 - 3	N	ND (2) *	3.1	110	ND (1) *	ND (1)	ND (0.407)	34	7.1	9.2	18	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	30	39
	10/04/08	5 - 6	N	ND (2) *	3.1	100	ND (1) *	ND (1)	ND (0.404)	35	7.1	8.8	4.4	ND (0.1) *	1.5	12	ND (1)	ND (1)	ND (2) *	28	41
	10/04/08	9 - 10	N	ND (2.1) *	3.8	120	ND (1.1) *	ND (1.1) *	ND (0.426)	20	8.7	8.1	3.8	ND (0.1) *	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.1) *	38	39
AOC1-BCW3	10/04/08	0 - 0.5	N	ND (2) *	4.4	140	ND (1) *	ND (1)	0.416	25	6.4	11	7.3	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	27	51
	10/04/08	2 - 3	N	ND (2) *	3.2	99	ND (1) *	ND (1)	ND (0.404)	25	7.5	9.8	4	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	30	38
	10/04/08	5 - 6	N	ND (2.1) *	4.2	170	ND (2.1) *	ND (1)	ND (0.415)	23	11	9.6	2.2	ND (0.1) *	ND (2.1) *	14	ND (1)	ND (2.1)	ND (4.1) *	36	43
	10/04/08	9 - 10	N	ND (2.1) *	4	120	ND (1.1) *	ND (1.1) *	ND (0.421)	21	9	8.5	2.2	ND (0.11) *	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.1) *	36	38
	10/04/08	9 - 10	FD	ND (2.1) *	4.2	130	ND (1.1) *	ND (1.1) *	ND (0.424)	22	9.3	8.8	2.3	ND (0.11) *	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.1) *	37	41
AOC1-BCW4	10/04/08	0 - 0.5	N	ND (2) *	4.4	180	ND (1) *	ND (1)	1.3	36	8.3	13	9.4	ND (0.1) *	ND (1)	16	ND (1)	ND (1)	ND (2) *	33	61
	10/04/08	2 - 3	N	ND (2) *	2.9	76	ND (1) *	ND (1)	ND (0.407)	24	5.8	8.3	3.6	ND (0.1) *	ND (1)	9.5	ND (1)	ND (1)	ND (2) *	23	33
	10/04/08	5 - 6	N	ND (2.1) *	4	60	ND (1) *	ND (1)	ND (0.416)	23	9.4	8.4	2.7	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	37	45
	10/04/08	9 - 10	N	ND (2.1) *	5.1	81	ND (2.1) *	ND (1.1) *	ND (0.426)	22	9.7	7.6	2.3	ND (0.11) *	ND (2.1) *	15	ND (1.1)	ND (2.1)	ND (4.3) *	35	42
AOC1-BCW5	10/04/08	0 - 0.5	N	ND (2) *	3.7	160	ND (1) *	ND (1)	0.445	35	8.7	12	6	ND (0.099) *	ND (1)	15	ND (1)	ND (1)	ND (2) *	34	46
	10/04/08	2 - 3	N	ND (2) *	3.5	130	ND (1) *	ND (1)	ND (0.407)	31	7.4	9.6	7	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	30	42
	10/04/08	5 - 6	N	ND (2.1) *	3.9	120	ND (1) *	ND (1)	ND (0.42)	26	9.9	8.4	2.7	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	41	44
	10/04/08	9 - 10	N	ND (2.1) *	4.7	110	ND (2.1) *	ND (1)	ND (0.425)	22	9.2	ND (7.4)	3.2	ND (0.11) *	ND (2.1) *	15	ND (1)	ND (2.1)	ND (4.2) *	35	40
	10/04/08	9 - 10	FD	ND (2.1) *	4.7	110	ND (2.1) *	ND (1.1) *	ND (0.427)	24	9	ND (7.3)	3	ND (0.11) *	ND (2.1) *	15	ND (1.1)	ND (2.1)	ND (4.2) *	34	40
AOC1-BCW6	08/22/08 ‡	0 - 0.5	N	ND (5.7) *	13	320	ND (2.8) *	ND (2.8) *	2.63	71	7.7	22	23	ND (0.14) *	ND (2.8) *	18	ND (2.8) *	ND (2.8)	ND (5.7) *	37	81
	08/22/08 ‡	2 - 3	N	ND (5.8) *	9.3	230	ND (2.9) *	ND (2.9) *	ND (0.608)	21	6.3	14	8.7	ND (0.14) *	ND (2.9) *	13	ND (2.9) *	ND (2.9)	ND (5.8) *	31	50
AOC1-T1a	10/16/08	0 - 0.5	N	ND (2) *	6.5	100	ND (2) *	ND (1)	ND (0.406)	19	7.3	11	4.9	ND (0.1) *	ND (2) *	14	ND (1)	ND (2)	ND (4) *	30	38
	10/16/08	2 - 3	N	ND (2) *	3.2	120	ND (1) *	ND (1)	ND (0.404)	27	7.7	8.6	3.8	ND (0.1) *	2	13	ND (1)	ND (1)	ND (2) *	29	37
	10/16/08	5 - 6	N	ND (2) *	3.5	110	ND (1) *	ND (1)	ND (0.405)	26	7.2	9.5	3.4	ND (0.1) *	2	12	ND (1)	ND (1)	ND (2) *	29	34
	10/16/08	9 - 10	N	ND (2) *	2.4	88	ND (1) *	ND (1)	ND (0.404)	14	7.3	7.5	1.4	ND (0.1) *	ND (1)	9.5	ND (1)	ND (1)	ND (2) *	29	32
AOC1-T1b	10/16/08	0 - 0.5	N	ND (2) *	2.9	88	ND (1) *	ND (1)	ND (0.405)	43 J	8.4	9	3.1	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	36	31
	10/16/08	0 - 0.5	FD	ND (2) *	2.8	86	ND (1) *	ND (1)	ND (0.405)	33 J	8.2	10	3.2	ND (0.1) *	ND (1)	16	ND (1)	ND (1)	ND (2) *	35	32
	10/16/08	2 - 3	N	ND (2.1) *	2.9	210	ND (1) *	ND (1)	ND (1.94) *	98	7.5	12	3.9	ND (0.1) *	ND (1)	16	ND (1)	ND (1)	ND (2.1) *	33	67
	10/16/08	5 - 6	N	ND (2) *	3	99	ND (1) *	ND (1)	0.402	28	7.2	9	3.2	ND (0.1) *	1.7	12	ND (1)	ND (1)	ND (2) *	31	31
	10/16/08	9 - 10	N	ND (2) *	2.6	120	ND (1) *	ND (1)	ND (0.402)	42	8	11	2.6	ND (0.1) *	5	14	ND (1)	ND (1)	ND (2) *	30	32
AOC1-T1c	10/16/08	0 - 0.5	N	ND (2) *	3.2	120	ND (1) *	ND (1)	0.601	44	7.4	13	7.5	ND (0.1) *	1.9	11	ND (1)	ND (1)	ND (2) *	33	53
	10/16/08	2 - 3	N	ND (2.1) *	2.6	150	ND (1) *	ND (1)	4.77 J	140	8	26	20 J	ND (0.1) *	2.5	11 J	ND (1)	ND (1)	ND (2.1) *	33	82 J
	10/16/08	2 - 3	FD	ND (2.1) *	3	170	ND (1) *	ND (1)	3.58 J	150	8.2	29	32 J	ND (0.1) *	2.2	14 J	ND (1)	ND (1)	ND (2.1) *	29	110 J
	10/16/08	5 - 6	N	ND (2) *	3.1	97	ND (1) *	ND (1)	0.446	46	7.2	15	5	ND (0.1) *	3	12	ND (1)	ND (1)	ND (2) *	27	44
	10/16/08	9 - 10	N	ND (2.1) *	2.8	120	ND (1) *	ND (1)	ND (0.418)	20	8.6	11	1.9	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	33	38

TABLE B-2a

Sample Results: Metals in Soil
AOC 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
AOC1-T2a	10/05/08	0 - 0.5	N	ND (2) *	4	110	ND (1) *	ND (1)	ND (0.403)	26	7.1	10	4.8	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	30	38
	10/16/08	2 - 3	N	ND (2) *	6	120	ND (2) *	ND (1)	ND (0.407)	28	8.7	10	4	ND (0.1) *	ND (2) *	15	ND (1)	ND (2)	ND (4) *	32	42
	10/16/08	5 - 6	N	ND (2) *	2.7	110	ND (1) *	ND (1)	ND (0.405)	19	8.1	8.3	2.4	ND (0.1) *	1.1	11	ND (1)	ND (1)	ND (2) *	28	35
	10/16/08	9 - 10	N	ND (2.1) *	2.9	110	ND (1) *	ND (1)	ND (0.416)	15	7.4	7.1	2.1	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2.1) *	27	36
AOC1-T2b	10/16/08	0 - 0.5	N	ND (2) J*	3.6	120	ND (1) *	ND (1)	ND (0.408)	26	7.3	9.3	3.2	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	28	39
	10/16/08	2 - 3	N	ND (2.1) *	3	93	ND (1) *	ND (1)	ND (0.414)	26	6.9	10	3	ND (0.1) *	2.4	11	ND (1)	ND (1)	ND (2.1) *	23	33
	10/16/08	5 - 6	N	ND (2) *	3	89	ND (1) *	ND (1)	ND (0.407)	53	6.7	8.7	2.4	ND (0.1) *	5.5	12	ND (1)	ND (1)	ND (2) *	25	32
	10/16/08	9 - 10	N	ND (2.1) *	2.4	99	ND (1) *	ND (1)	ND (0.415)	18	8.4	8.5	1.8	ND (0.1) *	1.3	12	ND (1)	ND (1)	ND (2.1) *	27	33
	10/16/08	9 - 10	FD	ND (2.1) *	2.3	110	ND (1) *	ND (1)	ND (0.413)	18	8.2	9.6	1.6	ND (0.1) *	1.2	13	ND (1)	ND (1)	ND (2.1) *	29	35
AOC1-T2c	10/08/08	0 - 0.5	N	ND (2) J*	3.7	88	ND (1) *	ND (1)	1.26	60	6.3	10	5.1	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	26	44
	10/08/08	2 - 3	N	ND (2) *	3.1	130	ND (1) *	ND (1)	ND (0.416)	42	8.4	11	3.3	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2) *	34	33
	10/08/08	5 - 6	N	ND (2) *	2.3	81	ND (1) *	ND (1)	ND (0.412)	22	7.2	9.1	1.8	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	31	28
	10/08/08	9 - 10	N	ND (2.1) *	3.7	40	ND (1) *	ND (1)	ND (0.419)	24	9.3	9.7	2.6	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	35	40
AOC1-T2d	10/07/08	0 - 0.5	N	ND (2) *	3	100	ND (1) *	ND (1)	ND (0.408)	46	8.2	10	2.9	ND (0.1) *	2.9	14	ND (1)	ND (1)	ND (2) *	36	36
	10/07/08	2 - 3	N	ND (2.1) *	ND (1)	120	ND (1) *	ND (1)	5.73	970	7.5	13	4.7	ND (0.1) *	1.5	11	ND (1)	ND (1)	ND (2.1) *	34	98
	10/07/08	5 - 6	N	ND (2.1) *	ND (1)	84	ND (1) *	ND (1)	4.34	370	6.9	11	3.9	ND (0.1) *	1.1	11	ND (1)	ND (1)	ND (2.1) *	26	130
	10/07/08	9 - 10	N	ND (2.1) *	4.5	86	ND (2.1) *	ND (1)	2.92	140	10	14	3.1	ND (0.1) *	ND (2.1) *	15	ND (1)	ND (2.1)	ND (4.2) *	33	68
	10/07/08	19 - 20	N	ND (2.1) *	5.8	56	ND (2.1) *	ND (1.1) *	ND (0.423)	26	10	9.2	3	ND (0.11) *	ND (2.1) *	16	ND (1.1)	ND (2.1)	ND (4.2) *	38	45
	10/07/08	29 - 30	N	ND (2.1) *	6.2	38	ND (2.1) *	ND (1)	ND (0.424)	21	8.5	8.9	2.7	ND (0.1) *	ND (2.1) *	14	ND (1)	ND (2.1)	ND (4.2) *	31	37
	10/07/08	29 - 30	FD	ND (2.1) *	9.7	40	ND (5.3) *	ND (1.1) *	ND (0.423)	24	8.7	ND (11)	2.2	ND (0.11) *	ND (5.3) *	16	ND (1.1)	ND (5.3) *	ND (11) *	34	36
	10/07/08	39 - 40	N	ND (2.1) *	6.4	79	ND (2.1) *	ND (1.1) *	ND (0.431)	22	8.9	11	3.6	ND (0.11) *	ND (2.1) *	16	ND (1.1)	ND (2.1)	ND (4.3) *	34	42
	10/07/08	49 - 50	N	ND (2.1) *	4.1	62	ND (1.1) *	ND (1.1) *	ND (0.425)	28	9.3	10	2.1	ND (0.11) *	ND (1.1)	17	ND (1.1)	ND (1.1)	ND (2.1) *	36	38
	10/08/08	59 - 60	N	ND (2) *	5.3	36	ND (2) *	ND (1)	ND (0.406)	39	9	9.8	2.2	ND (0.1) *	4.7	13	ND (1)	ND (2)	ND (4) *	33	32
	10/08/08	69 - 70	N	ND (2.2) *	4.4	41	ND (1.1) *	ND (1.1) *	ND (0.435)	18	9.1	9.8	2.8	ND (0.11) *	2.2	13	ND (1.1)	ND (1.1)	ND (2.2) *	31	31
AOC1-T2e	10/16/08	0 - 0.5	N	ND (2) *	2.9	98	ND (1) *	ND (1)	ND (0.405)	34	7.5	9.3	3.4	ND (0.1) *	2.2	13	ND (1)	ND (1)	ND (2) *	29	36
	10/16/08	2 - 3	N	ND (2) *	2.9	87	ND (1) *	ND (1)	ND (0.408)	30	6.9	8.4	3.2	ND (0.1) *	1.4	12	ND (1)	ND (1)	ND (2) *	27	30
	10/16/08	2 - 3	FD	ND (2) *	3.1	90	ND (1) *	ND (1)	ND (0.408)	32	7.1	8	3.2	ND (0.1) *	1.3	12	ND (1)	ND (1)	ND (2) *	27	33
	10/16/08	5 - 6	N	ND (2) *	2.6	98	ND (1) *	ND (1)	ND (0.402)	44	7	8.4	2.3	ND (0.1) *	5.4	12	ND (1)	ND (1)	ND (2) *	26	32
	10/16/08	9 - 10	N	ND (2.1) *	2.5	100	ND (1) *	ND (1)	ND (0.415)	20	6.4	4.9	1.1	ND (0.1) *	1.1	9	ND (1)	ND (1)	ND (2.1) *	24	27
AOC1-T3a	10/05/08	0 - 0.5	N	ND (2) *	4.1	150	ND (1) *	ND (1)	ND (0.403)	24	7.8	11	8.4	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	33	47
	10/17/08	2 - 3	N	ND (2) *	4.4	110	ND (1) *	ND (1)	ND (0.407)	19	7.1	9	4.2	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	29	37
	10/17/08	5 - 6	N	ND (2) *	4.2	110	ND (1) *	ND (1)	ND (0.405)	23	7	12	14	ND (0.1) *	1.7	12	ND (1)	ND (1)	ND (2) *	28	39
	10/17/08	9 - 10	N	ND (2) *	2.9	99	ND (1) *	ND (1)	ND (0.406)	15	7.2	10	1.9	ND (0.1) *	ND (1)	9.8	ND (1)	ND (1)	ND (2) *	26	33
AOC1-T3b	10/05/08	0 - 0.5	N	ND (2) *	2.6	78	ND (1) *	ND (1)	ND (0.402)	23	7	8	3.1	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	35	29
	10/17/08	2 - 3	N	ND (2.1) *	3.1	120	ND (1) *	ND (1)	2.77	170	6.5	13	9.1	ND (0.11) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	26	120
	10/17/08	5 - 6	N	ND (2) *	2.3	92	ND (1) *	ND (1)	ND (0.405)	46	7	8.6	2.3	ND (0.1) *	4.6	12	ND (1)	ND (1)	ND (2) *	25	34
	10/17/08	9 - 10	N	ND (2) *	2.7	110	ND (1) *	ND (1)	ND (0.41)	17	7.3	7.7	1.7	ND (0.1) *	1.1	9.4	ND (1)	ND (1)	ND (2) *	28	31
	10/17/08	9 - 10	FD	ND (2.1) *	2.5	110	ND (1) *	ND (1)	ND (0.412)	16	7.2	6.5	1.9	ND (0.1) *	1.1	9.5	ND (1)	ND (1)	ND (2.1) *	29	32

TABLE B-2a

Sample Results: Metals in Soil

AOC 1 – Area around Former Percolation Bed

Soil Engineering Evaluation/Cost Analysis

PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
AOC1-T3c	10/05/08	0 - 0.5	N	ND (2) *	4.6	130	ND (1) *	ND (1)	0.42	27	6.5	11	7	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	29	46
	10/05/08	2 - 3	N	ND (2) *	3.5	98	ND (1) *	ND (1)	ND (0.41)	30	8.9	9.7	3.4	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	33	39
	10/05/08	5 - 6	N	ND (2) *	3.7	130	ND (1) *	ND (1)	1.65	89	8.8	12	5.8	ND (0.1) *	1.4	14	ND (1)	ND (1)	ND (2) *	34	65
	10/05/08	9 - 10	N	ND (2) *	2.7	94	ND (1) *	ND (1)	ND (0.403)	19	8.2	10	2.4	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	32	36
AOC1-T4a	10/03/08	0 - 0.5	N	ND (2) *	4.2	120	ND (1) *	ND (1)	ND (0.402)	28	7.3	11	5.5	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	26	51
	10/03/08	2 - 3	N	ND (2) *	3.9	99	ND (1) *	ND (1)	ND (0.407)	26	7.7	10	4	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	31	40
	10/03/08	5 - 6	N	ND (2) *	4	89	ND (1) *	ND (1)	ND (0.409)	25	8.3	11	3.3	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	34	40
	10/03/08	9 - 10	N	ND (2) *	3.7	160	ND (1) *	ND (1)	0.525	26	6.9	9.6	4.3	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	28	36
AOC1-T4b	10/02/08	0 - 0.5	N	ND (2) *	2.9	83	ND (1) *	ND (1)	1.26	21	6.3	7.5	2.6	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	22	29
	10/02/08	2 - 3	N	ND (2) *	3.7	120	ND (1) *	ND (1)	ND (0.412)	29	7.6	12	8.8 J	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	33	46
	10/02/08	2 - 3	FD	ND (2) *	3.5	110	ND (1) *	ND (1)	ND (0.408)	28	7.2	11	7 J	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	31	50
	10/02/08	5 - 6	N	ND (2.1) *	3.6	110	ND (1) *	ND (1)	ND (0.419)	24	9.9	9.6	3.2	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	33	39
	10/02/08	9 - 10	N	ND (2.1) *	3.2	100	ND (1) *	ND (1)	ND (0.415)	19	7.7	8.8	2.4	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	31	37
AOC1-T4c	10/04/08	0 - 0.5	N	ND (2) J*	4.2	100	ND (1) *	ND (1)	ND (0.403)	19	5.5	22	5.9	ND (0.1) *	ND (1)	9.4	ND (1)	ND (1)	ND (2) *	25	33
	10/04/08	2 - 3	N	ND (2) *	3.8	130	ND (1) *	ND (1)	0.816	27	8.9	19	14	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	38	67
	10/04/08	5 - 6	N	ND (2) *	3.3	150	ND (1) *	ND (1)	0.868	28	9.2	21	19	ND (0.1) *	1.3	13	ND (1)	ND (1)	ND (2) *	36	71
	10/04/08	9 - 10	N	ND (2.1) *	3.1	120	ND (1) *	ND (1)	ND (0.413)	27	8.3	13	5.8	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	35	47
AOC1-T5a	10/04/08	0 - 0.5	N	ND (2) *	3.1	150	ND (1) *	ND (1)	ND (0.402)	21	7.8	13	4	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	33	41
	10/04/08	2 - 3	N	ND (2) *	2.8	95	ND (1) *	ND (1)	ND (0.403)	39	9	10	3.2	ND (0.099) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	32	38
	10/04/08	5 - 6	N	ND (2) *	3.8	99	ND (1) *	ND (1)	ND (0.405)	35	9	24	3.4	ND (0.1) *	2.2	17	ND (1)	ND (1)	ND (2) *	32	38
	10/04/08	9 - 10	N	ND (2) *	2.6	110	ND (1) *	ND (1)	ND (0.411)	24	7.4	11	3.6	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	30	38
	10/04/08	9 - 10	FD	ND (2) *	2.4	110	ND (1) *	ND (1)	ND (0.409)	27	7.8	11	3.1	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	30	38
AOC1-T5b	10/04/08	0 - 0.5	N	ND (2) J*	2.4	73	ND (1) *	ND (1)	ND (0.402)	26	6.8	11	4.9	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	28	33
	10/04/08	2 - 3	N	ND (2) *	3.3	110	ND (1) *	ND (1)	0.452	41	7.2	9.5	4.4	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	32	38
	10/04/08	5 - 6	N	ND (2) *	3.4	120	ND (1) *	ND (1)	0.596	61	7.9	9.8	4.8	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	31	41
	10/04/08	9 - 10	N	ND (2) *	3.5	120	ND (1) *	ND (1)	ND (0.409)	23	9.6	13	3.4	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	39	41
AOC1-T5c	10/04/08	0 - 0.5	N	ND (2) *	3.7	140	ND (1) *	ND (1)	ND (0.403)	15	6.7	8.8	5.8	ND (0.1) *	ND (1)	8.7	ND (1)	ND (1)	ND (2) *	27	37
	10/04/08	2 - 3	N	ND (2) *	3.3	150	ND (1) *	ND (1)	0.875	31	8.6	12	7.5	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	35	53
	10/04/08	5 - 6	N	ND (2) *	3.1	130	ND (1) *	ND (1)	0.641	36	7.2	12	11	ND (0.099) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	31	49
	10/04/08	9 - 10	N	ND (2) *	3.5	130	ND (1) *	ND (1)	0.478	21	7.7	9.8	3.9	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	32	39
AOC1-T6a	09/30/08	0 - 0.5	N	ND (2) *	3.2	96	ND (1) *	ND (1)	ND (0.402)	20	6.3	11	5.6	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	28	47
	09/30/08	2.5 - 3	N	ND (2) *	3.2	110	ND (1) *	ND (1)	ND (0.408)	20	6.9	8.9	5.6	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	29	36
	09/30/08	2.5 - 3	FD	ND (2) *	3.1	100	ND (1) *	ND (1)	ND (0.407)	21	6.6	8.8	5.4	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	31	40
	09/30/08	5.5 - 6	N	ND (2) *	2.3	94	ND (1) *	ND (1)	ND (0.408)	16	7.2	7.9	3.9	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	33	34
	09/30/08	9.5 - 10	N	ND (2) *	3.2	110	ND (1) *	ND (1)	ND (0.41)	20	7	8.7	12	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	32	40
AOC1-T6b	09/30/08	0 - 0.5	N	ND (2) *	3	110	ND (1) *	ND (1)	ND (0.401)	26	6.3	9	5.5	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	31	41
	09/30/08	2.5 - 3	N	ND (2) *	3.4	130	ND (1) *	ND (1)	ND (0.404)	18	5.7	7.1	4.4	ND (0.1) *	ND (1)	8.5	ND (1)	ND (1)	ND (2) *	25	29
	09/30/08	5.5 - 6	N	ND (2) *	2.9	100	ND (1) *	ND (1)	ND (0.404)	22	7.3	10	3.2	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	30	36
	09/30/08	9.5 - 10	N	ND (2) *	2.8	94	ND (1) *	ND (1)	ND (0.405)	25	7	9.3	3.1 J	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	30	37
	09/30/08	9.5 - 10	FD	ND (2) *	3	110	ND (1) *	ND (1)	ND (0.404)	27	7.9	10	8.5 J	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	33	39

TABLE B-2a
Sample Results: Metals in Soil
AOC 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				0.285	11	410	0.672	1.1	0.83	39.8	12.7	16.8	8.39	0.0125	1.37	27.3	1.47	5.15	0.78	52.2	58
Residential Regional Screening Levels [2]:				31	0.68	15,000	160	71	0.3	120,000	23	3,100	400	11	390	1,500	390	390	0.78	390	23,000
Residential DTSC-SL [3]:				NE	0.11	NE	15	5.2	NE	36,000	NE	NE	80	1	NE	490	NE	390	NE	390	NE
Ecological Comparison Values [4]:				0.285	11.4	330	23.3	0.0151	139.6	36.3	13	20.6	0.0166	0.0125	2.25	0.607	0.177	5.15	2.32	13.9	0.164
Background [5]:				NE	11	410	0.672	1.1	0.83	39.8	12.7	16.8	8.39	NE	1.37	27.3	1.47	NE	NE	52.2	58
Location	Date	Depth (ft bgs)	Sample Type	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium, Hexavalent	Chromium, total	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
AOC1-T6c	09/30/08	0 - 0.5	N	ND (2) *	2.9	81	ND (1) *	ND (1)	ND (0.401)	18	6.4	8.7	3.2	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	25	39
	09/30/08	2.5 - 3	N	ND (2) *	5.1	94	ND (1) *	ND (1)	ND (0.407)	26	6.6	9.7	5.1	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	29	37
	09/30/08	5.5 - 6	N	ND (2) *	2.4	110	ND (1) *	ND (1)	ND (0.406)	21	9	9.4	2.9	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	32	37
AOC4-1	10/14/08	0 - 0.5	N	ND (2) J*	3.7	440 J	ND (1) *	ND (1)	0.49	47	6.7	16	8.5	ND (0.1) *	ND (1)	19	ND (1)	ND (1)	ND (2) *	23	48
	10/14/08	0.5 - 1	N	ND (2) *	4	120	ND (1) *	ND (1)	ND (0.404)	32	9.6	13	10	ND (0.1) *	ND (1)	17	ND (1)	ND (1)	ND (2) *	32	47
	10/14/08	2 - 3	N	ND (2) *	3.6	120	ND (1) *	ND (1)	ND (0.405)	20	7.4	12	17	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	30	39
AOC1-1	01/23/16	0 - 0.5	N	ND (2.1) *	3.5	93	ND (1) *	ND (1)	12	410	6.8	14	5.4	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2.1) *	31	74
	01/23/16	2 - 3	N	ND (2) *	2.5	120	ND (1) *	ND (1)	4.1	290	7.6	14	4.5	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	35	74
	01/23/16	5 - 6	N	ND (2) *	2.3	130	ND (1) *	ND (1)	ND (0.2)	15	7	9	2.6	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	31	34
	01/23/16	9 - 10	N	ND (2) *	1.5	99	ND (1) *	ND (1)	ND (0.2)	17	7.7	9.6	2.1	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	36	35
	01/23/16	14 - 15	N	ND (2) *	1.8	130	ND (1) *	ND (1)	ND (0.2)	18	9	11	1.8	ND (0.1) *	ND (1)	15 J	ND (1)	ND (1)	ND (2) *	32	36
	01/23/16	14 - 15	FD	ND (2) *	1.5	130	ND (1) *	ND (1)	ND (0.2)	19	8.5	12	1.9	ND (0.1) *	ND (1)	12 J	ND (1)	ND (1)	ND (2) *	35	36
	01/24/16	19 - 20	N	ND (2) *	1.1	100	ND (1) *	ND (1)	ND (0.2)	18	8.7	9	1.3	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	36	39
	01/24/16	29 - 30	N	ND (2.1) *	1.5	100	ND (1) *	ND (1)	ND (0.21)	16	9.5	12	2.3	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	36	41
AOC1-2	01/23/16	0 - 0.5	N	ND (2.1) *	2.2	110	ND (1) *	ND (1)	ND (0.21)	20	7.9	9.1	4.2	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	35	38
	01/23/16	2 - 3	N	ND (2) J*	1.7	180	ND (1) *	ND (1)	ND (0.2)	18 J	8	9.1	1.9	ND (0.1) *	ND (1)	12	ND (1) J	ND (1)	ND (2) *	31	36
	01/23/16	5 - 6	N	ND (2) *	1.7	130	ND (1) *	ND (1)	ND (0.2)	19	8.7	11	1.8	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	32	36
	01/23/16	9 - 10	N	ND (2) *	ND (1)	74	ND (1) *	ND (1)	ND (0.2)	18	6.7	6.3	1	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	25	28
	01/23/16	14 - 15	N	ND (2) *	ND (1)	92	ND (1) *	ND (1)	ND (0.2)	13	7.9	8.1	1	ND (0.1) *	ND (1)	8.5	ND (1)	ND (1)	ND (2) *	35	34
	01/23/16	19 - 20	N	ND (2) *	1.5	73	ND (1) *	ND (1)	ND (0.2)	16 J	7.8	7.7	1.5	ND (0.1) *	ND (1)	12 J	ND (1)	ND (1)	ND (2) *	30	35
	01/23/16	20 - 30	FD	ND (2) *	1.4	84	ND (1) *	ND (1)	ND (0.2)	13 J	7.6	8	1.3	ND (0.1) *	ND (1)	9.4 J	ND (1)	ND (1)	ND (2) *	33	36
	01/23/16	29 - 30	N	ND (2) *	1.1	94	ND (1) *	ND (1)	ND (0.2)	15	7.8	7.6	1.2	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	31	31
AOC1-3	01/25/16	0 - 0.5	N	ND (2.1) *	3	100	ND (1) *	ND (1)	14	410	7.9	13	3.7	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	37	90
	01/25/16	2 - 3	N	ND (2) *	2.4	110	ND (1) *	ND (1)	3.7	210	8.6	11	3.3	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	36	60
	01/25/16	5 - 6	N	ND (2) *	1.2	130	ND (1) *	ND (1)	ND (0.2)	24	8.6	14	1.5	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	37	39
	01/25/16	9 - 10	N	ND (2) *	1.3	97	ND (1) *	ND (1)	ND (0.2)	13	7.5	7.7	1.4	ND (0.1) *	ND (1)	8.9	ND (1)	ND (1)	ND (2) *	33	32
	01/25/16	14 - 15	N	ND (2) *	1.8	110	ND (1) *	ND (1)	ND (0.2)	17	8.1	10	1.4	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	38	40
	01/25/16	14 - 15	FD	ND (2) *	1.4	110	ND (1) *	ND (1)	ND (0.2)	19	8.3	9.8	1.3	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	37	43
	01/25/16	19 - 20	N	ND (2) *	1.5	120	ND (1) *	ND (1)	ND (0.2)	19	9.5	11	1.6	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	42	38
	01/25/16	29 - 30	N	ND (2) *	1.3	66	ND (1) *	ND (1)	ND (0.2)	15	7.5	11	2.2	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	34	34
	01/25/16	39 - 40	N	ND (2.2) *	2.7	40	ND (1.1) *	ND (1.1) *	ND (0.22)	22	9.7	10	1.7	ND (0.11) *	ND (1.1)	18	ND (1.1)	ND (1.1)	ND (2.2) *	35	39
	01/25/16	49 - 50	N	ND (2.1) *	2.8	42	ND (1.1) *	ND (1.1) *	ND (0.21)	23	11	14	2.3	ND (0.11) *	ND (1.1)	19	ND (1.1)	ND (1.1)	ND (2.1) *	45	42
	01/25/16	59 - 60	N	ND (2.1) *	4	42	ND (1.1) *	ND (1.1) *	ND (0.21)	39	10	14	2.2	ND (0.11) *	ND (1.1)	23	ND (1.1)	ND (1.1)	ND (2.1) *	45	42
	01/26/16	69 - 70	N	ND (2.1) *	2.2	64	ND (1) *	ND (1)	ND (0.21)	20	8.9	19	1.5	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	35	38
	01/26/16	79 - 80	N	ND (2.1) *	2.4	86	ND (1) *	ND (1)	ND (0.21)	17	7.1	13	1.3	ND (0.11) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	29	31

TABLE B-2a

Sample Results: Metals in Soil

AOC 1 – Area around Former Percolation Bed

Soil Engineering Evaluation/Cost Analysis

PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium, Hexavalent	Chromium, total	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
AOC1-4	01/23/16	0 - 0.5	N	ND (2) *	1.9	82	ND (1) *	ND (1)	ND (0.2)	13	6.7	7	1.9	ND (0.1) *	ND (1)	9	ND (1)	ND (1)	ND (2) *	26	35
	01/23/16	2 - 3	N	ND (2) *	2	110	ND (1) *	ND (1)	ND (0.2)	19	7.7	8.7	3	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	32	30
	01/23/16	5 - 6	N	ND (2) *	1.8	84	ND (1) *	ND (1)	ND (0.2)	14	6.8	10	2.9	ND (0.1) *	ND (1)	9.5	ND (1)	ND (1)	ND (2) *	30	31
	01/23/16	9 - 10	N	ND (2) *	1.8	90	ND (1) *	ND (1)	ND (0.2)	14	7	9.3	2.2	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	31	33
	01/23/16	14 - 15	N	ND (2) *	1.8	95	ND (1) *	ND (1)	ND (0.2)	35	7.6	9.1	2	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	33	35
	01/23/16	19 - 20	N	ND (2) *	1.6	99	ND (1) *	ND (1)	ND (0.2)	16	8.4	8.4	1.2	ND (0.1) J*	ND (1)	12	ND (1)	ND (1)	ND (2) *	33	37
	01/23/16	19 - 20	FD	ND (2) J*	1.6	110 J	ND (1) *	ND (1)	ND (0.2)	21	9.9	11	1.3	ND (0.1) *	ND (1)	15	ND (1) J	ND (1)	ND (2) *	39	43 J
	01/23/16	29 - 30	N	ND (2.1) *	2.5	1,400	ND (1.1) *	ND (1.1) *	ND (0.21)	16	8.1	7.9	2.2	ND (0.1) *	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.1) *	32	39
AOC1-5	01/09/17	0 - 0.5	N	ND (2.1) *	1.3	65	ND (1) *	ND (1)	ND (0.21)	14	7.2	7.3	1.5	ND (0.1) *	ND (1)	9.7	ND (1) J	ND (1)	ND (2.1) *	28	26
	01/09/17	2 - 3	N	ND (2.1) *	1.6	76	ND (1) *	ND (1)	ND (0.21)	24	8.8	8.7	ND (1)	ND (0.1) *	ND (1)	12	ND (1) J	ND (1)	ND (2.1) *	42	32
	01/09/17	5 - 6	N	ND (2.1) *	1.4	77	ND (1) *	ND (1)	ND (0.21)	19	7.6	7.9	2.1	ND (0.1) *	ND (1)	10	ND (1) J	ND (1)	ND (2.1) *	27	45
	01/09/17	9 - 10	N	ND (2.1) *	ND (1)	110	ND (1) *	ND (1)	ND (0.21)	13	7.2	9.5	ND (1)	ND (0.1) *	ND (1)	8.6	ND (1) J	ND (1)	ND (2.1) *	29	28
	01/09/17	14 - 15	N	ND (2.1) *	1.7	51	ND (1.1) *	ND (1.1) *	ND (0.21)	18	8.4	8.3	1.9	ND (0.11) *	ND (1.1)	13	ND (1.1) J	ND (1.1)	ND (2.1) *	29	34
AOC1-6	01/09/17	0 - 0.5	N	ND (2.1) *	1.8	69	ND (1) *	ND (1)	0.22	23	8.4	11	2.9	ND (0.1) *	ND (1)	11	ND (1) J	ND (1)	ND (2.1) *	30	34
	01/09/17	2 - 3	N	ND (2.1) *	1.1	60	ND (1) *	ND (1)	ND (0.21)	17	7.1	6.7	1.2	ND (0.1) *	ND (1)	9.4	ND (1) J	ND (1)	ND (2.1) *	25	27
	01/09/17	5 - 6	N	ND (2.1) *	1.3	92	ND (1) *	ND (1)	ND (0.21)	14	8.3	8.8	ND (1)	ND (0.1) *	ND (1)	9.4	ND (1) J	ND (1)	ND (2.1) *	29	30
	01/09/17	9 - 10	N	ND (2.1) *	2.1	50	ND (1) *	ND (1)	ND (0.21)	21	9.9	8.3	1.5	ND (0.1) *	ND (1)	13	ND (1) J	ND (1)	ND (2.1) *	36	35
	01/09/17	14 - 15	N	ND (2.1) *	2.8	52	ND (1) *	ND (1)	ND (0.21)	23	9.4	7.3	1.6	ND (0.1) *	ND (1)	17	ND (1) J	ND (1)	ND (2.1) *	32	38
AOC16-5	02/20/17	0 - 0.5	N	ND (2.1) *	1.5	130	ND (1) *	1.4	0.56	28 J	5.7 J	18 J	29 J	---	ND (1)	9.8 J	ND (1) J	ND (1)	ND (2.1) J*	20 J	46 J
	02/20/17	0 - 0.5	FD	ND (2.1) *	1.7	130	ND (1) *	1.3	0.61	22 J	8.1 J	11 J	3.9 J	0.12	ND (1)	14 J	ND (1) J	ND (1)	ND (2.1) J*	25 J	36 J
	02/20/17	2 - 3	N	ND (2.1) *	1.3	84	ND (1) *	1.1	ND (0.21)	13	7.6	28	1.3	ND (0.1) *	ND (1)	12	ND (1) J	ND (1)	ND (2.1) J*	22	25
AOC1-7	01/09/17	0 - 0.5	N	ND (2.1) *	1.6 J	56	ND (1) *	ND (1)	ND (0.21)	14	6.4	9.4	1.6	ND (0.1) *	ND (1)	9.3 J	ND (1) J	ND (1)	ND (2.1) *	21	28 J
	01/09/17	2 - 3	N	ND (2.1) *	1.7	62	ND (1) *	ND (1)	ND (0.21)	20	9.5	9	1.9	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	34	35
	01/09/17	2 - 3	FD	ND (2.1) *	1.6	56	ND (1) *	ND (1)	ND (0.21)	18	8.6	7.1	1.4	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	30	33
	01/09/17	5 - 6	N	ND (2.1) *	1.6	51	ND (1) *	ND (1)	ND (0.21)	18	9.3	6.3	1.1	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	33	35
	01/09/17	9 - 10	N	ND (2.1) *	1.9	86	ND (1) *	ND (1)	ND (0.21)	25	11	8.8	1.6	ND (0.1) *	ND (1)	16	ND (1)	ND (1)	ND (2.1) *	38	42
	01/09/17	14 - 15	N	ND (2.1) *	1.9	61	ND (1) *	ND (1)	ND (0.21)	22	10	9.2	1.3	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	36	38
AOC1-8	01/05/17	0 - 0.5	N	ND (2.1) *	2.2	110	ND (1.1) *	ND (1.1) *	ND (0.21)	26	6.1	12	4.1	ND (0.11) *	ND (1.1)	9.9	ND (1.1) J	ND (1.1)	ND (2.1) J*	22	41
	01/05/17	2 - 3	N	ND (2.4) *	2.4	130	ND (1.2) *	ND (1.2) *	0.24	16	5.8	10	12	ND (0.12) *	ND (1.2)	7.3	ND (1.2) J	ND (1.2)	ND (2.4) J*	24	40
AOC1-BCW10	02/04/16	0 - 0.5	N	ND (2.1) *	3.6	190	ND (1) *	ND (1)	ND (0.21)	52	8.5	16	11	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	33	65
	02/04/16	2 - 3	N	ND (2.1) *	3.4	190	ND (1) *	ND (1)	0.42	66	8.8	15	11	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	32	63
	02/04/16	5 - 6	N	ND (2) *	1.7	100	ND (1) *	ND (1)	ND (0.2)	17	7.8	9.5	1.1	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	30	35
	02/04/16	9 - 10	N	ND (2.1) *	2.6	150	ND (1) *	ND (1)	ND (0.21)	25 J	11	7.9	1.8	ND (0.11) *	ND (1)	16	ND (1)	ND (1)	ND (2.1) *	40	49
	02/04/16	9 - 10	FD	ND (2.1) *	2.5	160	ND (1.1) *	ND (1.1) *	ND (0.21)	19 J	11	8.2	1.9	ND (0.11) *	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.1) *	41	44
AOC1-BCW11	02/04/16	0 - 0.5	N	ND (2.1) *	4.4	180	ND (1.1) *	ND (1.1) *	ND (0.21) J	19	6.6	14	8.5	ND (0.11) *	ND (1.1)	12	ND (1.1)	ND (1.1)	ND (2.1) *	25	54
	02/04/16	2 - 3	N	ND (2) *	2.5	180	ND (1) *	ND (1)	0.36	38	11	15	6.3	ND (0.1) *	ND (1)	17	ND (1)	ND (1)	ND (2) *	41	54
	02/04/16	5 - 6	N	ND (2.1) *	3.3	210	ND (1) *	ND (1)	0.5	54	10	16	7.3	ND (0.1) *	ND (1)	18	ND (1)	ND (1)	ND (2.1) *	38	62
	02/04/16	9 - 10	N	ND (2.2) *	2.1	91	ND (1.1) *	ND (1.1) *	ND (0.22)	11	6.5	6	ND (1.1)	ND (0.11) *	ND (1.1)	7.3	ND (1.1)	ND (1.1)	ND (2.2) *	22	27

TABLE B-2a
Sample Results: Metals in Soil
AOC 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				0.285	11	410	0.672	1.1	0.83	39.8	12.7	16.8	8.39	0.0125	1.37	27.3	1.47	5.15	0.78	52.2	58
Residential Regional Screening Levels [2]:				31	0.68	15,000	160	71	0.3	120,000	23	3,100	400	11	390	1,500	390	390	0.78	390	23,000
Residential DTSC-SL [3]:				NE	0.11	NE	15	5.2	NE	36,000	NE	NE	80	1	NE	490	NE	390	NE	390	NE
Ecological Comparison Values [4]:				0.285	11.4	330	23.3	0.0151	139.6	36.3	13	20.6	0.0166	0.0125	2.25	0.607	0.177	5.15	2.32	13.9	0.164
Background [5]:				NE	11	410	0.672	1.1	0.83	39.8	12.7	16.8	8.39	NE	1.37	27.3	1.47	NE	NE	52.2	58
Location	Date	Depth (ft bgs)	Sample Type	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium, Hexavalent	Chromium, total	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
AOC1-BCW12	02/04/16	0 - 0.5	N	ND (2.2) *	4.3	200	ND (1.1) *	ND (1.1) *	ND (0.23)	29	7.5	15	9.8	ND (0.11) *	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.2) *	30	74
	02/04/16	2 - 3	N	ND (2.3) *	4	190	ND (1.1) *	ND (1.1) *	0.8	48	7.7	17	10	ND (0.11) *	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.3) *	31	58
	02/04/16	5 - 6	N	ND (2.1) *	2.5	110	ND (1.1) *	ND (1.1) *	ND (0.21)	12	6.2	6.9	2	ND (0.11) *	ND (1.1)	8.3	ND (1.1)	ND (1.1)	ND (2.1) *	24	30
	02/04/16	9 - 10	N	ND (2.1) *	2.1	92	ND (1.1) *	ND (1.1) *	ND (0.21)	13	7.3	6.5	1.3	ND (0.11) *	ND (1.1)	8.2	ND (1.1)	ND (1.1)	ND (2.1) *	26	29
AOC1-BCW13	02/04/16	0 - 0.5	N	ND (2.1) *	3.7	190	ND (1.1) *	ND (1.1) *	ND (0.21)	29	8	16	8.7	ND (0.11) *	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.1) *	31	62
	02/04/16	2 - 3	N	ND (2.1) *	2.4	190	ND (1.1) *	ND (1.1) *	0.22	22	10	17	1.5	ND (0.11) *	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.1) *	39	44
	02/04/16	5 - 6	N	ND (2.2) *	3.4	73	ND (1.1) *	ND (1.1) *	ND (0.22)	17	9.3	11	2	ND (0.11) *	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.2) *	34	39
	02/04/16	9 - 10	N	ND (2.2) *	2.5	140	ND (1.1) *	ND (1.1) *	ND (0.22)	16	8.6	6.5	1.5	ND (0.11) *	ND (1.1)	11	ND (1.1)	ND (1.1)	ND (2.2) *	30	35
AOC1-BCW14	02/04/16	0 - 0.5	N	ND (2.1) *	2.5	150	ND (1.1) *	ND (1.1) *	ND (0.21)	28	9.5	12	4.7	ND (0.11) *	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.1) *	39	49
	02/04/16	2 - 3	N	ND (2.1) *	2.5	110	ND (1) *	ND (1)	0.23	15	7.7	10	3.6	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2.1) *	32	34
	02/04/16	5 - 6	N	ND (2.1) J*	ND (1)	88 J	ND (1) *	ND (1)	ND (0.21)	14	8	8.8	1.3	ND (0.1) *	ND (1)	9.6	ND (1) J	ND (1)	ND (2.1) *	29	34
	02/04/16	9 - 10	N	ND (2.1) *	4.5	280	ND (1.1) *	ND (1.1) *	ND (0.21)	19	11	22	1.2	ND (0.11) *	ND (1.1)	18	ND (1.1)	ND (1.1)	ND (2.1) *	37	29
AOC1-BCW15	02/04/16	0 - 0.5	N	ND (2.3) *	4.7	180	ND (1.2) *	ND (1.2) *	ND (0.23)	21	6.6	15	9.2	ND (0.12) *	ND (1.2)	12	ND (1.2)	ND (1.2)	ND (2.3) *	27	52
	02/04/16	2 - 3	N	ND (2.5) *	2.5	140	ND (1.2) *	ND (1.2) *	0.54	43	7	17	9.9	ND (0.13) *	ND (1.2)	12	ND (1.2)	ND (1.2)	ND (2.5) *	29	49
	02/04/16	5 - 6	N	ND (2.2) *	ND (1.1)	95	ND (1.1) *	ND (1.1) *	ND (0.22)	14	8.5	6.6	1.4	ND (0.11) *	ND (1.1)	9.9	ND (1.1)	ND (1.1)	ND (2.2) *	32	39
	02/04/16	9 - 10	N	ND (2.2) *	ND (1.1)	140	ND (1.1) *	ND (1.1) *	ND (0.22)	16	7.5	6.9	ND (1.1)	ND (0.11) *	ND (1.1)	12	ND (1.1)	ND (1.1)	ND (2.2) *	29	37
AOC1-BCW16	02/04/16	0 - 0.5	N	ND (2.2) *	2.4	150	ND (1.1) *	ND (1.1) *	ND (0.22)	30	8.9	13	5.8	ND (0.11) *	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.2) *	38	46
	02/04/16	2 - 3	N	ND (2.4) *	4.2	200	ND (1.2) *	ND (1.2) *	0.36	50	7.4	18	12	ND (0.12) *	ND (1.2)	12	ND (1.2)	ND (1.2)	ND (2.4) *	31	51
	02/04/16	5 - 6	N	ND (2.1) *	2.2	78	ND (1.1) *	ND (1.1) *	ND (0.21)	15	6.3	8.1	1.3	ND (0.11) *	ND (1.1)	8.8	ND (1.1)	ND (1.1)	ND (2.1) *	27	28
	02/04/16	9 - 10	N	ND (2.1) *	1.8	40	ND (1.1) *	ND (1.1) *	ND (0.21)	10	5.5	6.2	ND (1.1)	ND (0.11) *	ND (1.1)	7.7	ND (1.1)	ND (1.1)	ND (2.1) *	24	22
AOC1-BCW17	02/04/16	0 - 0.5	N	ND (2.3) *	2.7	140	ND (1.1) *	ND (1.1) *	ND (0.23)	15	6.9	13	5.1	ND (0.11) *	ND (1.1)	10	ND (1.1)	ND (1.1)	ND (2.3) *	28	36
	02/04/16	2 - 3	N	ND (2.1) *	ND (1.1)	110	ND (1.1) *	ND (1.1) *	ND (0.21)	23	9.1	18	1.4	ND (0.11) *	ND (1.1)	12	ND (1.1)	ND (1.1)	ND (2.1) *	36	41
	02/04/16	5 - 6	N	ND (2.1) *	ND (1.1)	120	ND (1.1) *	ND (1.1) *	ND (0.21)	18	8.5	18	2	ND (0.11) *	ND (1.1)	11	ND (1.1)	ND (1.1)	ND (2.1) *	34	38
	02/04/16	9 - 10	N	ND (2.1) *	ND (1.1)	250	ND (1.1) *	ND (1.1) *	ND (0.21)	19	8.3	15	1.7	ND (0.11) *	ND (1.1)	11	ND (1.1)	ND (1.1)	ND (2.1) *	34	39
AOC1-BCW18	02/05/16	0 - 0.5	N	ND (2.6) *	3.7	250	ND (1.3) *	ND (1.3) *	ND (0.26)	46	9.4	19	13	ND (0.13) *	ND (1.3)	18	ND (1.3)	ND (1.3)	ND (2.6) *	39	68
	02/05/16	2 - 3	N	ND (2.5) *	2.9	180	ND (1.2) *	ND (1.2) *	ND (0.25)	10	5.5	7	3.5	ND (0.12) *	ND (1.2)	7.6	ND (1.2)	ND (1.2)	ND (2.5) *	23	30
	02/05/16	5 - 6	N	ND (2.2) *	1.7	110	ND (1.1) *	ND (1.1) *	ND (0.22)	9.6	5.8	6.9	ND (1.1)	ND (0.11) *	ND (1.1)	7.6	ND (1.1)	ND (1.1)	ND (2.2) *	22	28
	02/05/16	9 - 10	N	ND (2.2) *	2.4	180	ND (1.1) *	ND (1.1) *	ND (0.22)	17	8.4	6	1.5	ND (0.11) *	ND (1.1)	11	ND (1.1)	ND (1.1)	ND (2.2) *	33	35
AOC1-BCW19	02/05/16	0 - 0.5	N	ND (2.3) J*	3.3	190	ND (1.2) *	ND (1.2) *	1.4	58	8.5	15	11	ND (0.12) *	ND (1.2)	15	ND (1.2) J	ND (1.2)	ND (2.3) *	34	60
	02/05/16	2 - 3	N	ND (2.1) *	1.4	60	ND (1) *	ND (1)	ND (0.21)	12	7.1	6.9	1.4	ND (0.1) *	ND (1)	8.2	ND (1)	ND (1)	ND (2.1) *	26	27
	02/05/16	5 - 6	N	ND (2.1) *	ND (1)	62	ND (1) *	ND (1)	ND (0.21)	15	8.2	6.9	1	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2.1) *	32	34
	02/05/16	9 - 10	N	ND (2.2) *	1.9	59	ND (1.1) *	ND (1.1) *	ND (0.22)	12	7.1	7.7	ND (1.1)	ND (0.11) *	ND (1.1)	8.6	ND (1.1)	ND (1.1)	ND (2.2) *	31	31
AOC1-BCW20	02/05/16	0 - 0.5	N	ND (2.1) *	ND (1)	75	ND (1) *	ND (1)	ND (0.21)	20	8.7	8.2	2.2	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	35	38
	02/05/16	2 - 3	N	ND (2.1) *	1.8	67	ND (1.1) *	ND (1.1) *	ND (0.21)	14	7.3	7.4	1.6	ND (0.11) *	ND (1.1)	9.9	ND (1.1)	ND (1.1)	ND (2.1) *	34	31
	02/05/16	5 - 6	N	ND (2.3) *	1.6	71	ND (1.1) *	ND (1.1) *	ND (0.22)	12	7.1	8.7	1.4	ND (0.11) *	ND (1.1)	8.9	ND (1.1)	ND (1.1)	ND (2.3) *	29	29
	02/05/16	9 - 10	N	ND (2.3) *	2.4	70	ND (1.1) *	ND (1.1) *	ND (0.23)	22	11	17	2.9	ND (0.11) *	ND (1.1)	15	ND (1.1)	ND (1.1)	ND (2.3) *	43	48
AOC1-BCW21	02/05/16	0 - 0.5	N	ND (2.3) *	3.3	190	ND (1.1) *	ND (1.1) *	ND (0.23)	42	8.6	17	13	ND (0.11) *	ND (1.1)	15	ND (1.1)	ND (1.1)	ND (2.3) *	36	64
	02/05/16	2 - 3	N	ND (2.2) *	2.9	110	ND (1.1) *	ND (1.1) *	ND (0.22)	22	10	9.7	3.2	ND (0.11) *	ND (1.1)	12	ND (1.1)	ND (1.1)	ND (2.2) *	38	40
	02/05/16	5 - 6	N	ND (2.2) *	2	420	ND (1.1) *	ND (1.1) *	ND (0.22)	15	7.2	13	1.6	ND (0.11) *	ND (1.1)	11	ND (1.1)	ND (1.1)	ND (2.2) *	29	33
	02/05/16	9 - 10	N	ND (2.2) *	2	140	ND (1.1) *	ND (1.1) *	ND (0.22)	19	9.1	14	2	ND (0.11) *	ND (1.1)	11	ND (1.1)	ND (1.1)	ND (2.2) *	41	40

TABLE B-2a

Sample Results: Metals in Soil

AOC 1 – Area around Former Percolation Bed

Soil Engineering Evaluation/Cost Analysis

PG&E Topock Compressor Station, Needles, California

Location	Date	Depth (ft bgs)	Sample Type	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium, Hexavalent	Chromium, total	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
AOC1-BCW22	02/05/16	0 - 0.5	N	ND (2.1) *	3.9	72	ND (1) *	ND (1)	ND (0.21)	12	4.6	7	6.1	ND (0.1) *	ND (1)	6.8	ND (1)	ND (1)	ND (2.1) *	23	26
	02/05/16	2 - 3	N	ND (2.1) *	3.9	120	ND (1) *	ND (1)	ND (0.21)	20	6.6	10	16	ND (0.11) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	30	43
	02/05/16	5 - 6	N	ND (2.1) *	2.9	90	ND (1) *	ND (1)	ND (0.21)	16	7.6	7.7	4.2	ND (0.1) *	ND (1)	9.1	ND (1)	ND (1)	ND (2.1) *	36	36
	02/05/16	9 - 10	N	ND (2.2) *	2.2	66	ND (1.1) *	ND (1.1) *	ND (0.22)	15	7.2	8.8	ND (1.1)	ND (0.11) *	ND (1.1)	9.6	ND (1.1)	ND (1.1)	ND (2.2) *	29	33
AOC1-BCW23	02/05/16	0 - 0.5	N	ND (2.6) *	6.9	270	ND (1.3) *	ND (1.3) *	ND (0.26)	38	9.6	22	16	ND (0.13) *	ND (1.3)	18	ND (1.3)	ND (1.3)	ND (2.6) *	42	84
	02/05/16	2 - 3	N	ND (2.4) *	3.3	180	ND (1.2) *	ND (1.2) *	ND (0.24)	17	7.6	12	6.9	ND (0.12) *	ND (1.2)	12	ND (1.2)	ND (1.2)	ND (2.4) *	33	47
	02/05/16	5 - 6	N	ND (2.2) *	2.3	55	ND (1.1) *	ND (1.1) *	ND (0.22)	11	5.9	5.7	1.7	ND (0.11) *	ND (1.1)	6.9	ND (1.1)	ND (1.1)	ND (2.2) *	28	24
	02/05/16	9 - 10	N	ND (2.2) *	2	120	ND (1.1) *	ND (1.1) *	ND (0.22)	13	7.3	7.6	1.5	ND (0.11) *	ND (1.1)	8.7	ND (1.1)	ND (1.1)	ND (2.2) *	29	33
AOC1-BCW24	02/05/16	0 - 0.5	N	ND (2.4) J*	3.4	170	ND (1.2) *	ND (1.2) *	ND (0.24)	30	9.2	14	7.4	ND (0.12) *	ND (1.2)	15	ND (1.2) J	ND (1.2)	ND (2.4) *	40	56
	02/05/16	2 - 3	N	ND (2.4) *	2.7	170	ND (1.2) *	ND (1.2) *	0.28	29	6.7	15	8.8	ND (0.12) *	ND (1.2)	11	ND (1.2)	ND (1.2)	ND (2.4) *	29	49
	02/05/16	5 - 6	N	ND (2.2) *	1.9	55	ND (1.1) *	ND (1.1) *	ND (0.22)	11	7.3	7.7	1.1	ND (0.11) *	ND (1.1)	8	ND (1.1)	ND (1.1)	ND (2.2) *	28	27
	02/05/16	9 - 10	N	ND (2.2) *	1.9	43	ND (1.1) *	ND (1.1) *	ND (0.22)	7.9	4.5	4.9	1.3	ND (0.11) *	ND (1.1)	5.6	ND (1.1)	ND (1.1)	ND (2.2) *	19	21
AOC1-BCW25	02/05/16	0 - 0.5	N	ND (2.6) *	5.1	230	ND (1.3) *	ND (1.3) *	ND (0.26)	39	9.4	18	11	ND (0.13) *	ND (1.3)	16	ND (1.3)	ND (1.3)	ND (2.6) *	41	69
	02/05/16	2 - 3	N	ND (2.6) *	3.6	180	ND (1.3) *	ND (1.3) *	ND (0.26)	21	9.2	14	3.8	ND (0.13) *	ND (1.3)	12	ND (1.3)	ND (1.3)	ND (2.6) *	38	42
	02/05/16	5 - 6	N	ND (2.2) *	2.2	110	ND (1.1) *	ND (1.1) *	ND (0.22)	13	7.5	7.9	2.6	ND (0.11) *	ND (1.1)	8.8	ND (1.1)	ND (1.1)	ND (2.2) *	31	37
	02/05/16	9 - 10	N	ND (2.2) *	2	120	ND (1.1) *	ND (1.1) *	ND (0.22)	16	9.1	14	2	ND (0.11) *	ND (1.1)	11	ND (1.1)	ND (1.1)	ND (2.2) *	38	42
AOC1-BCW26	02/04/16	0 - 0.5	N	ND (2.2) *	5	170	ND (1.1) *	ND (1.1) *	ND (0.22)	35	9	15	8.9	ND (0.11) *	ND (1.1)	15	ND (1.1)	ND (1.1)	ND (2.2) *	35	59
	02/04/16	2 - 3	N	ND (2.5) *	7.1	190	ND (1.3) *	ND (1.3) *	ND (0.25)	12	6.3	10	8.2	ND (0.13) *	ND (1.3)	9.8	ND (1.3)	ND (1.3)	ND (2.5) *	23	43
	02/04/16	5 - 6	N	ND (2.1) *	3.3	74	ND (1.1) *	ND (1.1) *	ND (0.21)	13	6.8	11	3.6	ND (0.11) *	ND (1.1)	9.2	ND (1.1)	ND (1.1)	ND (2.1) *	24	33
	02/04/16	9 - 10	N	ND (2.4) *	3.3	42	ND (1.2) *	1.3	ND (0.24)	19	9	25	3.1	ND (0.12) *	ND (1.2)	14	ND (1.2)	ND (1.2)	ND (2.4) *	35	40
AOC1-BCW27	02/05/16	0 - 0.5	N	ND (2.4) *	5.2	210	ND (1.2) *	ND (1.2) *	ND (0.24)	33	8.1	17	17	ND (0.12) *	ND (1.2)	15	ND (1.2)	ND (1.2)	ND (2.4) *	35	59
	02/05/16	2 - 3	N	ND (2.3) *	1.7	65	ND (1.1) *	ND (1.1) *	ND (0.23)	12	8	8.6	2	ND (0.11) *	ND (1.1)	9.2	ND (1.1)	ND (1.1)	ND (2.3) *	36	33
	02/05/16	5 - 6	N	ND (2.1) *	1.4	53	ND (1.1) *	ND (1.1) *	ND (0.21)	9.7	6.3	9	1.3	ND (0.11) *	ND (1.1)	7	ND (1.1)	ND (1.1)	ND (2.1) *	26	29
	02/05/16	9 - 10	N	ND (2.3) *	1.9	78	ND (1.1) *	ND (1.1) *	ND (0.23)	15	7.4	7.4	2.2	ND (0.11) *	ND (1.1)	12	ND (1.1)	ND (1.1)	ND (2.3) *	30	31
AOC1-BCW28	02/05/16	0 - 0.5	N	ND (2.4) *	5.1	270	ND (1.2) *	ND (1.2) *	0.3	49	9.2	19	14	ND (0.12) *	ND (1.2)	17	ND (1.2)	ND (1.2)	ND (2.4) *	39	73
	02/05/16	2 - 3	N	ND (2.3) *	4.6	150	ND (1.2) *	ND (1.2) *	ND (0.23)	18	6.8	10	4.2	ND (0.11) *	ND (1.2)	9.9	ND (1.2)	ND (1.2)	ND (2.3) *	32	38
	02/05/16	5 - 6	N	ND (2.2) *	1.3	96	ND (1.1) *	1.1	ND (0.22)	18	7.8	8.3	1.4	ND (0.11) *	ND (1.1)	12	ND (1.1)	ND (1.1)	ND (2.2) *	29	33
	02/05/16	9 - 10	N	ND (2.2) *	1.8	110	ND (1.1) *	ND (1.1) *	ND (0.22)	18	8.9	11	2.1	ND (0.11) *	ND (1.1)	11	ND (1.1)	ND (1.1)	ND (2.2) *	36	39
AOC1-BCW29	02/04/16	0 - 0.5	N	ND (2.6) *	4.3	160	ND (1.3) *	ND (1.3) *	ND (0.26)	33	8.7	15	8.3	ND (0.13) *	ND (1.3)	14	ND (1.3)	ND (1.3)	ND (2.6) *	38	56
	02/04/16	2 - 3	N	ND (2.7) *	4.2	210	ND (1.4) *	ND (1.4) *	ND (0.27)	17	8.7	13	5.2	ND (0.14) *	ND (1.4) *	13	ND (1.4)	ND (1.4)	ND (2.7) *	31	49
	02/04/16	5 - 6	N	ND (3.1) *	5.4	350	ND (1.5) *	ND (1.5) *	ND (0.31)	27	14	23	7.6	ND (0.15) *	ND (1.5) *	19	ND (1.5) *	ND (1.5)	ND (3.1) *	46	66
	02/04/16	9 - 10	N	ND (2.4) *	2.7	74	ND (1.2) *	ND (1.2) *	ND (0.24) J	11	7.3	7.1	ND (1.2)	ND (0.12) *	ND (1.2)	9.6	ND (1.2)	ND (1.2)	ND (2.4) *	32	29
AOC1-BCW30	02/04/16	0 - 0.5	N	ND (2.4) J*	5.5	220	ND (1.2) *	ND (1.2) *	ND (0.24)	42	7.3	18	17 J	ND (0.12) *	ND (1.2) J	14	ND (1.2) J	ND (1.2)	ND (2.4) J*	28	61
	02/04/16	2 - 3	N	ND (2.4) *	3.4	140	ND (1.2) *	ND (1.2) *	0.26	14	6	8.7	2.7	ND (0.12) *	ND (1.2)	11	ND (1.2)	ND (1.2)	ND (2.4) *	22	28
	02/04/16	5 - 6	N	ND (2.3) *	3.7	210	ND (1.2) *	ND (1.2) *	ND (0.23)	12	6	8.4	2.9	ND (0.12) *	ND (1.2)	9.6	ND (1.2)	ND (1.2)	ND (2.3) *	23	29
	02/04/16	9 - 10	N	ND (2.3) *	2.7	49	ND (1.2) *	ND (1.2) *	ND (0.23)	8.8	5.8	7.8	ND (1.2)	ND (0.12) *	ND (1.2)	6.3	ND (1.2)	ND (1.2)	ND (2.3) *	19	27

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
AOC1-BCW7	02/05/16	0 - 0.5	N	ND (2) *	2.2	74	ND (1) *	ND (1)	0.29	18	6.3	18	8	ND (0.1) *	ND (1)	9.6	ND (1)	ND (1)	ND (2) *	24	34
	02/05/16	2 - 3	N	ND (2.1) *	3.5	80	ND (1) *	ND (1)	0.36	20	7	8.4	1.7	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2.1) *	25	29
	02/05/16	2 - 3	FD	ND (2.1) *	4.3	91	ND (1) *	ND (1)	0.28	23	6.3	7.5	1.7	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2.1) *	25	27
	02/05/16	5 - 6	N	ND (2.1) *	6.7	150	ND (1) *	ND (1)	ND (0.21)	15	3.3	6.2	2.2	ND (0.1) *	ND (1)	7.5	ND (1)	ND (1)	ND (2.1) *	15	15
	02/05/16	9 - 10	N	ND (2.1) *	7.1	540	ND (1.1) *	ND (1.1) *	0.36	24	10	23	1.4	ND (0.1) *	ND (1.1)	18	ND (1.1)	ND (1.1)	ND (2.1) *	41	26
	02/05/16	14 - 15	N	ND (2.1) *	3	210	ND (1.1) *	ND (1.1) *	ND (0.21)	19	10	8.4	2.4	ND (0.1) *	ND (1.1)	16	ND (1.1)	ND (1.1)	ND (2.1) *	33	39
	02/05/16	19 - 20	N	ND (2.1) *	3.9	460 J	ND (1) *	ND (1)	ND (0.21)	20	9.1	7.2	1.8	ND (0.11) *	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	34	38
	02/05/16	19 - 20	FD	ND (2.1) *	3.5	210 J	ND (1.1) *	ND (1.1) *	ND (0.21)	19	9.1	8.7	1.8	ND (0.1) *	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.1) *	34	38
AOC1-BCW8	02/04/16	0 - 0.5	N	ND (2.2) *	3.8	180	ND (1.1) *	ND (1.1) *	ND (0.22)	21	7.1	14	8.3	ND (0.11) *	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.2) *	32	53
	02/04/16	2 - 3	N	ND (2) *	2.5	110	ND (1) *	ND (1)	0.44	28	9.3	10	4.5	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	37	45
	02/04/16	5 - 6	N	ND (2) *	1.4	82	ND (1) *	ND (1)	0.24	18	9.6	8.4	3.2	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	32	35
	02/04/16	9 - 10	N	ND (2.1) *	1.1	92	ND (1.1) *	ND (1.1) *	ND (0.21)	15 J	8	9.3	1.1	ND (0.11) *	ND (1.1)	10	ND (1.1) J	ND (1.1)	ND (2.1) *	32	35
	02/04/16	9 - 10	FD	ND (2.1) *	2.2	110	ND (1.1) *	ND (1.1) *	ND (0.21)	11 J	8.7	11	ND (1.1)	ND (0.11) *	ND (1.1)	9.5	ND (1.1)	ND (1.1)	ND (2.1) *	30	37
AOC1-BCW9	02/04/16	0 - 0.5	N	ND (2.2) *	4	200	ND (1.1) *	ND (1.1) *	ND (0.22)	35	8.3	17	9.3	ND (0.11) *	ND (1.1)	15	ND (1.1)	ND (1.1)	ND (2.2) *	33	61
	02/04/16	2 - 3	N	ND (2.2) *	3.5	190	ND (1.1) *	ND (1.1) *	1.2	66	8.1	16	11	ND (0.11) *	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.2) *	33	57
	02/04/16	5 - 6	N	ND (2.1) *	2.4	110	ND (1.1) *	ND (1.1) *	ND (0.21)	17	8.5	9.5	3	ND (0.1) *	ND (1.1)	11	ND (1.1)	ND (1.1)	ND (2.1) *	37	37
	02/04/16	9 - 10	N	ND (2.1) *	2.4	100	ND (1.1) *	ND (1.1) *	ND (0.21)	13	7.9	10	ND (1.1)	ND (0.1) *	ND (1.1)	10	ND (1.1)	ND (1.1)	ND (2.1) *	28	32
AOC1-T1e	01/11/16	0 - 1	N	ND (2.1) *	2.7	37	ND (1) *	ND (1)	ND (0.21)	26	7.5	13	3.3	---	ND (1)	16	ND (1)	ND (1)	ND (2.1) *	23	37
	01/11/16	2 - 3	N	ND (2.1) *	2.7	32	ND (1) *	ND (1)	ND (0.21)	18	9.8	10	2	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	30	40
	01/11/16	5 - 6	N	ND (2.1) *	1.9	22	ND (1) *	ND (1)	ND (0.21)	16	6.6	7.5	1.1	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	23	30
	01/11/16	9 - 10	N	ND (2.1) *	1.9	40	ND (1) *	ND (1)	ND (0.2)	20	8.1	11	1.3	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	27	32
	01/11/16	9 - 10	FD	ND (2.1) *	2.4	43	ND (1) *	ND (1)	ND (0.21)	17	8.1	13	1.5	0.18	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	27	32
	01/11/16	14 - 15	N	ND (2.2) *	2.1	42	ND (1.1) *	ND (1.1) *	ND (0.22)	17	6.8	11	1.3	0.16	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.2) *	24	28
AOC1-T1f	01/12/16	0 - 1	N	ND (2.1) *	2.5	73	ND (1) *	ND (1)	0.71	49	6.6	13	5.5	0.13	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	23	41
	01/12/16	2 - 3	N	ND (2.1) *	2.3	37	ND (1) *	ND (1)	ND (0.21)	20	7.6	7.2	1.5	0.13	ND (1)	19	ND (1)	ND (1)	ND (2.1) *	25	32
	01/12/16	5 - 6	N	ND (2.1) *	3.1	32	ND (1.1) *	ND (1.1) *	ND (0.21)	24	8.9	11	2	0.11	ND (1.1)	18	ND (1.1)	ND (1.1)	ND (2.1) *	27	40
	01/12/16	9 - 10	N	ND (2.1) *	2.7	72	ND (1) *	ND (1)	ND (0.21)	18 J	11 J	9.1	1.9	0.11	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	36 J	46 J
	01/12/16	9 - 10	FD	ND (2) *	3.1	71	ND (1) *	ND (1)	ND (0.21)	30 J	8.2 J	11	2.6	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	28 J	35 J
	01/12/16	14 - 15	N	ND (2) *	2.2	55	ND (1) *	ND (1)	0.68	29	7.6	9.2	2	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	25	34
AOC1-T1g	02/17/17	0 - 0.5	N	ND (2) *	1.4	97	ND (1) *	1.4	ND (0.2)	26	8.2	12	4.1	ND (0.1) *	ND (1)	15	ND (1) J	ND (1) J	ND (2) J*	30	33
	02/17/17	0 - 0.5	FD	ND (2) *	ND (1)	100	ND (1) *	1.4	ND (0.2)	24	9.9	14	1.6	ND (0.1) *	ND (1)	15	ND (1) J	ND (1) J	ND (2) J*	31	36
	02/17/17	2 - 3	N	ND (2.1) *	ND (1)	80	ND (1) *	1.3	ND (0.21)	30	9.4	13	ND (1)	ND (0.1) *	ND (1)	17	ND (1) J	ND (1) J	ND (2.1) J*	31	32
	02/17/17	5 - 6	N	ND (2.1) *	ND (1)	81	ND (1) *	1.1	0.63	23	7.1	9.2	1.1	ND (0.1) *	ND (1)	9.9	ND (1) J	ND (1) J	ND (2.1) J*	27	30
	02/17/17	9 - 10	N	ND (2.1) *	ND (1)	69	ND (1) *	1.1	ND (0.21)	14	6.7	9.2	ND (1)	ND (0.1) *	ND (1)	8.8	ND (1) J	ND (1) J	ND (2.1) J*	26	29
AOC1-T2f	12/17/15	0 - 1	N	ND (2) *	7.6	96	ND (1) *	ND (1)	0.22	14	5.3	12	7.9	ND (0.1) *	3.2	11	ND (1)	ND (1)	ND (2) *	25	39
	12/17/15	2 - 3	N	ND (2) *	4.4	55	ND (1) *	ND (1)	0.25	17	7.5	11	3.1	ND (0.1) *	8.2	12	ND (1)	ND (1)	ND (2) *	37	40

TABLE B-2a

Sample Results: Metals in Soil

AOC 1 – Area around Former Percolation Bed

Soil Engineering Evaluation/Cost Analysis

PG&E Topock Compressor Station, Needles, California

Location	Date	Depth (ft bgs)	Sample Type	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium, Hexavalent	Chromium, total	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
				Metals (mg/kg)																	
Interim Screening Level [1]:				0.285	11	410	0.672	1.1	0.83	39.8	12.7	16.8	8.39	0.0125	1.37	27.3	1.47	5.15	0.78	52.2	58
Residential Regional Screening Levels [2]:				31	0.68	15,000	160	71	0.3	120,000	23	3,100	400	11	390	1,500	390	390	0.78	390	23,000
Residential DTSC-SL [3]:				NE	0.11	NE	15	5.2	NE	36,000	NE	NE	80	1	NE	490	NE	390	NE	390	NE
Ecological Comparison Values [4]:				0.285	11.4	330	23.3	0.0151	139.6	36.3	13	20.6	0.0166	0.0125	2.25	0.607	0.177	5.15	2.32	13.9	0.164
Background [5]:				NE	11	410	0.672	1.1	0.83	39.8	12.7	16.8	8.39	NE	1.37	27.3	1.47	NE	NE	52.2	58
AOC1-T2g	03/03/16	9 - 10	N	4.5	3.6	90	ND (1.1) *	ND (1.1) *	30	2,100	8	11	5.2	0.26	8.4	10	ND (1.1)	ND (1.1)	ND (2.2) *	26	140
	03/03/16	14 - 15	N	ND (2.1) *	2.3	52	ND (1.1) *	ND (1.1) *	0.77	28	8.6	8.9	2	0.16	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.1) *	33	75
	03/03/16	19 - 20	N	ND (2.1) *	1.8	43	ND (1.1) *	ND (1.1) *	0.58	27	8.7	9.2	2	0.16	ND (1.1)	17	ND (1.1)	ND (1.1)	ND (2.1) *	30	53
	03/03/16	29 - 30	N	ND (2.1) *	2.1	50	ND (1.1) *	ND (1.1) *	0.25	21	10	9.9	2.1	0.15	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.1) *	36	50
	03/03/16	39 - 40	N	ND (2.1) *	2.2	94	ND (1.1) *	ND (1.1) *	0.23	19	8.9	9.2	1.8	0.14	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.1) *	36	39
	03/03/16	39 - 40	FD	ND (2.1) *	2	79	ND (1.1) *	ND (1.1) *	ND (0.21)	19	9	9.8	1.8	0.13	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.1) *	36	39
	03/03/16	49 - 50	N	ND (2.1) *	2.8	22	ND (1.1) *	ND (1.1) *	ND (0.21)	18	8.9	15	1.9	0.12	ND (1.1)	15	ND (1.1)	ND (1.1)	ND (2.1) *	36	37
	03/03/16	59 - 60	N	ND (2.1) *	2.3	69	ND (1.1) *	ND (1.1) *	ND (0.21)	18	9.6	13	2.1	0.15	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.1) *	37	44
	03/03/16	69 - 70	N	ND (2.1) *	2.1	67	ND (1.1) *	ND (1.1) *	ND (0.21)	15	7.5	8.4	1.4	0.11	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.1) *	29	36
AOC1-T2h	03/04/16	0 - 1	N	ND (2.1) J*	1.4	120	ND (1) *	ND (1)	2.5	100 J	9	9.2 J	2.2	ND (0.1) *	ND (1)	17	ND (1) J	ND (1)	ND (2.1) *	32	39
	03/04/16	2 - 3	N	ND (2.1) *	2.1	72	ND (1.1) *	ND (1.1) *	0.42	24	11	9.9	2.2	ND (0.11) *	ND (1.1)	16	ND (1.1)	ND (1.1)	ND (2.1) *	34	45
	03/04/16	5 - 6	N	ND (2.1) *	ND (1)	130	ND (1) *	ND (1)	6.8	200	9.4	9.8	3.4	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	32	85
	03/04/16	9 - 10	N	ND (2.1) *	ND (1)	100	ND (1) *	ND (1)	0.94	28	8.7	16	1.4	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	31	44
	03/04/16	14 - 15	N	ND (2.1) *	1.7	42	ND (1) *	ND (1)	0.29	19	7.1	9	1.1	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2.1) *	26	33
	03/04/16	19 - 20	N	ND (2.1) *	1.5	58	ND (1.1) *	ND (1.1) *	0.23	18	9.1	12	1.3	ND (0.1) *	ND (1.1)	12	ND (1.1)	ND (1.1)	ND (2.1) *	31	41
	03/04/16	29 - 30	N	ND (2.1) *	1.9	40	ND (1) *	ND (1)	ND (0.21)	18	8.9	8.9	1.2	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	31	34
	03/04/16	39 - 40	N	ND (2.1) *	2.2	44	ND (1.1) *	ND (1.1) *	ND (0.21)	17	7.9	8	1.6	ND (0.1) *	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.1) *	30	35
AOC1-T2i	03/05/16	0 - 1	N	ND (2.1) *	1.8	92	ND (1) *	ND (1)	0.61	28	7.8	10	2.6	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	31	36
	03/05/16	2 - 3	N	ND (2.1) *	1.3	89	ND (1) *	ND (1)	0.55	25	7.8	9.2	2.5	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	27	34
	03/05/16	5 - 6	N	ND (2.1) *	ND (1)	89	ND (1) *	ND (1)	0.29	16	7.8	10	3.5	0.12	ND (1)	10	ND (1)	ND (1)	ND (2.1) *	27	40
	03/05/16	9 - 10	N	ND (2) *	1.2	110	ND (1) *	ND (1)	0.31	40	7.9	12	4.8	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	28	40
	03/05/16	14 - 15	N	ND (2.1) *	ND (1)	100	ND (1) *	ND (1)	0.28	17	9	9.5	1.4	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	35	38
	03/05/16	19 - 20	N	ND (2) *	1.2	130	ND (1) *	ND (1)	0.27	18	8.7	14	1.3	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2) *	31	39
AOC1-T2j	03/05/16	0 - 1	N	ND (2.1) *	ND (1)	93	ND (1) *	ND (1)	0.6	31	11	8.8	1.9	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	48	40
	03/05/16	2 - 3	N	ND (2.1) *	ND (1)	80 J	ND (1) *	ND (1)	0.38	21	8.3 J	9.3	2.4	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2.1) *	35	32
	03/05/16	2 - 3	FD	ND (2.1) *	ND (1)	65 J	ND (1) *	ND (1)	0.39	18	6.5 J	10	1.7	ND (0.1) *	ND (1)	9.1	ND (1)	ND (1)	ND (2.1) *	29	29
	03/05/16	5 - 6	N	ND (2.1) *	1.7	64	ND (1) *	ND (1)	ND (0.21)	18	8.7	9.2	1.4	0.11	ND (1)	11	ND (1)	ND (1)	ND (2.1) *	33	31
	03/05/16	9 - 10	N	ND (2.1) *	ND (1)	81	ND (1) *	ND (1)	0.37	16	7.4	6.4	1.3	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2.1) *	41	33
	03/05/16	14 - 15	N	ND (2.1) *	1.5	64	ND (1.1) *	ND (1.1) *	0.26	26	10	12	2.1	ND (0.11) *	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.1) *	42	44
	03/05/16	19 - 20	N	ND (2.1) *	1.6	53	ND (1.1) *	ND (1.1) *	0.7	22 J	9.8	8.8	1.7	ND (0.11) *	ND (1.1)	11 J	ND (1.1)	ND (1.1)	ND (2.1) *	39	46
	03/05/16	19 - 20	FD	ND (2.1) *	1.6	57	ND (1.1) *	ND (1.1) *	0.64	30 J	11	9.3	2	ND (0.11) *	ND (1.1)	14 J	ND (1.1)	ND (1.1)	ND (2.1) *	40	45
AOC1-T5D	01/12/16	0 - 1	N	ND (2) *	1.3	84	ND (1) *	ND (1)	ND (0.2)	23	7.5	8.3	6.2	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	26	33
	01/12/16	2 - 3	N	ND (2.1) *	5.3	230	ND (1.1) *	ND (1.1) *	2.7	120 J	6.6	17	18	ND (0.11) *	ND (1.1)	12	ND (1.1)	ND (1.1)	ND (2.1) *	28	100 J
	01/12/16	2 - 3	FD	ND (2.1) *	4.2	210	ND (1) *	ND (1)	2.6	69 J	6.4	14	16	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	25	72 J
	01/12/16	5 - 6	N	ND (2) *	2.3	120	ND (1) *	ND (1)	2.4	80	7.9	9.7	3.7	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	32	42
	01/12/16	9 - 10	N	ND (2) *	1.9	97	ND (1) *	ND (1)	0.33	23	8.2	8.3	4.8	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	31	40
	01/12/16	14 - 15	N	ND (2) *	1.8	110	ND (1) *	ND (1)	0.92	36	7.3	8.8	4.1	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	27	36
	01/12/16	19 - 20	N	ND (2) *	ND (1)	120 J	ND (1) *	ND (1)	0.51	23	9.5	8.8	1.8	ND (0.099) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	33	48
	01/12/16	19 - 20	FD	ND (2.1) *	ND (1.1)	91 J	ND (1.1) *	ND (1.1) *	0.72	22	9.3	8.8	1.8	ND (0.11) *	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.1) *	32	52

TABLE B-2a
Sample Results: Metals in Soil
AOC 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
AOC1-T6D	02/09/16	0 - 0.5	N	ND (2) *	3.7	110 J	ND (1) *	ND (1)	ND (0.2) J	19	6.7	7.6	2.4	ND (0.1) *	ND (1)	9.9	ND (1)	ND (1)	2.4	28	100
	02/09/16	2 - 3	N	ND (2.1) *	2.6	96	ND (1) *	ND (1)	0.32 J	19	8.4	11	1.3	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	31	38
	02/09/16	5 - 6	N	ND (2.1) *	1.3	110	ND (1) *	ND (1)	0.24 J	19	9.1	11	1.7	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	2.3	33	43
	02/09/16	9 - 10	N	ND (2.1) *	3.4	39	ND (1) *	ND (1)	ND (0.21) J	16	7.6	8.8	1.4	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	2.6	27	35
	02/09/16	9 - 10	FD	ND (2.1) *	3.9	40	ND (1) *	ND (1)	ND (0.21) J	16	7.6	9.5	1.7	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	2.1	29	36
	02/09/16	14 - 15	N	ND (2.1) *	3.1	72 J	ND (1) *	ND (1)	ND (0.21) J	16	8.3	8.3	1.2	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	2.4	31	36
	02/09/16	14 - 15	FD	ND (2) *	2	91 J	ND (1) *	ND (1)	ND (0.2) J	19	9.5	9.9	1.7	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	35	41
	02/09/16	19 - 20	N	ND (2) *	2.6	65	ND (1) *	ND (1)	ND (0.2) J	24	9.7	10	1.2	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	2.2	37	41
AOC1-T7	02/19/17	0 - 0.5	N	ND (2.1) *	1.1	84	ND (1.1) *	1.3	ND (0.21)	23	8.2	13	ND (1.1)	ND (0.1) *	ND (1.1)	13	ND (1.1) J	ND (1.1)	ND (2.1) J*	26	32
	02/19/17	2 - 3	N	ND (2) *	ND (1)	58	ND (1) *	1.1	0.33	27	6.4	8.9	1.1	ND (0.1) *	ND (1)	10	ND (1) J	ND (1)	ND (2) J*	24	35
	02/19/17	5 - 6	N	ND (2) *	ND (1)	72	ND (1) *	1.1	0.43	18	6.5	8.9	7.1	ND (0.1) *	ND (1)	8.5	ND (1) J	ND (1)	ND (2) J*	23	30
	02/19/17	9 - 10	N	ND (2.1) *	1.2	78	ND (1) *	1.3	ND (0.21)	17	7.3	10	ND (1)	ND (0.1) *	ND (1)	9.5	ND (1) J	ND (1)	ND (2.1) J*	27	30
AOC1-T8	02/18/17	0 - 0.5	N	ND (2.1) *	ND (1)	57	ND (1) *	1.2	0.23	43	7.8	11	1.1	ND (0.1) *	ND (1)	16	ND (1) J	ND (1)	ND (2.1) J*	22	34
	02/18/17	2 - 3	N	ND (2.1) *	ND (1)	60	ND (1) *	1	ND (0.21)	18	6.1	17	1.1	ND (0.1) *	ND (1)	8.8	ND (1) J	ND (1)	ND (2.1) J*	20	28
	02/18/17	5 - 6	N	ND (2.1) *	1.5	47	ND (1.1) *	1.2	ND (0.21)	14	7.3	8.6	ND (1.1)	ND (0.11) *	ND (1.1)	9.9	ND (1.1) J	ND (1.1)	ND (2.1) J*	23	36
	02/18/17	9 - 10	N	ND (2.1) *	ND (1)	62	ND (1) *	1.1	0.22	13 J	6	10	ND (1)	ND (0.1) *	ND (1)	7.9 J	ND (1) J	ND (1)	ND (2.1) J*	20	31
	02/18/17	9 - 10	FD	ND (2) *	ND (1)	63	ND (1) *	1.1	ND (0.21)	17 J	6.8	9.2	ND (1)	ND (0.1) *	ND (1)	11 J	ND (1) J	ND (1)	ND (2) J*	21	27
AOC4-GB10	02/10/10	0 - 0.5	N	ND (2.2) *	ND (1.1)	160 J	ND (1.1) *	ND (1.1) *	ND (0.44)	35 J	8.5	16	14	ND (0.11) *	ND (1.1)	20	ND (1.1)	ND (1.1)	ND (2.2) *	40 J	71 J
AOC4-GB11	02/10/10	0 - 0.5	N	ND (2.2) *	ND (1.1)	170	ND (1.1) *	ND (1.1) *	ND (0.43)	31	9.1	13	7.2 J	ND (0.11) *	ND (1.1)	17	ND (1.1)	ND (1.1)	ND (2.2) *	38	46
	02/10/10	0 - 0.5	FD	ND (2.2) *	ND (1.1)	160	ND (1.1) *	ND (1.1) *	0.57	29	8.1	14	16 J	ND (0.11) *	ND (1.1)	16	ND (1.1)	ND (1.1)	ND (2.2) *	38	47
AOC4-GB12	02/10/10	0 - 0.5	N	ND (2.2) *	ND (1.1)	160	ND (1.1) *	ND (1.1) *	ND (0.44)	35	9.1	15	5.5	ND (0.11) *	ND (1.1)	24	ND (1.1)	ND (1.1)	ND (2.2) *	42	43
MW-10	06/27/97	1	N	---	---	---	---	---	ND (0.05)	14.2	---	14.1	---	---	---	8.8	---	---	---	---	20.9
	06/27/97	3	N	---	---	---	---	---	ND (0.05)	13.4	---	8.3	---	---	---	9	---	---	---	---	26.6
	06/27/97	6	N	---	---	---	---	---	ND (0.05)	19	---	8.4	---	---	---	10.7	---	---	---	---	23.3
	06/27/97	10	N	---	---	95.3	---	---	ND (0.05)	26.7	---	9.6	2.8	---	0.62	14.1	---	---	---	26.9	30.4
	06/27/97	20	N	---	---	---	---	---	ND (0.05)	14.7	---	7.7	---	---	---	10.2	---	---	---	---	27.1
	06/27/97	25	N	---	---	---	---	---	ND (0.05)	16.1	---	10.6	---	---	---	13.4	---	---	---	---	34.1
	06/27/97	30	N	---	---	---	---	---	ND (0.05)	13.8	---	9.4	---	---	---	11.5	---	---	---	---	31.5
	06/27/97	35	N	---	---	87		---	---	---	---	---	3.6	---	ND (0.2)	---	---	---	---	29.9	---
	06/27/97	40	N	---	---	---	---	---	ND (0.05)	14.5	---	9.2	---	---	---	12.6	---	---	---	---	29.4
	06/28/97	50	N	---	---	---	---	---	ND (0.05)	14.3	---	8.5	---	---	---	12.2	---	---	---	---	31.2
	06/27/97	60	N	---	---	------	---	---	ND (0.05)	9.1	---	6	---	---	---	6.6	---	---	---	---	16.3
	06/27/97	70	N	---	---	110	---	---	ND (0.05)	11.7	---	8.8	2.2	---	ND (0.2)	9.4	---	---	---	20.1	24.2
	06/27/97	75	N	---	---	---	---	---	ND (0.05)	11.5	---	6.4	---	---	---	8.2	---	---	---	---	24.9
	06/27/97	75	FD	---	---	---	---	---	0.1	9.6	---	6.97	---	---	---	8.1	---	---	---	---	21.6
	06/27/97	82	N	---	---	115	---	---	ND (0.05)	9.9	---	6.3	2.3	---	ND (0.2)	8.7	---	---	---	21.5	26.6

TABLE B-2a
Sample Results: Metals in Soil
AOC 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
MW-11	06/29/97	1	N	---	---	---	---	---	ND (0.05)	12.2	---	7.5	---	---	---	8.4	---	---	---	---	24.8
	06/29/97	3	N	---	---	---	---	---	ND (0.05)	31.1	---	6.6	---	---	---	7.3	---	---	---	---	29.5
	06/29/97	6	N	---	---	---	---	---	ND (0.05)	26.9	---	5.3	---	---	---	5.6	---	---	---	---	23.2
	06/29/97	10	N	---	---	101	---	---	ND (0.05)	13.5	---	8.3	6.3	---	0.32	7.7	---	---	---	18.9	38.5
	06/29/97	20	N	---	---	---	---	---	ND (0.05)	5.9	---	6	---	---	---	4.9	---	---	---	---	19.9
	06/29/97	30	N	---	---	91.4	---	---	ND (0.05)	12.6	---	6.9	1.8	---	0.8	8.2	---	---	---	22	28.4
	06/29/97	40	N	---	---	---	---	---	ND (0.05)	9.8	---	9.8	---	---	---	8.6	---	---	---	---	28.4
	06/29/97	50	N	---	---	---	---	---	ND (0.05)	13.6	---	6.9	---	---	---	10.1	---	---	---	---	29.8
	06/29/97	60	N	---	---	27.4	---	---	ND (0.05)	9.6	---	5.8	3	---	0.088 J	8.3	---	---	---	18.1	26.2
	06/29/97	60	FD	---	---	---	---	---	ND (0.05)	10	---	5.74	---	---	---	8.6	---	---	---	---	19.8
	06/29/97	69	N	---	---	370	---	---	ND (0.05)	16.9	---	13.8	5	---	ND (0.2)	11.3	---	---	---	23.2	
MW-13	07/09/97	10	N	---	---	---	---	---	ND (0.05)	10.8	---	9.3	---	---	---	8.1	---	---	---	---	27.2
	07/09/97	20	N	---	---	94.2	---	---	ND (0.05)	10.5	---	7.1	2.4	---	0.14 J	8.9	---	---	---	21.1	35.7
	07/09/97	25	N	---	---	124	---	---	---	---	---	---	2.8	---	ND (0.2)	---	---	---	---	26.4	---
	07/09/97	30	N	---	---	---	---	---	ND (0.05)	12.2	---	8.6	---	---	---	8.2	---	---	---	---	33.3
	07/09/97	40	N	---	---	---	---	---	ND (0.05)	10.7	---	8.1	---	---	---	9.4	---	---	---	--- 28.3	30.4
	07/09/97	40	FD	---	---	---	---	---	ND (0.05)	6.4	---	5.6	---	---	---	5.6	---	---	---	---	17.7
Old Well-BCW-1	09/11/13	7 - 8	N	ND (2.2) J*	4.8	130	ND (1.1) J*	ND (1.1) J*	80	4,200	7	14	12 J	ND (0.11) *	18	11	2.1	ND (1.1) J	ND (2.2) *	37 J	190
Old Well-BCW-2	09/11/13	4 - 5	N	ND (2.1) *	19	130	ND (1) *	ND (1)	73	4,400	7.2	23	10	ND (0.11) *	6.7	12	ND (1)	ND (1)	ND (2.1) *	61	150
PA-01	11/09/15	0 - 1	N	ND (2) J*	3.4	85 J	ND (1) *	ND (1)	0.65	20	3.7	8.5	9.3	ND (0.1) *	ND (1)	6.9	ND (1)	ND (1)	ND (2) *	18	80
PA-03	11/09/15	0 - 1	N	ND (2) *	3.8	140	ND (1) *	ND (1)	0.65	26	7.1	15	13	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2) *	25	200
PA-04	11/09/15	0 - 1	N	ND (2) *	3.9	170	ND (1) *	ND (1)	0.69	36	7.1	14	25	ND (0.1) *	ND (1)	20	ND (1)	ND (1)	ND (2) *	33	56
PA-14	01/27/16	0 - 1	N	ND (2.1) *	4.5	180	ND (1) *	ND (1)	ND (0.21)	20	5.5	22	10	ND (0.1) *	ND (1)	8.7	ND (1)	ND (1)	ND (2.1) *	23	270
PA-15	01/27/16	0 - 1	N	ND (2.1) *	4.7	120	ND (1) *	ND (1)	1.1	170	6.6	26	20	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	25	120
PA-16	01/27/16	0 - 1	N	ND (2.1) *	4.1	150	ND (1) *	ND (1)	1.3	47	6.4	26	8.5	ND (0.1) *	1.2	35	ND (1)	ND (1)	ND (2.1) *	25	64
SD-14	01/11/16	0 - 1	N	ND (2.1) *	3.7	87	ND (1) *	ND (1)	0.72	29	5.6	14	13	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2.1) *	20	37
	01/11/16	2 - 3	N	ND (2.1) *	2.6	94	ND (1) *	ND (1)	0.63	32	5	7.6	16	ND (0.1) *	ND (1)	9.1	ND (1)	ND (1)	ND (2.1) *	19	47
	01/11/16	5 - 6	N	ND (2.3) *	6.7	140	ND (1.1) *	ND (1.1) *	3.1	42	4.5	64	120	ND (0.11) *	5	11	ND (1.1)	ND (1.1)	ND (2.3) *	18	660
	01/11/16	9 - 10	N	ND (2.1) *	1.6	64	ND (1) *	ND (1)	1.1	35	7.6	7.8	1.9	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2.1) *	28	36
SD-15	01/12/16	0 - 0.5	N	ND (2.1) *	1.8	220	ND (1.1) *	ND (1.1) *	0.77	19	6.3	13	2.7	ND (0.11) *	ND (1.1)	9.6	ND (1.1)	ND (1.1)	ND (2.1) *	24	32
	01/12/16	2 - 3	N	ND (2.1) *	2.1	36	ND (1.1) *	ND (1.1) *	ND (0.21)	25	7.7	12	1.8	ND (0.11) *	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.1) *	27	32
	01/12/16	5 - 6	N	ND (2.1) *	1.6	72	ND (1.1) *	ND (1.1) *	ND (0.21)	21	7.2	11	1.5	ND (0.11) *	ND (1.1)	12	ND (1.1)	ND (1.1)	ND (2.1) *	28	32
	01/12/16	9 - 10	N	ND (2.1) *	2	49	ND (1.1) *	ND (1.1) *	ND (0.21)	20	9.4	9.3	2.1	ND (0.11) *	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.1) *	35	37
SD-16	01/12/16	0 - 0.5	N	ND (2.1) *	1.3	100	ND (1.1) *	ND (1.1) *	ND (0.21)	16	7.3	10	1.8	ND (0.1) *	ND (1.1)	10	ND (1.1)	ND (1.1)	ND (2.1) *	28	32
	01/12/16	2 - 3	N	ND (2.1) *	1.9	230	ND (1.1) *	ND (1.1) *	ND (0.21)	19	7.6	11	2.2	ND (0.1) *	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.1) *	34	28
	01/12/16	5 - 6	N	ND (2.1) *	2.3	46	ND (1) *	ND (1)	ND (0.21)	24	10	9.3	2.4	ND (0.11) *	ND (1)	16	ND (1)	ND (1)	ND (2.1) *	37	40
	01/12/16	9 - 10	N	ND (2.1) *	1.4	69	ND (1) *	ND (1)	ND (0.21)	13	9.4	6.1	1.9	ND (0.1) *	ND (1)	9.3	ND (1)	ND (1)	ND (2.1) *	28	33
SD-17	12/17/15	0 - 0.5	N	ND (2.1) *	5.1	190	ND (1) *	ND (1)	ND (0.2)	17	6.6	15	15	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	27	60
	12/17/15	2 - 3	N	ND (2) *	5.5	180	ND (1) *	ND (1)	0.25	18	7.6	16	19	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2) *	30	65

TABLE B-2a
Sample Results: Metals in Soil
AOC 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
SD-18	12/17/15	0 - 0.5	N	ND (2.1) *	2.9	63	ND (1.1) *	ND (1.1) *	ND (0.21)	32	11	17	3.4	ND (0.11) *	ND (1.1)	22	ND (1.1)	ND (1.1)	ND (2.1) *	41	310
SD-19	01/13/16	0 - 0.5	N	ND (2.1) *	2.3	150 J	ND (1) *	ND (1)	ND (0.21)	30	9.8	15 J	2	ND (0.1) *	ND (1)	24	ND (1)	ND (1)	ND (2.1) *	31	33
	01/13/16	0 - 0.5	FD	ND (2.1) *	2.3	120 J	ND (1) *	ND (1)	ND (0.21)	28	9.8	11 J	2.1	ND (0.11) *	1.3	22	ND (1)	ND (1)	ND (2.1) *	31	33
	01/13/16	2 - 3	N	ND (2) *	2.8	150	ND (1) *	ND (1)	ND (0.2)	24	8.3	10	2.8	ND (0.1) *	ND (1)	17	ND (1)	ND (1)	ND (2) *	32	33
	01/13/16	5 - 6	N	ND (2) *	1.2	75	ND (1) *	ND (1)	ND (0.2)	14	6.6	7.9	1.5	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	23	30
	01/13/16	8 - 8.5	N	ND (2) *	1.9	94	ND (1) *	ND (1)	ND (0.2)	15	6.5	7.8	1.8	0.12	ND (1)	11	ND (1)	ND (1)	ND (2) *	24	35
SD-25	03/10/16	0 - 1	N	ND (2.1) *	2.2	89	ND (1) *	ND (1)	ND (0.21)	23	8.6	15	3.1	0.1	ND (1)	20	ND (1)	ND (1)	ND (2.1) *	32	39
SD-26	03/10/16	0 - 1	N	ND (2) *	4.8	130	ND (1) *	1.1	0.32	24	5.6	21	16	ND (0.1) *	ND (1)	17	ND (1)	ND (1)	ND (2) *	22	220
SD-OS33	12/20/16	1.5 - 2	N	ND (2.1) J*	4.7	120	ND (1) *	ND (1)	0.36	29	8	12	5.2	ND (0.1) *	ND (1)	15	ND (1) J	ND (1)	ND (2.1) *	34	47
TCS-4	03/25/14	59 - 60	N	ND (2) J*	2.1	80	ND (1) *	ND (1) J	2.2	61 J	6.3	18 J	32 J	ND (0.1) *	ND (1)	16 J	1.6	ND (1) J	ND (2) J*	29	30
	03/25/14	113	N	ND (2) *	20	51	ND (1) *	ND (1)	ND (0.4)	1,700	31	580	17	ND (0.1) *	35	300	42	ND (1)	ND (2) *	5.7	55
TCS4-E	03/01/16	4 - 5	N	8.3 J	19 J	140	ND (1) J*	ND (1)	29 J	3,100	6.5	16 J	6.2	ND (0.1) *	9.6 J	10 J	ND (1) J	ND (1)	ND (2.1) J*	67 J	190 J
	03/01/16	4 - 5	FD	16 J	18 J	120	ND (1.1) J*	ND (1.1) *	50 J	3,400	5.9	12 J	5	ND (0.11) *	9.1 J	7.1 J	ND (1.1) J	ND (1.1)	ND (2.1) J*	60 J	120 J
	03/01/16	5 - 6	N	ND (2.1) *	ND (1)	58	ND (1) *	ND (1)	0.99	13	8	8	ND (1)	ND (0.1) *	ND (1)	7.6	ND (1)	ND (1)	ND (2.1) *	32	31
TCS4-N	03/01/16	4 - 5	N	8.6	14	100	ND (1.1) *	ND (1.1) *	33	3,400	6.9	8.7	6.9	ND (0.1) *	4.9	13	ND (1.1)	ND (1.1)	ND (2.1) *	70	82
	03/01/16	5 - 6	N	6.9	3.8	130	ND (1.1) *	ND (1.1) *	39	3,300	7.5	14	6.2	ND (0.11) *	15	12	ND (1.1)	ND (1.1)	ND (2.2) *	33	130
TCS4-S	03/01/16	4 - 5	N	ND (2.1) *	1.9	74	ND (1.1) *	ND (1.1) *	30	840	7.4	9	4.5	ND (0.11) *	ND (1.1)	9.5	ND (1.1)	ND (1.1)	ND (2.1) *	33	120
	03/01/16	5 - 6	N	5	2.7	100	ND (1.1) *	ND (1.1) *	21	2,200	7.3	11	3.1	ND (0.11) *	3.4	9	ND (1.1)	ND (1.1)	ND (2.2) *	30	150
SS-1	06/29/97 ‡	0.5	N	---	---	---	---	---	ND (0.05)	38.2	---	16.5	---	---	---	17.9	---	---	---	---	55
	06/29/97 ‡	1.5	N	---	---	---	---	---	ND (0.05)	25.3	---	13.6	---	---	---	12.5	---	---	---	---	43.4
SS-2	06/29/97	0.5	N	---	---	---	---	---	ND (0.05)	18.9	---	14.1	---	---	---	13.2	---	---	---	---	48.3
	06/29/97	1.5	N	---	---	---	---	---	ND (0.05)	10.2	---	12.9	---	---	---	9.4	---	---	---	---	42.2
SS-3	06/29/97	0.5	N	---	---	---	---	---	ND (0.05)	---	---	---	---	---	---	---	---	---	---	---	---
SS-4	06/29/97	0.5	N	---	---	---	---	---	ND (0.05)	---	---	---	---	---	---	---	---	---	---	---	---
SS-5	06/29/97	0.5	N	---	---	---	---	---	ND (0.05)	---	---	---	---	---	---	---	---	---	---	---	---
SS-6	06/29/97	0.5	N	---	---	---	---	---	ND (0.05)	---	---	---	---	---	---	---	---	---	---	---	---
SS-7	06/29/97	0.5	N	---	---	---	---	---	ND (0.05)	---	---	---	---	---	---	---	---	---	---	---	---
SS-8	06/29/97	0.5	N	---	---	---	---	---	ND (0.05)	---	---	---	---	---	---	---	---	---	---	---	---
SSB-1	06/25/97	1	N	---	---	---	---	---	ND (0.05)	13.7	---	14.9	---	---	---	11.6	---	---	---	---	35.7
	06/25/97	3	N	---	---	---	---	---	ND (0.05)	13.6	---	11	---	---	---	12	---	---	---	---	29.6
	06/25/97	6	N	---	---	---	---	---	ND (0.05)	16.7	---	16.9	---	---	---	12.2	---	---	---	---	34.5
	06/25/97	10	N	---	---	97.3	---	---	ND (0.05)	16.5	---	8.2	1.3	---	ND (0.2)	12.9	---	---	---	24.6	26.2
SSB-6	06/30/97	1	N	---	---	---	---	---	ND (0.05)	13.7	---	8.6	---	---	---	8.9	---	---	---	---	29.1
	06/30/97	3	N	---	---	---	---	---	ND (0.05)	27.5	---	6.6	---	---	---	8.2	---	---	---	---	24.8
	06/30/97	6	N	---	---	---	---	---	0.06	467	---	33.8	---	---	---	5.5	---	---	---	---	132
	06/30/97	10	N	---	---	100	---	---	ND (0.05)	14.8	---	9.6	3.1	---	0.79	10.3	---	---	---	22.7	33.4

TABLE B-2a
Sample Results: Metals in Soil
AOC 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Date	Depth (ft bgs)	Sample Type	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium, Hexavalent	Chromium, total	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
SSB-7	06/30/97	1	N	---	---	---	---	---	ND (0.05)	19.8	---	7.7	---	---	---	8.4	---	---	---	---	28.1
	06/30/97	3	N	---	---	---	---	---	ND (0.05)	24.9	---	6.5	---	---	---	7	---	---	---	---	29.4
	06/30/97	6	N	---	---	---	---	---	ND (0.05)	8.6	---	14.7	---	---	---	6.3	---	---	---	---	23
	06/30/97	10	N	---	---	77.5	---	---	ND (0.05)	8.1	---	5.8	1.8	---	ND (0.2)	6.5	---	---	---	16.2	23.4
SSB-8	07/10/97	1	N	---	---	---	---	---	ND (0.05)	53.1	---	15.1	---	---	---	15.3	---	---	---	---	38.3
	07/10/97	3	N	---	---	---	---	---	ND (0.05)	13.6	---	14.1	---	---	---	10.6	---	---	---	---	35.3
	07/10/97	6	N	---	---	---	---	---	ND (0.05)	15.3	---	7.3	---	---	---	10	---	---	---	---	33.5
	07/10/97	10	N	---	---	43.9	---	---	ND (0.05)	17.1	---	10.7	2.8	---	0.071 J	13.9	---	---	---	26.8	35.8
	07/10/97	10	FD	---	---	---	---	---	ND (0.05)	13.7	---	8	---	---	---	11.1	---	---	---	---	30
SSB-9	07/10/97	1	N	---	---	---	---	---	ND (0.05)	17.3	---	8.6	---	---	---	10.1	---	---	---	---	35.5
	07/10/97	3	N	---	---	---	---	---	ND (0.05)	11	---	6.1	---	---	---	7	---	---	---	---	31.8
	07/10/97	6	N	---	---	---	---	---	ND (0.05)	9.6	---	6.4	---	---	---	7.8	---	---	---	---	25.3
	07/10/97	10	N	---	---	102	---	---	ND (0.05)	15.7	---	7.7	3	---	0.096 J	11.4	---	---	---	25.7	33.1
XMW-9	06/25/97	3	N	---	---	---	---	---	ND (0.05)	18.4	---	12	---	---	---	9	---	---	---	---	25.8
	06/25/97	10	N	---	---	257	---	---	ND (0.05)	45.7	---	19.7	5.7	---	0.075 J	35.2	---	---	---	44.5	44.2
	06/25/97	10	FD	---	---	---	---	---	ND (0.05)	31.1	---	16.7	---	---	---	27	---	---	---	---	38.7
	06/25/97	30	N	---	---	88.1	---	---	ND (0.05)	35.6	---	17.2	7.2	---	0.11 J	32.1	---	---	---	42.9	50.3
	06/25/97	50	N	---	---	57.4	---	---	ND (0.05)	36.3	---	15.6	4.5	---	ND (0.2)	28.5	---	---	---	37.7	54.2
	06/25/97	70	N	---	---	1,580	---	---	ND (0.05)	6.7	---	170	6.1	---	1.8	7.4	---	---	---	19.7	54.6
Category 2																					
Spill04162006_Sam	04/26/06	0	N	5	2.3	140	0.5	0.5	---	35	5.3	10	18	0.14	2.7	15	1	0.5	5	24	78
Spill04162006_Sam	04/26/06	0	N	10	4.6	210	1	1	---	20	7	11	6.2	0.16	5	15	1	1	10	34	42
Category 3																					
DS-1	06/24/88	1 - 3	N	---	---	---	---	---	6.8	80	---	---	---	---	---	---	---	---	---	---	---
DS-2	06/24/88	0 - 3	N	---	---	---	---	---	0.7	43	---	---	---	---	---	---	---	---	---	---	---
DS-3	06/24/88	0 - 3	N	---	---	---	---	---	ND (0.5)	25	---	---	---	---	---	---	---	---	---	---	---
DS-4	06/24/88	0 - 3	N	---	---	---	---	---	ND (0.5)	28	---	---	---	---	---	---	---	---	---	---	---

TABLE B-2a

Sample Results: Metals in Soil
AOC 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Notes:

Category 1: Validated data suitable for all uses, including risk assessment and remedial action decisions.
Category 2: Validated data suitable for use in characterization of the chemicals of potential concern at the facility and to help define the nature and extent of contamination.
Category 3: Validated data suitable only for use in qualitative characterization of the nature and extent of contamination.

Results greater than or equal to the interim screening level are circled; however, if the interim screening level is equal to the background value, only results greater than the interim screening level are circled.

ǂ	This location is in an area where soil is transitioning into sediment.
Δ	sediment sample
*	Reporting limits greater than or equal to the interim screening level.
---	not analyzed
ft bgs	feet below ground surface
mg/kg	milligrams per kilogram
DTSC	California Department of Toxic Substances Control
DTSC-SL	DTSC Screening Levels
FD	field duplicate
J	concentration or reporting limit estimated by laboratory or data validation
N	primary sample
ND	not detected at the listed reporting limit
NE	not established
USEPA	United States Environmental Protection Agency

1 Interim screening level is background value. If background value is not available then the interim screening value is the lower of the Ecological Comparison Value , residential DTSC-SL, or USEPA residential regional screening value.

2 United States Environmental Protection Agency (USEPA). 2017. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. November.

3 California Department of Toxic Substances Control (DTSC). 2018. Human Health Risk Assessment (HHRA) Note Number 3. January.

4 ARCADIS. 2008. "Technical Memorandum 3: Ecological Comparison Values for Metals and Polycyclic Aromatic Hydrocarbons in Soil." May 28.

5 CH2M HILL. 2009. "Final Soil Background Technical Memorandum at Pacific Gas and Electric Company Topock Compressor Station, Needles, California." May.

TABLE B-2b

Sample Results: Dioxins and Furans

AOC 1 – Area around Former Percolation Bed

Soil Engineering Evaluation/Cost Analysis

PG&E Topock Compressor Station, Needles, California

				Dioxin/Furans (ng/kg)																			
			Interim Screening Level[1] :	NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
			Residential Regional Screening Levels[2] :	NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
			Residential DTSC-SL[3] :	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
			Ecological Comparison Values[4] :	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
			Background[5] :	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
Location	Date	Depth (ft bgs)	Sample Type	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDF	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDF	2,3,4,6,7,8-HxCDF	2,3,4,7,8-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	OCDD	OCDF	TEQ Avian	TEQ Human	TEQ Mammals
Category 1																							
AOC1-BCW6	08/22/08	0 - 0.5	N	2,100 J	210 J	ND (8.4) J	14 J	14 J	75 J	14 J	25 J	ND (5.5) J	ND (5.3) J*	ND (4) J	ND (350) J	ND (5.5) J	ND (0.31) J	ND (2) J	16,000 J	510 J	37	64	64
	08/22/08	2 - 3	N	570 J	85 J	ND (6.7) J	3.1 J	ND (2) J	ND (0.79) J	ND (5.2) J	7.9 J	ND (2.3) J	ND (0.37) J	ND (1.5) J	ND (2.5) J	ND (1.5) J	ND (0.1) J	ND (0.2) J	8,000 J	200 J	5	11	11
AOC1-1	01/23/16	0 - 0.5	N	5,600 J	410 J	31 J	43 J	44 J	180 J	20 J	100 J	ND (8) J	23 J	6.4 J	ND (2,900) J	13 J	1.1 J	ND (0.18) J	87,000 J	700 J	220	300	300
	01/23/16	2 - 3	N	3,700 J	370 J	28 J	20 J	23 J	120 J	13 J	49 J	5.7 J	11 J	3.8 J	ND (1,900) J	7.1 J	ND (0.12) J	ND (1.2) J	66,000 J	810 J	140	190	190
AOC1-2	01/23/16	0 - 0.5	N	41	4.2 J	ND (0.68)	ND (0.66)	ND (0.41)	1.5 J	ND (0.45)	1.1 J	ND (0.23)	ND (1.4)	ND (0.4)	ND (5.3)	ND (0.16)	ND (0.08)	ND (0.14)	300	8.1 J	1.5	1.9	1.9
	01/23/16	2 - 3	N	ND (1.3)	ND (0.32)	ND (0.093)	ND (0.17)	ND (0.11)	ND (0.15)	ND (0.095)	ND (0.15)	0.29 J	ND (0.064)	ND (0.057)	ND (0.11)	ND (0.057)	ND (0.046)	ND (0.053)	21 J	ND (0.83)	0.17	0.15	0.15
AOC1-3	01/25/16	0 - 0.5	N	6,200 J	670 J	ND (35)	62 J	ND (40)	230 J	ND (35)	140 J	ND (47)	37 J	ND (3.4)	ND (3,100)	15 J	ND (0.47)	ND (3.4)	45,000 J	730 J	250	330	330
	01/25/16	2 - 3	N	3,600	300	ND (15)	31	ND (18)	120	26	76	ND (3.3)	15	ND (10)	ND (1,700)	ND (11)	ND (0.33)	ND (0.95)	33,000 J	480	130	180	180
	01/25/16	5 - 6	N	13 J	1.3 J	ND (0.32) J	ND (0.25) J	ND (0.39) J	ND (0.23) J	ND (0.18) J	ND (0.23) J	ND (0.29) J	ND (0.27) J	ND (0.21) J	ND (5.4) J	ND (0.22) J	ND (0.14) J	ND (0.073) J	200 J	ND (3.6)	0.74	0.8	0.8
	01/25/16	9 - 10	N	5.2 J	ND (0.82) J	ND (0.36) J	ND (0.19) J	ND (0.13) J	ND (0.098) J	ND (0.24) J	0.5 J	ND (0.15) J	ND (0.29) J	ND (0.1) J	ND (1.3) J	ND (0.11) J	ND (0.22) J	ND (0.2) J	72 J	ND (2.1)	0.58	0.52	0.52
AOC1-4	01/23/16	0 - 0.5	N	24 J	ND (2.4) J	ND (0.6) J	ND (0.9) J	ND (0.59) J	ND (0.46) J	ND (0.55) J	ND (0.47) J	ND (0.71) J	ND (0.27) J	ND (0.14) J	ND (3.8) J	ND (0.15) J	ND (0.1) J	ND (0.15) J	240 J	ND (5)	0.74	0.92	0.92
	01/23/16	2 - 3	N	18 J	2 J	ND (2.4) J	ND (0.23) J	ND (0.31) J	ND (0.22) J	ND (0.29) J	ND (0.22) J	ND (0.37) J	ND (0.16) J	ND (0.091) J	ND (2.7) J	ND (0.096) J	ND (0.081) J	ND (0.084) J	310 J	ND (5.6)	0.5	0.66	0.66
AOC1-5	01/09/17	0 - 0.5	N	120	ND (9.5)	ND (1.4)	ND (0.37)	ND (0.44)	ND (0.47)	ND (0.58)	ND (1.6)	ND (0.25)	ND (0.47)	ND (0.11)	ND (6)	ND (0.12)	ND (0.087)	ND (0.098)	1,300	28	1.2	2.4	2.4
	01/09/17	2 - 3	N	6.5 J	ND (0.2)	ND (0.24)	ND (0.11)	ND (0.053)	ND (0.17)	ND (0.048)	ND (0.16)	ND (0.063)	ND (0.07)	ND (0.064)	ND (0.2)	ND (0.067)	ND (0.071)	ND (0.1)	ND (44)	ND (1.3)	0.2	0.2	0.2
	01/09/17	5 - 6	N	280	45	ND (2.5)	1.3 J	ND (1.2)	ND (0.22)	ND (1.7)	ND (2.2)	ND (0.52)	ND (0.49)	ND (0.24)	ND (53)	ND (0.25)	ND (0.077)	ND (0.12)	4,200	280	4.7	8	8
	01/09/17	9 - 10	N	8.1 J	ND (1.6)	ND (1.1)	ND (0.29)	ND (0.14)	ND (0.19)	ND (0.13)	ND (1.1)	ND (0.56)	ND (0.14)	ND (0.11)	0.77 J	ND (0.11)	ND (0.071)	ND (0.27)	83	ND (4.4)	0.51	0.45	0.45
	01/09/17	14 - 15	N	1.8 J	ND (0.13)	ND (0.39)	ND (0.3)	ND (0.067)	ND (0.09)	ND (0.061)	0.27 J	ND (0.079)	ND (0.064)	ND (0.043)	ND (0.069)	ND (0.046)	ND (0.12)	ND (0.18)	ND (9.2)	ND (0.73)	0.26	0.19	0.19
AOC1-6	01/09/17	0 - 0.5	N	440	42	ND (4.5)	ND (1.6)	ND (1.3)	12 J	ND (2.8)	5.1 J	ND (1.6)	ND (1)	ND (0.52)	ND (110)	ND (0.55)	ND (0.18)	ND (0.25)	4,500	94	8.8	14	14
	01/09/17	2 - 3	N	77	ND (10)	ND (0.72)	ND (0.49)	ND (0.51)	2.4 J	ND (0.46)	ND (0.79)	ND (0.6)	ND (0.19)	ND (0.39)	ND (20)	ND (0.41)	ND (0.092)	ND (0.13)	750	26	1.8	2.7	2.7
	01/09/17	5 - 6	N	ND (8.9)	ND (1.1)	ND (0.24)	ND (0.12)	ND (0.13)	ND (0.14)	ND (0.32)	ND (0.28)	ND (0.15)	ND (0.06)	ND (0.051)	1.2 J	ND (0.053)	ND (0.044)	ND (0.039)	ND (75)	ND (1.5)	0.28	0.3	0.3
	01/09/17	9 - 10	N	ND (3.5)	ND (0.37)	ND (0.38)	ND (0.052)	ND (0.092)	ND (0.051)	ND (0.084)	ND (0.05)	ND (0.11)	ND (0.098)	ND (0.11)	ND (0.095)	ND (0.11)	ND (0.069)	ND (0.063)	ND (41)	ND (1.5)	ND (0.21)	ND (0.16)	ND (0.16)
	01/09/17	14 - 15	N	3.5 J	ND (0.34)	ND (0.13)	ND (0.11)	ND (0.14)	ND (0.11)	ND (0.097)	ND (0.11)	ND (0.13)	ND (0.21)	ND (0.047)	ND (0.31)	ND (0.049)	ND (0.067)	ND (0.048)	ND (30)	ND (1.6)	0.24	0.24	0.24
AOC16-5	02/20/17	0 - 0.5	N	820 J	54	5.9 J	3.8 J	9 J	26	ND (3.1)	8.4 J	ND (1.6)	ND (2.4)	ND (0.23)	ND (370)	ND (2.8)	ND (0.095)	ND (0.16)	6,800 J	100	26	36	36
	02/20/17	0 - 0.5	FD	440 J	28	3.1 J	2.1 J	5.3 J	15	ND (4.1)	4.9 J	1.3 J	ND (1.3)	ND (0.27)	ND (260)	ND (2.1)	ND (0.075)	ND (0.68)	3,700 J	45	18	23	23
	02/20/17	2 - 3	N	ND (7.9)	ND (0.57)	ND (0.18)	ND (0.069)	ND (0.081)	ND (0.34)	ND (0.078)	ND (0.11)	ND (0.094)	ND (0.065)	ND (0.047)	ND (5.9)	ND (0.049)	ND (0.031)	ND (0.036)	ND (66)	ND (0.91)	ND (0.42)	ND (0.44)	ND (0.44)
AOC1-7	01/09/17	0 - 0.5	N	480	38 J	ND (0.85)	1.4 J	1.8 J	7.7 J	ND (1.8)	ND (0.29)	ND (0.8)	ND (0.8)	ND (0.13)	ND (61)	ND (0.65)	ND (0.33)	0.38 J	5,100	130 J	6.2	12	12
	01/09/17	2 - 3	N	190 J	19	ND (1.3)	ND (0.8)	ND (1.1)	5 J	ND (0.95)	ND (1.8)	ND (0.43)	ND (0.28)	ND (0.33)	ND (41)	ND (0.35)	ND (0.075)	ND (0.11)	2,200 J	69	3.4	5.8	5.8
	01/09/17	2 - 3	FD	97 J	9.8 J	ND (0.79)	ND (0.64)	ND (0.45)	2.8 J	ND (0.41)	1.6 J	ND (0.53)	ND (0.57)	ND (0.14)	ND (30)	ND (0.14)	ND (0.073)	ND (0.12)	980 J	24 J	2.5	3.8	3.8
	01/09/17	5 - 6	N	4 J	ND (1.3)	1.2 J	ND (0.32)	ND (0.11)	ND (0.061)	ND (0.099)	ND (0.63)	ND (0.41)	ND (0.36)	ND (0.2)	0.84 J	ND (0.16)	ND (0.068)	ND (0.24)	51	2.5 J	0.61	0.49	0.49
	01/09/17	9 - 10	N	ND (0.27)	ND (0.42)	ND (0.59)	ND (0.19)	ND (0.28)	ND (0.083)	ND (0.07)	ND (0.24)	ND (0.53)	ND (0.048)	ND (0.1)	ND (0.079)	ND (0.056)	ND (0.055)	ND (0.077)	17 J	ND (1.2)	0.2	0.15	0.15
	01/09/17	14 - 15	N	1.1 J	ND (0.11)	ND (0.33)	ND (0.068)	ND (0.032)	ND (0.067)	ND (0.03)	ND (0.066)	ND (0.038)	ND (0.079)	ND (0.059)	ND (0.26)	ND (0.062)	ND (0.096)	ND (0.12)	12 J	ND (0.66)	0.21	0.15	0.15

TABLE B-2b
Sample Results: Dioxins and Furans
AOC 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Dioxin/Furans (ng/kg)																			
Interim Screening Level[1] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
Residential Regional Screening Levels[2] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
Residential DTSC-SL[3] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
Ecological Comparison Values[4] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
Background[5] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
Location	Date	Depth (ft bgs)	Sample Type	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDF	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDF	2,3,4,6,7,8-HxCDF	2,3,4,7,8-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	OCDD	OCDF	TEQ Avian	TEQ Human	TEQ Mammals
AOC1-8	01/05/17	0 - 0.5	N	130	18	ND (1.9)	ND (1.2)	ND (0.54)	5.4 J	1.9 J	2.9 J	ND (4.4)	ND (0.84)	ND (0.35)	ND (41)	ND (0.26)	ND (0.19)	ND (0.35)	1,200	41	4.1	5.8	5.8
	01/05/17	2 - 3	N	200	ND (1.5)	ND (1.8)	ND (2)	ND (1.9)	8.5 J	ND (1.6)	5.1 J	ND (2.1)	ND (0.95)	ND (0.97)	ND (78)	ND (0.98)	ND (0.3)	ND (0.44)	1,800	64	6.6	9	9
AOC1-BCW10	02/04/16	0 - 0.5	N	5,100	ND (240)	27	ND (7.1)	ND (1.1)	88	ND (45)	23	ND (1.3)	ND (4.2)	ND (0.58)	ND (570)	5.1 J	ND (0.4)	2.3 J	42,000	1,700	55	110	110
	02/04/16	2 - 3	N	670	ND (0.21)	ND (4)	3.5 J	ND (0.21)	17	ND (7.7)	7 J	1.6 J	ND (1)	ND (1.1)	ND (110)	ND (1.2)	ND (0.08)	ND (0.077)	6,700	120	9.7	18	18
	02/04/16	5 - 6	N	17	ND (0.091)	ND (0.12)	ND (0.2)	ND (0.16)	0.78 J	ND (1.5)	ND (0.19)	ND (0.24)	ND (0.16)	ND (1.5)	ND (0.27)	ND (1.6)	ND (0.045)	ND (0.069)	130	2.2 J	1.2	0.79	0.79
	02/04/16	9 - 10	N	ND (1.7)	0.38 J	ND (0.094)	ND (0.064)	ND (0.15)	ND (0.12)	ND (0.14)	ND (0.06)	ND (0.18)	ND (0.074)	ND (0.074)	ND (0.42)	ND (0.08)	ND (0.049)	ND (0.11)	ND (14)	ND (0.14)	0.22	0.15	0.15
	02/04/16	9 - 10	FD	ND (0.88)	ND (0.03)	ND (0.067)	ND (0.046)	ND (0.052)	ND (0.036)	ND (0.048)	ND (0.034)	ND (0.061)	ND (0.052)	ND (0.062)	ND (0.21)	ND (0.067)	ND (0.025)	0.1 J	ND (3.8)	ND (0.047)	0.2	0.089	0.089
AOC1-BCW11	02/04/16	0 - 0.5	N	380	ND (1.3)	ND (1.6)	1.9 J	ND (2.8)	8.6 J	ND (4.9)	3.7 J	ND (1.1)	ND (0.35)	ND (0.19)	ND (58)	ND (0.21)	ND (0.36)	ND (0.36)	4,700	52	5.4	10	10
	02/04/16	2 - 3	N	830	ND (1.9)	ND (8)	4 J	ND (2.3)	25	ND (19)	9.3 J	ND (2.7)	ND (2.4)	ND (0.53)	ND (2.4)	2.7 J	ND (0.19)	ND (0.96)	9,700	320 J	9.1	19	19
	02/04/16	5 - 6	N	1,800	110	12 J	7.8 J	ND (2.1)	50	4.6 J	18	ND (2.4)	ND (3.8)	ND (1.4)	ND (340)	ND (1.6)	0.5 J	1 J	16,000	440	29	52	52
	02/04/16	9 - 10	N	ND (2.2)	ND (0.055)	ND (0.07)	ND (0.13)	ND (0.15)	ND (0.13)	ND (0.14)	ND (0.15)	ND (0.18)	ND (0.1)	ND (0.06)	ND (0.76)	ND (0.065)	ND (0.061)	ND (0.16)	ND (13)	ND (0.56)	ND (0.27)	ND (0.19)	ND (0.19)
AOC1-BCW12	02/04/16	0 - 0.5	N	1,400	160	ND (11)	13	ND (7.7)	41	ND (6.8)	15	ND (8.7)	4.4 J	ND (7.5)	ND (380)	5.8 J	ND (0.32)	2.5 J	15,000	590	41	54	54
	02/04/16	2 - 3	N	2,900	410	ND (41)	ND (3.3)	ND (45)	70	ND (40)	15	ND (51)	ND (2.9)	ND (23)	ND (670)	ND (23)	ND (0.52)	ND (0.84)	50,000	2,300	70	100	100
	02/04/16	5 - 6	N	36 J	ND (1.8) J	ND (0.22) J	ND (0.39) J	ND (0.48) J	ND (0.37) J	ND (0.44) J	ND (0.37) J	ND (0.57) J	ND (0.28) J	ND (0.12) J	ND (15) J	ND (0.13) J	ND (0.063) J	ND (0.088) J	120 J	ND (3.2) J	1.2	1.5	1.5
AOC1-BCW13	02/04/16	0 - 0.5	N	550	36	5.4 J	2.6 J	5 J	16	ND (10)	ND (5.4)	ND (0.78)	ND (0.3)	ND (0.26)	ND (140)	2.1 J	0.27 J	0.9 J	5,200	260	14	19	19
	02/04/16	2 - 3	N	8.3 J	ND (0.39)	ND (0.19)	ND (0.29)	ND (0.21)	ND (0.088)	ND (0.22)	ND (0.23)	ND (0.25)	ND (0.13)	ND (0.07)	ND (1.9)	ND (0.075)	ND (0.051)	ND (0.047)	70	ND (0.96)	0.32	0.37	0.37
	02/04/16	5 - 6	N	ND (1.8)	0.21 J	ND (0.079)	0.14 J	ND (0.066)	ND (0.1)	ND (0.084)	ND (0.055)	ND (0.35)	ND (0.072)	ND (0.1)	ND (0.072)	ND (0.11)	ND (0.13)	0.26 J	ND (12)	ND (0.4)	0.46	0.21	0.21
	02/04/16	9 - 10	N	ND (2.3)	ND (0.2)	ND (0.093)	ND (0.074)	ND (0.098)	ND (0.22)	ND (0.091)	ND (0.069)	ND (0.12)	ND (0.18)	ND (0.069)	ND (0.6)	ND (0.074)	ND (0.075)	0.25 J	ND (7.6)	ND (0.26)	0.47	0.24	0.24
AOC1-BCW14	02/04/16	0 - 0.5	N	530	51	ND (2.8)	3.8 J	3.1 J	ND (0.4)	1.5 J	7.4 J	ND (3.7)	ND (1)	ND (1.6)	1.1 J	ND (1.6)	ND (0.52)	0.9 J	6,600	120	6	11	11
	02/04/16	2 - 3	N	47	6.2 J	ND (0.46)	ND (0.39)	ND (0.24)	1.5 J	ND (0.21)	0.78 J	ND (2.3)	ND (0.075)	ND (0.11)	ND (8.9)	ND (0.12)	ND (0.062)	ND (0.3)	680	14 J	1.1	1.7	1.7
AOC1-BCW15	02/04/16	0 - 0.5	N	260 J	24 J	2.4 J	1.8 J	1.5 J	7.4 J	ND (1.1) J	3.6 J	ND (0.42) J	ND (0.26) J	0.71 J	ND (81) J	ND (0.89) J	ND (0.064) J	0.56 J	2,700 J	80 J	6.8	9.6	9.6
AOC1-BCW16	02/04/16	0 - 0.5	N	580	53 J	4.8 J	4.5 J	ND (7.1)	24 J	ND (2)	9.4 J	ND (2.4)	3.8 J	ND (1.1)	ND (190)	ND (1.2)	ND (0.48)	ND (0.3)	5,400	190 J	18	26	26
	02/04/16	2 - 3	N	300	43	4.7 J	22	ND (0.16)	ND (1.1)	2 J	5 J	1.5 J	3.8 J	ND (0.7)	ND (130)	ND (0.73)	0.34 J	ND (0.46)	3,100	120	14	18	18
	02/04/16	5 - 6	N	26	2.3 J	ND (0.47)	ND (0.33)	0.63 J	ND (1.1)	ND (0.77)	ND (0.67)	ND (0.26)	ND (0.11)	ND (0.38)	ND (8.5)	ND (0.3)	ND (4.8) *	0.39 J	200	4.7 J	3.7	3.5	3.5
	02/04/16	9 - 10	N	ND (1.9)	ND (0.18)	ND (0.11)	ND (0.15)	ND (0.084)	ND (0.11)	ND (0.082)	0.22 J	ND (0.098)	ND (0.1)	ND (0.16)	ND (0.29)	ND (0.17)	ND (0.1)	ND (0.15)	ND (6.4)	ND (0.41)	0.32	0.21	0.21
AOC1-BCW17	02/04/16	0 - 0.5	N	15	1.7 J	ND (0.59)	ND (0.24)	ND (0.26)	ND (0.21)	ND (0.23)	ND (0.21)	ND (0.3)	ND (0.13)	ND (0.28)	ND (0.26)	ND (0.12)	ND (0.06)	ND (0.17)	120	3 J	0.37	0.42	0.42
	02/04/16	2 - 3	N	2 J	ND (0.49)	ND (0.052)	ND (0.1)	ND (0.1)	ND (0.086)	ND (0.089)	ND (0.12)	ND (0.11)	ND (0.061)	ND (0.069)	ND (0.2)	ND (0.069)	ND (0.051)	ND (0.091)	ND (24)	ND (0.37)	0.18	0.14	0.14
AOC1-BCW18	02/05/16	0 - 0.5	N	1,300	57 J	ND (6.7)	ND (2.8)	6.8 J	21	ND (0.46)	7.4 J	ND (1.2)	ND (1.7)	1.1 J	ND (110)	ND (0.8)	ND (0.21)	ND (0.49)	15,000	230 J	12	29	29
	02/05/16	2 - 3	N	4.1 J	ND (0.13)	ND (0.1)	ND (0.4)	ND (0.17)	ND (0.39)	ND (0.15)	ND (0.37)	ND (0.19)	ND (0.087)	ND (0.2)	ND (1.4)	ND (0.22)	ND (0.053)	ND (0.22)	ND (9.5)	0.39 J	0.43	0.31	0.31
	02/05/16	5 - 6	N	ND (0.29)	ND (0.05)	ND (0.036)	ND (0.056)	ND (0.032)	ND (0.055)	ND (0.03)	ND (0.072)	ND (0.084)	ND (0.073)	ND (0.09)	ND (0.1)	ND (0.097)	ND (0.076)	ND (0.3)	ND (0.66)	ND (0.068)	ND (0.3)	ND (0.13)	ND (0.13)
	02/05/16	9 - 10	N	ND (0.19)	ND (0.028)	ND (0.036)	ND (0.06)	ND (0.034)	ND (0.049)	ND (0.031)	ND (0.1)	ND (0.04)	ND (0.058)	ND (0.062)	ND (0.035)	ND (0.067)	ND (0.069)	ND (0.2)	ND (0.9)	ND (0.052)	ND (0.21)	ND (0.1)	ND (0.1)
AOC1-BCW19	02/05/16	0 - 0.5	N	7,100 J	470 J	29 J	28 J	41 J	160 J	14 J	57 J	13 J	13 J	10 J	ND (1,000) J	15 J	ND (0.82) J	4 J	97,000 J	1,200 J	120	210	210

TABLE B-2b
Sample Results: Dioxins and Furans
AOC 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Dioxin/Furans (ng/kg)																			
Interim Screening Level[1] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
Residential Regional Screening Levels[2] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
Residential DTSC-SL[3] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
Ecological Comparison Values[4] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
Background[5] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
Location	Date	Depth (ft bgs)	Sample Type	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDF	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDF	2,3,4,6,7,8-HxCDF	2,3,4,7,8-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	OCDD	OCDF	TEQ Avian	TEQ Human	TEQ Mammals
AOC1-BCW20	02/05/16	0 - 0.5	N	160	ND (0.2)	1.2 J	1.3 J	ND (0.24)	6.1 J	ND (3.1)	2.7 J	ND (0.28)	ND (0.26)	ND (0.32)	ND (42)	ND (0.34)	ND (0.068)	ND (0.064)	1,600	35	3.4	5.6	5.6
	02/05/16	2 - 3	N	4.4 J	ND (0.13)	ND (0.16)	ND (0.17)	ND (0.056)	ND (0.039)	ND (0.052)	ND (0.037)	ND (0.065)	ND (0.074)	ND (0.086)	ND (1.5)	ND (0.1)	ND (0.041)	ND (0.11)	ND (21)	ND (0.41)	0.26	0.22	0.22
	02/05/16	5 - 6	N	ND (3.1)	ND (0.088)	ND (0.068)	ND (0.17)	ND (0.075)	ND (0.069)	ND (0.069)	ND (0.14)	ND (0.087)	ND (0.054)	ND (0.1)	ND (1.1)	ND (0.11)	ND (0.06)	0.15 J	ND (13)	0.31 J	0.35	0.19	0.19
	02/05/16	9 - 10	N	ND (0.61)	ND (0.084)	ND (0.038)	ND (0.04)	ND (0.064)	ND (0.05)	ND (0.059)	ND (0.047)	ND (0.075)	ND (0.097)	ND (0.085)	ND (0.2)	ND (0.091)	ND (0.041)	ND (0.14)	ND (2)	ND (0.031)	ND (0.21)	ND (0.12)	ND (0.12)
AOC1-BCW21	02/05/16	0 - 0.5	N	2,000	ND (9.8)	ND (12)	5.2 J	14	44	ND (23)	16	3.8 J	4.6 J	ND (0.2)	5.5 J	3.5 J	ND (0.29)	ND (0.48)	20,000	440	18	42	42
	02/05/16	2 - 3	N	12 J	ND (0.086)	ND (0.11)	ND (0.13)	ND (0.12)	ND (0.13)	ND (0.11)	ND (0.12)	ND (0.14)	ND (0.12)	ND (0.075)	ND (0.12)	ND (0.081)	ND (0.053)	ND (0.14)	110	3.1 J	0.26	0.31	0.31
	02/05/16	5 - 6	N	ND (1)	ND (0.04)	ND (0.05)	ND (0.047)	ND (0.067)	ND (0.046)	ND (0.057)	ND (0.044)	ND (0.078)	ND (0.073)	ND (0.08)	ND (0.43)	ND (0.086)	ND (0.047)	ND (0.1)	ND (5.6)	ND (0.17)	ND (0.19)	ND (0.12)	ND (0.12)
	02/05/16	9 - 10	N	ND (0.73)	ND (0.069)	ND (0.087)	ND (0.03)	ND (0.05)	ND (0.062)	ND (0.12)	ND (0.034)	ND (0.058)	ND (0.074)	ND (0.052)	ND (0.39)	ND (0.056)	ND (0.055)	ND (0.04)	ND (3.4)	ND (0.19)	ND (0.15)	ND (0.12)	ND (0.12)
AOC1-BCW22	02/05/16	0 - 0.5	N	190 J	22 J	2.3 J	ND (0.63) J	ND (1.2) J	5.5 J	ND (0.99) J	2.1 J	ND (0.77) J	ND (0.87) J	ND (0.4) J	ND (49) J	ND (0.88) J	ND (0.15) J	ND (0.097) J	2,500 J	63 J	4.6	7	7
AOC1-BCW23	02/05/16	0 - 0.5	N	540	63	5.2 J	ND (4)	ND (3.4)	16	ND (4.5)	ND (4.9)	ND (1.5)	ND (2.3)	5.7 J	ND (170)	ND (2.3)	ND (0.34)	3.1 J	5,900	180	17	21	21
	02/05/16	2 - 3	N	16	1.9 J	ND (0.57)	ND (0.22)	ND (0.13)	ND (0.5)	ND (0.11)	ND (0.5)	0.67 J	ND (0.16)	ND (0.23)	ND (1.7)	ND (0.23)	ND (0.16)	ND (0.17)	120	2.3 J	0.62	0.65	0.65
AOC1-BCW24	02/05/16	0 - 0.5	N	830	58	ND (15)	4.9 J	ND (4.7)	20	ND (4.1)	12 J	ND (5.3)	1.7 J	ND (2)	ND (160)	ND (2)	ND (0.15)	ND (0.93)	10,000	150	16	27	27
	02/05/16	2 - 3	N	510	110	ND (28)	ND (1.5)	ND (8.3)	23	5.4 J	ND (5.7)	ND (1.7)	1.5 J	ND (3.5)	ND (250)	ND (3.5)	ND (0.068)	ND (0.2)	5,500	310	20	26	26
	02/05/16	5 - 6	N	ND (1.6) J	ND (0.079) J	ND (0.12) J	ND (0.11) J	ND (0.061) J	ND (0.1) J	ND (0.057) J	ND (0.1) J	ND (0.073) J	ND (0.11) J	ND (0.073) J	ND (0.55) J	ND (0.078) J	ND (0.086) J	ND (0.046) J	ND (8.3)	ND (0.13) J	ND (0.21)	ND (0.18)	ND (0.18)
AOC1-BCW25	02/05/16	0 - 0.5	N	1,700	110 J	12 J	7.8 J	ND (1.7)	50 J	ND (29)	16	ND (2)	4.7 J	ND (1)	ND (400)	ND (1.1)	ND (0.16)	1.4 J	17,000	620 J	36	58	58
	02/05/16	2 - 3	N	38	3.4 J	ND (0.32)	1.4 J	ND (0.16)	ND (0.3)	ND (1.6)	ND (0.56)	ND (0.18)	ND (0.2)	ND (0.15)	ND (17)	ND (0.16)	ND (0.056)	ND (0.12)	510	17 J	1.4	1.9	1.9
	02/05/16	5 - 6	N	7.2 J	ND (0.69)	ND (0.33)	ND (0.13)	ND (0.18)	ND (0.13)	ND (0.17)	ND (0.12)	ND (0.21)	ND (0.084)	ND (0.78)	ND (4.5)	ND (0.84)	ND (0.03)	ND (0.26)	73	6.6 J	0.93	0.58	0.58
	02/05/16	9 - 10	N	ND (0.36)	ND (0.032)	ND (0.04)	ND (0.03)	ND (0.057)	ND (0.03)	ND (0.053)	ND (0.055)	ND (0.066)	ND (0.042)	ND (0.036)	ND (0.15)	ND (0.039)	ND (0.023)	ND (0.076)	ND (1.8)	ND (0.037)	ND (0.11)	ND (0.067)	ND (0.067)
AOC1-BCW26	02/04/16	0 - 0.5	N	4,100	250	ND (18)	16	18	95	15	30	ND (13)	ND (1.7)	ND (3.1)	ND (540)	7.8 J	ND (0.5)	2.6 J	39,000	710	58	100	100
	02/04/16	2 - 3	N	ND (19)	3 J	ND (1.7)	ND (0.76)	ND (0.21)	ND (1.2)	ND (0.4)	ND (1.7)	ND (0.76)	ND (0.37)	0.26 J	ND (1.4)	ND (0.24)	ND (0.083)	ND (0.2)	ND (120)	ND (3.4)	0.78	0.75	0.75
AOC1-BCW27	02/05/16	0 - 0.5	N	91	ND (0.57)	ND (0.73)	ND (0.68)	ND (0.14)	3.5 J	ND (2.9)	1.3 J	ND (0.25)	ND (0.82)	ND (0.18)	ND (25)	ND (2)	ND (0.19)	0.7 J	660	21 J	4	3.9	3.9
	02/05/16	2 - 3	N	ND (0.2)	ND (0.095)	ND (0.035)	ND (0.055)	ND (0.041)	ND (0.054)	ND (0.038)	ND (0.052)	ND (0.048)	ND (0.071)	ND (0.084)	ND (0.066)	ND (0.091)	ND (0.052)	0.24 J	ND (1.2)	ND (0.095)	0.37	0.12	0.12
	02/05/16	5 - 6	N	0.6 J	ND (0.068)	ND (0.086)	ND (0.055)	ND (0.058)	ND (0.055)	ND (0.15)	ND (0.052)	ND (0.068)	ND (0.089)	ND (0.058)	ND (0.34)	ND (0.063)	ND (0.04)	ND (0.069)	4.4 J	ND (0.56)	0.17	0.13	0.13
	02/05/16	9 - 10	N	0.27 J	ND (0.028)	ND (0.035)	ND (0.08)	ND (0.022)	ND (0.029)	ND (0.02)	ND (0.027)	ND (0.026)	ND (0.037)	ND (0.032)	ND (0.29)	ND (0.035)	ND (0.053)	ND (0.19)	ND (1.5)	ND (0.076)	0.18	0.088	0.088
AOC1-BCW28	02/05/16	0 - 0.5	N	5,700	ND (28)	ND (35)	23	ND (74)	180	ND (68)	53	ND (86)	14	8.9 J	ND (1,000)	15	ND (1)	2.7 J	47,000	1,500	110	180	180
	02/05/16	2 - 3	N	16	ND (0.16)	ND (0.2)	ND (0.19)	ND (0.21)	ND (0.19)	ND (1.2)	ND (0.27)	ND (0.24)	ND (0.094)	ND (0.13)	ND (8.2)	ND (0.14)	ND (0.056)	ND (0.11)	130	4.7 J	0.75	0.83	0.83
	02/05/16	5 - 6	N	8 J	ND (0.71)	ND (0.14)	ND (0.2)	ND (0.19)	ND (0.19)	ND (0.33)	ND (0.18)	ND (0.22)	ND (0.097)	ND (0.12)	ND (4.8)	ND (0.13)	ND (0.19)	0.23 J	82	4 J	0.76	0.6	0.6
	02/05/16	9 - 10	N	ND (0.65)	ND (0.076)	ND (0.097)	ND (0.034)	ND (0.044)	ND (0.033)	ND (0.041)	ND (0.032)	ND (0.051)	ND (0.072)	ND (0.064)	ND (0.15)	ND (0.069)	ND (0.066)	ND (0.15)	ND (1.8)	ND (0.23)	ND (0.2)	ND (0.11)	ND (0.11)
AOC1-BCW29	02/04/16	0 - 0.5	N	2,900	280	ND (5)	ND (13)	ND (12)	68	ND (12)	ND (12)	ND (14)	ND (2.4)	10 J	ND (600)	ND (4.1)	ND (0.39)	ND (1.2)	30,000	1,300	47	84	84
	02/04/16	2 - 3	N	2.8 J	ND (0.12)	ND (0.14)	0.74 J	ND (0.13)	ND (0.14)	ND (0.13)	ND (0.13)	ND (0.27)	ND (0.095)	ND (0.15)	ND (2.5)	ND (0.16)	ND (0.084)	ND (1.1)	24 J	ND (0.8)	0.93	0.45	0.45
	02/04/16	5 - 6	N	2.7 J	0.69 J	ND (0.29)	ND (0.2)	0.3 J	ND (0.072)	ND (0.36)	ND (0.18)	ND (0.26)	ND (0.2)	ND (0.14)	ND (1)	ND (0.15)	ND (0.27)	1.2 J	29	ND (1.1)	1.7	0.56	0.56
	02/04/16	9 - 10	N	17	ND (0.75)	ND (0.11)	ND (0.15)	ND (0.072)	ND (0.23)	ND (0.14)	ND (0.15)	ND (0.084)	ND (0.09)	ND (0.092)	ND (1.3)	ND (0.17)	ND (0.12)	ND (0.61)	370	2.4 J	0.65	0.55	0.55

TABLE B-2b
Sample Results: Dioxins and Furans
AOC 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Dioxin/Furans (ng/kg)																			
Interim Screening Level[1] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
Residential Regional Screening Levels[2] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
Residential DTSC-SL[3] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
Ecological Comparison Values[4] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
Background[5] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**1,2,3,4,6,7,8-HpCDD**	**1,2,3,4,6,7,8-HpCDF**	**1,2,3,4,7,8,9-HpCDF**	**1,2,3,4,7,8-HxCDD**	**1,2,3,4,7,8-HxCDF**	**1,2,3,6,7,8-HxCDD**	**1,2,3,6,7,8-HxCDF**	**1,2,3,7,8,9-HxCDD**	**1,2,3,7,8,9-HxCDF**	**1,2,3,7,8-PeCDD**	**1,2,3,7,8-PeCDF**	**2,3,4,6,7,8-HxCDF**	**2,3,4,7,8-PeCDF**	**2,3,7,8-TCDD**	**2,3,7,8-TCDF**	**OCDD**	**OCDF**	**TEQ Avian**	**TEQ Human**	**TEQ Mammals**
AOC1-BCW30	02/04/16	0 - 0.5	N	5,200	460	24	22	34	ND (5.8)	32	49	ND (9.1)	12 J	ND (8.8)	ND (890)	13	0.5 J	7	14,000	980	100	140	140
	02/04/16	2 - 3	N	ND (0.77)	2.4 J	ND (0.22)	ND (0.46)	ND (0.63)	ND (0.32)	ND (0.49)	ND (0.64)	ND (0.93)	0.87 J	ND (0.23)	ND (7.8)	ND (0.46)	ND (1.1)	0.65 J	98	3.6 J	2.9	2.2	2.2
AOC1-BCW31	02/20/17	0 - 0.5	N	9.3 J	1.1 J	ND (0.13)	ND (0.11)	ND (0.19)	0.43 J	ND (0.18)	ND (0.33)	ND (0.22)	ND (0.11)	ND (0.092)	ND (3)	ND (0.095)	ND (0.11)	ND (0.27)	ND (88)	ND (1.3)	0.53	0.5	0.5
	02/20/17	2 - 3	N	ND (0.46)	ND (0.049)	ND (0.058)	ND (0.039)	ND (0.042)	ND (0.04)	ND (0.04)	ND (0.053)	ND (0.048)	ND (0.054)	ND (0.037)	ND (0.21)	ND (0.039)	ND (0.03)	ND (0.034)	ND (7.4)	ND (0.16)	ND (0.1)	ND (0.078)	ND (0.078)
AOC1-BCW32	02/20/17	0 - 0.5	N	20	2.9 J	0.32 J	ND (0.11)	ND (0.12)	1.2 J	ND (0.2)	ND (0.43)	ND (0.14)	ND (0.064)	0.27 J	14	ND (0.056)	ND (0.035)	ND (0.087)	190	5.5 J	1.7	1.9	1.9
	02/20/17	2 - 3	N	ND (2.9)	ND (0.38)	ND (0.083)	ND (0.076)	ND (0.054)	ND (0.076)	ND (0.098)	ND (0.12)	ND (0.062)	ND (0.06)	ND (0.043)	ND (0.58)	ND (0.045)	ND (0.035)	ND (0.023)	ND (40)	0.93 J	0.14	0.13	0.13
AOC1-BCW7	02/05/16	0 - 0.5	N	200	16	2.1 J	0.87 J	1.8 J	5.6 J	ND (3.2)	ND (2)	0.59 J	ND (0.35)	ND (0.19)	ND (37)	ND (0.39)	0.17 J	0.26 J	2,600	74	3.9	6.4	6.4
	02/05/16	2 - 3	N	100	8.2 J	1.1 J	0.85 J	0.94 J	2.9 J	ND (0.27)	1.2 J	ND (0.26)	ND (0.21)	ND (0.24)	ND (18)	ND (0.26)	ND (0.051)	0.19 J	1,100	32	2	3.1	3.1
	02/05/16	2 - 3	FD	90	ND (0.15)	ND (0.68)	0.54 J	ND (0.24)	ND (2.5)	ND (0.88)	1.3 J	ND (0.28)	ND (0.15)	ND (0.12)	ND (17)	ND (0.13)	ND (0.052)	ND (0.074)	870	30	1.5	2.5	2.5
	02/05/16	5 - 6	N	ND (2.7)	ND (0.094)	ND (0.12)	0.24 J	ND (0.081)	ND (0.074)	ND (0.075)	ND (0.071)	ND (0.094)	ND (0.095)	ND (0.038)	ND (0.28)	ND (0.041)	ND (0.068)	ND (0.052)	ND (23)	ND (0.6)	0.18	0.17	0.17
	02/05/16	9 - 10	N	5 J	ND (0.36)	ND (0.15)	ND (0.075)	ND (0.084)	ND (0.074)	ND (0.078)	ND (0.07)	ND (0.098)	ND (0.085)	ND (0.12)	ND (1)	ND (0.13)	ND (0.05)	ND (0.037)	54	1.5 J	0.24	0.23	0.23
AOC1-BCW8	02/04/16	0 - 0.5	N	730	55	ND (2.8)	ND (3.2)	ND (4.9)	15	ND (4.3)	5.9 J	ND (5.6)	ND (1.5)	ND (0.73)	ND (120)	ND (0.63)	ND (0.18)	ND (0.66)	9,900	170	11	21	21
	02/04/16	2 - 3	N	1,400	110	7.6 J	6.9 J	6.4 J	30	6 J	14	2.5 J	ND (1.8)	ND (2.9)	ND (180)	ND (3.7)	ND (0.33)	3 J	18,000	270	23	38	38
	02/04/16	5 - 6	N	240 J	53 J	8.8 J	ND (0.5) J	ND (0.55) J	6.7 J	ND (0.51) J	ND (1.2) J	ND (0.66) J	ND (0.23) J	ND (0.26) J	ND (81) J	ND (0.64) J	ND (0.072) J	ND (0.08) J	2,600 J	170 J	5.9	9	9
AOC1-BCW9	02/04/16	0 - 0.5	N	920	78	ND (6.7)	3.7 J	ND (11)	22	ND (9.7)	7.7 J	ND (1.8)	ND (0.23)	ND (1.2)	ND (220)	ND (1.9)	ND (0.13)	1.5 J	10,000	220	19	29	29
	02/04/16	2 - 3	N	17	ND (1.8)	ND (0.19)	ND (0.33)	ND (0.41)	ND (0.71)	ND (0.36)	ND (0.29)	ND (0.47)	ND (0.13)	ND (0.15)	ND (3.9)	ND (0.15)	ND (0.067)	ND (0.096)	150	5.1 J	0.55	0.68	0.68
AOC1-T1e	01/11/16	0 - 1	N	670	68	ND (4.3)	4 J	ND (3)	15	4 J	8.9 J	ND (3.5)	2.1 J	ND (0.8)	ND (84)	ND (0.31)	0.23 J	ND (0.12)	6,300	120	11	19	19
	01/11/16	2 - 3	N	29	ND (3)	ND (0.52)	ND (0.65)	ND (0.85)	ND (0.58)	ND (0.72)	ND (0.62)	ND (31)	ND (0.25)	ND (0.4)	2.7 J	ND (0.28)	ND (0.13)	ND (0.14)	190	ND (2.2)	2.4	2.6	2.6
	01/11/16	5 - 6	N	4.5 J	ND (0.79)	ND (0.14)	ND (0.26)	ND (0.18)	ND (0.3)	ND (0.16)	ND (0.31)	ND (0.21)	ND (0.16)	ND (0.095)	ND (0.18)	ND (0.074)	ND (0.062)	ND (0.1)	51	ND (1.2)	0.28	0.27	0.27
	01/11/16	9 - 10	N	28	ND (3.6)	ND (2)	ND (0.38)	ND (0.34)	ND (0.34)	ND (0.29)	ND (0.8)	ND (0.4)	ND (0.16)	ND (0.17)	ND (3.6)	ND (0.18)	ND (0.12)	ND (0.14)	240	ND (4.9)	0.67	0.86	0.86
AOC1-T1f	01/12/16	0 - 1	N	550	74	ND (5.5)	3.6 J	ND (11)	13	ND (9.1)	ND (0.54)	ND (12)	ND (0.76)	ND (0.66)	ND (140)	ND (0.69)	ND (0.11)	ND (0.51)	6,800	230	12	19	19
	01/12/16	2 - 3	N	2.5 J	ND (0.27)	ND (0.071)	ND (0.037)	ND (0.055)	ND (0.032)	ND (0.048)	ND (0.032)	ND (0.099)	ND (0.024)	ND (0.059)	ND (0.055)	ND (0.059)	ND (0.03)	ND (0.034)	29	ND (0.43)	0.099	0.092	0.092
	01/12/16	5 - 6	N	7.7 J	ND (0.12)	ND (0.15)	ND (0.25)	ND (0.4)	ND (0.22)	ND (0.29)	ND (0.17)	ND (0.2)	ND (0.19)	ND (0.14)	ND (0.17)	ND (0.15)	ND (0.2)	ND (0.76)	22 J	ND (0.5)	0.74	0.43	0.43
	01/12/16	9 - 10	N	9.6 J	ND (0.56)	0.74 J	ND (0.33)	ND (0.16)	ND (0.3)	ND (0.15)	ND (0.32)	ND (0.43)	ND (0.27)	ND (0.14)	ND (0.24)	ND (0.15)	ND (0.1)	ND (0.17)	30	ND (0.29)	0.45	0.43	0.43
AOC1-T1g	02/17/17	0 - 0.5	N	260 J	17	1.5 J	1.4 J	1.1 J	ND (6.1)	0.79 J	2.3 J	ND (0.38)	ND (0.56)	0.34 J	ND (36)	ND (0.5)	ND (0.067)	ND (0.06)	2,000 J	35	3.6	6.5	6.5
	02/17/17	0 - 0.5	FD	650 J	21	1.5 J	ND (1)	1.2 J	7.7 J	0.73 J	2.7 J	ND (0.31)	ND (0.55)	ND (0.46)	ND (28)	ND (0.57)	ND (0.066)	ND (0.34)	6,900 J	34	4.3	12	12
	02/17/17	2 - 3	N	590	78	6 J	2.7 J	3.6 J	16	2.7 J	5.6 J	1.1 J	1.5 J	ND (1.3)	ND (110)	ND (0.66)	ND (0.12)	ND (0.2)	7,300	250	11	19	19
	02/17/17	5 - 6	N	160	34	2.3 J	ND (0.37)	ND (0.7)	5.7 J	ND (0.37)	ND (1.4)	ND (0.58)	0.45 J	ND (0.29)	ND (44)	ND (0.42)	ND (0.05)	ND (0.045)	1,600	95	3.8	6	6
	02/17/17	9 - 10	N	91	9.1 J	ND (0.7)	ND (0.34)	ND (0.27)	2.7 J	ND (0.26)	0.78 J	ND (0.31)	ND (0.14)	ND (0.082)	ND (14)	ND (0.085)	ND (0.027)	ND (0.032)	610	25	1.3	2.4	2.4
AOC1-T2g	03/03/16	9 - 10	N	3,100 J	820 J	ND (31)	12 J	ND (21)	85	ND (89) J	16	ND (25)	3.6 J	ND (0.62)	ND (1,200)	ND (0.65)	ND (0.13)	ND (0.2)	35,000	4,200	89	130	130
	03/03/16	14 - 15	N	310	ND (0.22)	6.5 J	ND (0.91)	ND (0.46)	12 J	ND (17)	2.1 J	ND (0.53)	ND (0.42)	ND (0.73)	ND (220)	ND (0.76)	ND (0.22)	ND (0.16)	3,300	170	14	18	18
	03/03/16	19 - 20	N	59	11 J	ND (1.2)	ND (0.23)	ND (0.39)	2.1 J	ND (3.8)	ND (0.22)	ND (0.46)	ND (0.039)	ND (0.11)	ND (44)	ND (0.12)	ND (0.037)	0.14 J	640	43	3	3.6	3.6

TABLE B-2b

Sample Results: Dioxins and Furans
AOC 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Dioxin/Furans (ng/kg)																			
			Interim Screening Level[1] :	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**4.8**	**NE**	**NE**	**NE**	**4.8**	**NE**	**NE**	**NE**	**16**	**50**	**5.58**
			Residential Regional Screening Levels[2] :	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**4.8**	**NE**	**NE**	**NE**	**4.8**	**NE**	**NE**	**NE**	**NE**	**4.8**	**NE**
			Residential DTSC-SL[3] :	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**50**	**NE**
			Ecological Comparison Values[4] :	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**16**	**NE**	**1.6**
			Background[5] :	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**5.98**	**5.58**	**5.58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**1,2,3,4,6,7,8-HpCDD**	**1,2,3,4,6,7,8-HpCDF**	**1,2,3,4,7,8,9-HpCDF**	**1,2,3,4,7,8-HxCDD**	**1,2,3,4,7,8-HxCDF**	**1,2,3,6,7,8-HxCDD**	**1,2,3,6,7,8-HxCDF**	**1,2,3,7,8,9-HxCDD**	**1,2,3,7,8,9-HxCDF**	**1,2,3,7,8-PeCDD**	**1,2,3,7,8-PeCDF**	**2,3,4,6,7,8-HxCDF**	**2,3,4,7,8-PeCDF**	**2,3,7,8-TCDD**	**2,3,7,8-TCDF**	**OCDD**	**OCDF**	**TEQ Avian**	**TEQ Human**	**TEQ Mammals**
AOC1-T2h	03/04/16	0 - 1	N	930	150	ND (4.3)	3.4 J	ND (1.1)	23	ND (27)	5.9 J	ND (1.3)	ND (0.86)	ND (0.66)	ND (290) J	ND (0.59)	ND (0.13)	ND (0.18)	11,000	720 J	21	34	34
	03/04/16	2 - 3	N	570	56	5.3 J	2.8 J	ND (0.22)	14	1.6 J	5.8 J	ND (0.91)	ND (1.3)	ND (0.81)	ND (130)	1.1 J	0.2 J	ND (0.38)	6,700	200	12	19	19
	03/04/16	5 - 6	N	69	5.7 J	ND (0.19)	0.97 J	ND (0.12)	ND (1.9)	ND (0.26)	0.9 J	ND (0.14)	ND (0.23)	ND (0.18)	ND (11)	ND (0.19)	ND (0.035)	ND (0.17)	420	10 J	1.2	1.9	1.9
	03/04/16	9 - 10	N	460	44	6.4 J	ND (2.3)	ND (0.23)	13	ND (0.67)	4.7 J	ND (0.68)	ND (0.75)	ND (0.24)	ND (240)	0.86 J	ND (0.13)	0.23 J	5,400	250	16	21	21
AOC1-T2i	03/05/16	0 - 1	N	670	88	10 J	1.7 J	ND (0.62)	14	ND (20)	ND (2.6)	ND (0.72)	ND (0.12)	ND (0.42)	ND (220)	ND (0.13)	ND (0.044)	ND (0.22)	9,800	610	15	25	25
	03/05/16	2 - 3	N	420	37	3.4 J	2.8 J	4.1 J	13	1.1 J	4.5 J	ND (0.81)	ND (1.2)	ND (0.34)	ND (80)	ND (0.79)	ND (0.12)	ND (0.18)	5,800	150	7.9	14	14
	03/05/16	5 - 6	N	16	ND (1.6)	ND (0.3)	ND (0.15)	0.72 J	0.88 J	0.87 J	ND (0.36)	ND (0.72)	ND (0.08)	ND (0.091)	ND (6)	ND (0.096)	ND (0.029)	ND (0.14)	170	9.4 J	0.75	0.91	0.91
	03/05/16	9 - 10	N	910	110	ND (12)	ND (1.8)	ND (0.27)	21	1.1 J	4.7 J	1.3 J	1.2 J	ND (0.92)	ND (280)	ND (0.47)	ND (0.039)	0.28 J	10,000	730	20	32	32
AOC1-T2j	03/05/16	0 - 1	N	190	8.7 J	ND (1.5)	0.93 J	ND (0.31)	4.6 J	ND (0.3)	ND (1.4)	ND (0.36)	ND (0.25)	ND (0.098)	ND (21)	ND (0.26)	ND (0.052)	ND (0.1)	2,900	21 J	2.2	4.8	4.8
	03/05/16	2 - 3	N	380 J	37	3.6 J	2.4 J	ND (0.16)	11 J	1.9 J	4.7 J	ND (0.86)	1.5 J	ND (0.15)	ND (78)	ND (1.3)	0.28 J	ND (0.31)	4,000 J	120	8.6	13	13
	03/05/16	2 - 3	FD	170 J	16	ND (0.58)	1.1 J	2.4 J	6.4 J	1.2 J	2.6 J	0.79 J	ND (0.82)	ND (0.23)	ND (41)	0.68 J	ND (0.09)	ND (0.19)	1,400 J	33	4.6	6.5	6.5
	03/05/16	5 - 6	N	120	19	1.8 J	ND (0.38)	ND (0.6)	3.5 J	ND (0.59)	1.2 J	ND (0.7)	ND (0.12)	ND (0.097)	ND (42)	ND (0.22)	ND (0.11)	0.55 J	1,700	99	3.6	4.8	4.8
	03/05/16	9 - 10	N	17	1.9 J	ND (0.37)	ND (0.16)	ND (0.12)	0.56 J	ND (0.4)	ND (0.25)	ND (0.14)	ND (0.045)	ND (0.092)	ND (5.2)	ND (0.097)	ND (0.065)	ND (0.33)	190	10 J	0.65	0.71	0.71
AOC1-T5D	01/12/16	0 - 1	N	280	30	ND (2.2)	ND (1.4)	ND (1.2)	ND (9.1)	ND (1.1)	3.7 J	ND (1.4)	ND (0.19)	ND (0.6)	ND (96)	ND (1.3)	ND (0.1)	ND (0.54)	2,700	94	7.4	10	10
	01/12/16	2 - 3	N	21,000 J	2,800	130 J	79	360	880	ND (66)	190	ND (83)	ND (40) *	ND (22)	ND (6,300)	ND (24)	4.9 J	12	270,000	11,000 J	520	830	830
	01/12/16	2 - 3	FD	44,000 J	3,700	ND (250) J	ND (96)	360	1,200	89	260	ND (52)	ND (23) *	ND (2.9)	ND (5,900)	68	6.2	14	340,000	18,000 J	600	1,100	1,100
	01/12/16	5 - 6	N	2,500	420	39	5.9 J	ND (9.8)	57	ND (9.1)	ND (13)	ND (11)	ND (2.1)	ND (0.41)	ND (860)	ND (1)	0.59 J	ND (0.34)	28,000	2,200	58	92	92
	01/12/16	9 - 10	N	500	86	ND (4.3)	ND (2.8)	ND (0.66)	15	ND (0.61)	ND (3.6)	ND (0.77)	ND (0.77)	ND (0.28)	ND (230)	ND (0.3)	ND (0.11)	ND (0.22)	5,000	290	15	21	21
	01/12/16	14 - 15	N	1,700	120	10 J	7.7 J	13	38	ND (2.6)	15	ND (2.3)	3.2 J	ND (1.3)	ND (340)	ND (1.4)	ND (0.52)	0.73 J	22,000	380	31	53	53
	01/12/16	19 - 20	N	590	130	20	4 J	ND (7.1)	22	ND (6.6)	7.1 J	ND (8.2)	ND (0.27)	ND (0.3)	ND (370)	ND (0.32)	ND (0.083)	ND (0.12)	5,300	410	24	32	32
	01/12/16	19 - 20	FD	620	120	18	ND (3.5)	ND (5.7)	24	ND (5.3)	7 J	ND (6.6)	ND (0.45)	ND (0.15)	ND (380)	ND (0.45)	ND (0.087)	ND (0.067)	5,400	400	24	33	33
AOC1-T6D	02/09/16	0 - 0.5	N	240	13	1.4 J	ND (0.84)	ND (0.051)	3.8 J	ND (0.34)	1.7 J	0.34 J	ND (0.49)	ND (0.23)	ND (58)	ND (0.27)	ND (0.4)	0.31 J	2,100	48	4.7	7.3	7.3
	02/09/16	2 - 3	N	17	0.66 J	ND (0.25)	ND (0.18)	ND (0.089)	0.49 J	ND (0.087)	ND (0.11)	ND (0.1)	ND (0.17)	ND (0.076)	ND (1.7)	ND (0.14)	ND (3.5)	ND (0.2)	100	1.5 J	2.2	2.2	2.2
	02/09/16	5 - 6	N	5.1 J	ND (0.24)	ND (0.08)	ND (0.046)	ND (0.059)	ND (0.15)	ND (0.048)	ND (0.14)	ND (0.069)	ND (0.04)	ND (0.062)	ND (0.49)	ND (0.056)	ND (2.6)	ND (0.14)	41	ND (0.32)	1.5	1.5	1.5
	02/09/16	9 - 10	N	ND (0.74)	ND (0.093)	0.11 J	ND (0.071)	ND (0.066)	ND (0.023)	ND (0.051)	ND (0.022)	ND (0.061)	ND (0.063)	ND (0.029)	ND (0.18)	ND (0.03)	ND (0.94)	0.17 J	ND (4.5)	ND (0.13)	0.71	0.55	0.55
	02/09/16	9 - 10	FD	ND (1.1)	ND (0.32)	0.27 J	ND (0.087)	ND (0.092)	ND (0.064)	ND (0.09)	ND (0.12)	ND (0.37)	ND (0.067)	ND (0.14)	ND (0.096)	ND (0.15)	ND (2.4)	ND (0.25)	ND (4.6)	ND (0.18)	1.5	1.3	1.3
AOC1-T7	02/19/17	0 - 0.5	N	210 J	21	ND (1.5)	0.65 J	0.81 J	4 J	ND (0.44)	ND (0.66)	ND (0.43)	ND (0.32)	ND (0.088)	ND (37)	ND (0.069)	ND (0.13)	ND (0.038)	2,100 J	68 J	3	5.7	5.7
	02/19/17	2 - 3	N	310	34	2.5 J	1.9 J	2.2 J	10 J	ND (1.6)	4.1 J	ND (0.63)	ND (0.65)	0.6 J	ND (56)	ND (0.64)	ND (0.15)	ND (0.094)	3,600	65	5.6	9.8	9.8
	02/19/17	5 - 6	N	690	150	8.6 J	1.1 J	ND (1.4)	19	ND (0.64)	2.5 J	ND (0.93)	ND (0.22)	ND (0.16)	ND (190)	ND (0.17)	ND (0.051)	ND (0.1)	7,600	610	14	23	23
	02/19/17	9 - 10	N	93	15	ND (1)	ND (0.15)	0.38 J	3.1 J	ND (0.26)	ND (0.63)	ND (0.11)	ND (0.099)	ND (0.078)	ND (26)	ND (0.081)	ND (0.041)	ND (0.045)	1,000	51	1.9	3.2	3.2

TABLE B-2b
Sample Results: Dioxins and Furans
AOC 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Dioxin/Furans (ng/kg)																			
Interim Screening Level[1] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
Residential Regional Screening Levels[2] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
Residential DTSC-SL[3] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
Ecological Comparison Values[4] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
Background[5] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**1,2,3,4,6,7,8-HpCDD**	**1,2,3,4,6,7,8-HpCDF**	**1,2,3,4,7,8,9-HpCDF**	**1,2,3,4,7,8-HxCDD**	**1,2,3,4,7,8-HxCDF**	**1,2,3,6,7,8-HxCDD**	**1,2,3,6,7,8-HxCDF**	**1,2,3,7,8,9-HxCDD**	**1,2,3,7,8,9-HxCDF**	**1,2,3,7,8-PeCDD**	**1,2,3,7,8-PeCDF**	**2,3,4,6,7,8-HxCDF**	**2,3,4,7,8-PeCDF**	**2,3,7,8-TCDD**	**2,3,7,8-TCDF**	**OCDD**	**OCDF**	**TEQ Avian**	**TEQ Human**	**TEQ Mammals**
AOC1-T8	02/18/17	0 - 0.5	N	360	48	3.4 J	2.2 J	2.2 J	11 J	ND (1.2)	4.9 J	0.69 J	ND (1.2)	1 J	ND (110)	ND (0.64)	ND (0.17)	0.25 J	4,000	130	9.2	14	14
	02/18/17	2 - 3	N	330	46	3.4 J	2.4 J	2.8 J	12 J	ND (1.1)	4.7 J	0.75 J	ND (1.4)	ND (0.79)	ND (100)	ND (0.86)	ND (0.072)	ND (0.25)	3,100	110	8.6	13	13
	02/18/17	5 - 6	N	80	4.3 J	0.83 J	ND (0.26)	ND (0.18)	1.5 J	ND (0.33)	ND (0.13)	0.36 J	ND (0.2)	ND (0.19)	ND (7.8)	ND (0.047)	ND (0.025)	ND (0.036)	470	14 J	0.82	1.7	1.7
	02/18/17	9 - 10	N	49	5.8 J	0.69 J	ND (0.15)	ND (0.11)	1.3 J	ND (0.069)	ND (0.4)	ND (0.12)	ND (0.18)	ND (0.082)	ND (14)	ND (0.085)	ND (0.046)	ND (0.042)	590	18 J	1.1	1.7	1.7
	02/18/17	9 - 10	FD	110	14	ND (0.86)	ND (0.2)	ND (0.34)	3.1 J	ND (0.45)	0.92 J	ND (0.13)	0.17 J	ND (0.089)	ND (33)	ND (0.093)	ND (0.029)	ND (0.024)	1,300	39	2.5	4	4
AOC4-GB10	02/10/10	0 - 0.5	N	4,200	140	14	16	ND (21)	88	ND (13)	29	ND (12.5)	ND (12.5) *	ND (12.5)	ND (12.5)	6.5 J	ND (5) *	ND (5)	52,000	260	37	87	87
AOC4-GB11	02/10/10	0 - 0.5	N	4,700	180	ND (12.5)	ND (13)	ND (28)	110	ND (17)	34	ND (12.5)	ND (12.5) *	3.7 J	ND (14)	6.7 J	1.2 J	ND (5)	33,000	610	35	87	87
	02/10/10	0 - 0.5	FD	5,300	230	ND (12.5)	21	ND (43)	160	ND (23)	39	ND (12.5)	ND (12.5) *	ND (12.5)	22	14	1.7 J	ND (5)	30,000	440	48	110	110
AOC4-GB12	02/10/10	0 - 0.5	N	490	26	ND (12.5)	5.5 J	ND (12.5)	14	ND (12.5)	ND (12.5)	ND (12.5)	ND (12.5) *	ND (12.5)	ND (12.5)	1.4 J	ND (5) *	ND (5)	4,400	66	18	21	21
Old Well-BCW-1	09/11/13	7 - 8	N	7,000	ND (1.2)	170	21	64	200	ND (280)	40	ND (2)	8.8 J	ND (0.42)	ND (4,000)	ND (4.8)	ND (0.17)	0.46 J	53,000	8,400	250	350	350
Old Well-BCW-2	09/11/13	4 - 5	N	8,300	ND (1.9)	170	50	110	380	ND (450)	97	ND (5.6)	18	ND (2.4)	63	ND (10)	ND (0.23)	1.6	100,000	11,000	100	230	230
PA-14	01/27/16	0 - 1	N	660 J	49 J	4.1 J	7.1 J	ND (3.2) J	20 J	4.3 J	14 J	ND (0.51) J	4.9 J	ND (1.4) J	ND (64) J	2.1 J	ND (0.53) J	3.2 J	5,300 J	92 J	18	23	23
PA-15	01/27/16	0 - 1	N	2,600 J	320 J	15 J	21 J	19 J	85 J	25 J	43 J	4.5 J	10 J	4 J	ND (340) J	6.7 J	ND (0.93) J	4.2 J	22,000 J	370 J	58	86	86
PA-16	01/27/16	0 - 1	N	880 J	74 J	5.1 J	7.2 J	6 J	24 J	7.1 J	12 J	1.6 J	ND (0.95) J	2.1 J	ND (110) J	2.3 J	ND (0.63) J	ND (1.2) J	7,300 J	140 J	15	25	25
SD-14	01/11/16	0 - 1	N	5,500	340	45	49	ND (1.4)	170	15	85	9 J	24	ND (1.4)	ND (1,200)	9.1 J	3.1 J	2.7 J	40,000	1,100	130	190	190
	01/11/16	2 - 3	N	3,100	240	ND (9.4)	14	ND (1.9)	71	ND (5.2)	29	ND (2.3)	ND (5.8) *	ND (0.91)	ND (490)	4.2 J	ND (1.4)	ND (1.4)	25,000	1,100	46	83	83
	01/11/16	5 - 6	N	1,500	ND (27)	ND (34)	ND (3.8)	ND (7)	35	ND (8.8)	12 J	ND (4.6)	ND (4.5)	ND (0.76)	ND (190)	ND (1.7)	ND (1.2)	ND (0.68)	20,000	400	20	40	40
	01/11/16	9 - 10	N	6.3 J	ND (0.59)	ND (0.3)	ND (0.19)	ND (0.16)	ND (0.18)	ND (0.15)	ND (0.17)	ND (0.19)	ND (0.14)	ND (0.045)	ND (0.81)	ND (0.049)	ND (0.094)	ND (0.32)	55	ND (1.3)	0.4	0.32	0.32
SD-15	01/12/16	0 - 0.5	N	1,300	120	11 J	7.1 J	ND (0.71)	36	2.9 J	14	ND (0.83)	3.6 J	ND (0.9)	ND (240)	2.5 J	ND (0.56)	ND (1)	13,000	390	25	41	41
	01/12/16	2 - 3	N	50	5.1 J	ND (0.38)	ND (0.26)	0.61 J	ND (1.4)	ND (1.6)	ND (0.43)	ND (0.15)	ND (0.065)	ND (0.091)	ND (18)	ND (0.098)	ND (0.099)	ND (0.2)	450	13 J	1.5	2	2
	01/12/16	5 - 6	N	51	3.7 J	ND (0.5)	ND (0.34)	ND (0.28)	ND (1.4)	ND (1.2)	ND (0.22)	ND (0.33)	ND (0.11)	ND (0.071)	ND (12)	ND (0.12)	ND (0.043)	ND (0.085)	430	7.2 J	1	1.6	1.6
	01/12/16	9 - 10	N	8.4 J	ND (0.59)	ND (0.29)	ND (0.15)	ND (0.14)	ND (0.23)	ND (0.13)	ND (0.38)	ND (0.17)	ND (0.11)	ND (0.076)	ND (0.76)	ND (0.041)	ND (0.04)	ND (0.38)	36	0.67 J	0.39	0.3	0.3
SD-16	01/12/16	0 - 0.5	N	6.2 J	ND (0.52)	ND (0.19)	ND (0.1)	ND (0.11)	ND (0.3)	ND (0.098)	ND (0.097)	ND (0.12)	ND (0.069)	ND (0.052)	1.1 J	ND (0.056)	ND (0.041)	ND (0.3)	44	1.2 J	0.39	0.31	0.31
	01/12/16	2 - 3	N	1.6 J	ND (0.2)	ND (0.071)	ND (0.097)	ND (0.04)	ND (0.096)	ND (0.037)	ND (0.091)	ND (0.047)	ND (0.065)	ND (0.073)	0.26 J	ND (0.078)	ND (0.024)	ND (0.18)	7.5 J	ND (0.21)	0.22	0.13	0.13
	01/12/16	5 - 6	N	0.57 J	ND (0.12)	ND (0.075)	ND (0.04)	ND (0.07)	ND (0.04)	ND (0.065)	ND (0.038)	ND (0.092)	ND (0.051)	ND (0.059)	ND (0.11)	ND (0.064)	ND (0.059)	0.27 J	2.5 J	0.15 J	0.38	0.12	0.12
	01/12/16	9 - 10	N	0.32 J	ND (0.11)	ND (0.15)	ND (0.039)	ND (0.035)	ND (0.038)	ND (0.043)	ND (0.011)	ND (0.037)	ND (0.029)	ND (0.063)	ND (0.22)	ND (0.068)	ND (0.036)	ND (0.095)	ND (1.5)	ND (0.092)	0.14	0.074	0.074
SD-25	03/10/16	0 - 1	N	140 J	9.5 J	0.82 J	ND (0.61) J	ND (1.4) J	3.5 J	1.7 J	2 J	ND (0.28) J	ND (0.24) J	ND (0.97) J	ND (9.4) J	2.4 J	ND (0.099) J	1.7 J	990 J	13 J	5.6	4.2	4.2
SD-26	03/10/16	0 - 1	N	1,400 J	99 J	6.9 J	14 J	8.3 J	36 J	8.2 J	21 J	2.6 J	6.2 J	2.2 J	ND (93) J	4.2 J	ND (0.68) J	ND (2.4) J	13,000 J	170 J	26	41	41
TCS-4	03/25/14	59 - 60	N	4,200	740	53	8.1 J	ND (21)	79	ND (19)	16	ND (25)	2.3 J	ND (1.5)	ND (1,400)	ND (1.6)	ND (0.09)	ND (0.15)	46,000	3,800	96	150	150
	03/25/14	113	N	1,000	200	20	ND (4.5)	ND (5.7)	26	ND (5.3)	10 J	ND (6.7)	ND (1.2)	ND (0.87)	ND (490)	18	ND (0.45)	ND (0.3)	11,000	920	50	51	51

TABLE B-2b

Sample Results: Dioxins and Furans
AOC 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Dioxin/Furans (ng/kg)																			
Interim Screening Level[1] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
Residential Regional Screening Levels[2] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
Residential DTSC-SL[3] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
Ecological Comparison Values[4] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
Background[5] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
Location	Date	Depth (ft bgs)	Sample Type	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDF	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDF	2,3,4,6,7,8-HxCDF	2,3,4,7,8-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	OCDD	OCDF	TEQ Avian	TEQ Human	TEQ Mammals
TCS4-E	03/01/16	4 - 5	N	10,000 J	ND (550)	ND (650) J	54 J	230	630	ND (770)	110	ND (16)	26	ND (1.1)	ND (9,100)	ND (5.2)	3.2 J	1.9 J	140,000 J	19,000	600	780	780
	03/01/16	4 - 5	FD	19,000 J	ND (2.5)	430 J	ND (170) J	250	680	ND (810)	ND (160)	ND (17)	19	ND (1.1)	ND (8,600)	ND (4.6)	2.4 J	1.3 J	220,000 J	18,000	590	870	870
	03/01/16	5 - 6	N	150	ND (0.24)	ND (1.1)	ND (0.3)	1.2 J	ND (3.2)	ND (3.3)	ND (1.1)	ND (0.41)	ND (0.13)	ND (0.22)	ND (38)	ND (0.23)	0.23 J	ND (0.065)	1,000	35	3	4.6	4.6
TCS4-N	03/01/16	4 - 5	N	2,600	ND (0.45)	36	9.5 J	20	70	ND (90)	15	ND (5.6)	3.1 J	ND (0.81)	ND (1,100)	ND (0.86)	ND (0.32)	0.46 J	26,000	1,800	74	110	110
	03/01/16	5 - 6	N	4,200	ND (750)	96	9.6 J	ND (12)	140	ND (180)	23	ND (14)	3.6 J	ND (0.58)	ND (2,300)	ND (2.9)	0.34 J	ND (0.49)	48,000	4,300	150	210	210
TCS4-S	03/01/16	4 - 5	N	3,300	ND (0.47)	77	18	41	120	ND (160)	36	ND (2.8)	9 J	ND (0.88)	ND (1,800)	ND (1.5)	ND (0.37)	0.48 J	39,000	3,300	130	180	180
	03/01/16	5 - 6	N	940	130	21	1.8 J	ND (0.32)	23	ND (37)	4.3 J	ND (0.38)	0.8 J	ND (1.2)	ND (530)	ND (1.3)	ND (0.23)	ND (0.066)	10,000	1,100	34	47	47

Notes:

Category 1: Validated data suitable for all uses, including risk assessment and remedial action decisions.
Category 2: Validated data suitable for use in characterization of the chemicals of potential concern at the facility and to help define the nature and extent of contamination.
Category 3: Validated data suitable only for use in qualitative characterization of the nature and extent of contamination.
Results greater than or equal to the Interim Screening Level are circled.

‡	This location is in an area where soil is transitioning into sediment.
--	not analyzed
ft bgs	feet below ground surface
ng/kg	nanograms per kilogram
DTSC-SL	DTSC Screening Levels
DTSC	California Department of Toxic Substances Control
FD	Field Dupliicate
J	concentration or reporting limit estimated by laboratory or data validation
JR	estimated value, one or more input values is “R” qualified.
N	Primary Sample
NA	NA = not applicable
NE	not established
ND	not detected at the listed reporting limit
R	The result has been rejected; identification and/or quantitation could not be verified because critical QC specifications were not met (e.g., a non-detect result obtained for an archive sample following a hold time of greater than one year).
USEPA	USEPA = United States Environmental Protection Agency

1 For individual dioxins and furans, selected value is the lower of the ECV, residential DTSC-SL, or USEPA residential regional screening value, unless the background value is higher. For TEQ values, selected value is the DTSC-SL.

2 United States Environmental Protection Agency (USEPA). 2017. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. November.

3 California Department of Toxic Substances Control (DTSC). 2018. Human Health Risk Assessment (HHRA) Note Number 3. JanuaryCalifornia Department of Toxic Substances Control (DTSC). 2017. Human Health Risk Assessment (HHRA) Note 2, Soil Remedial Goals for Dioxins and Dioxin-like Compounds for Consideration at California Hazardous Waste Sites. April.

4 ARCADIS. 2008. "Technical Memorandum 3: Ecological Comparison Values for Metals and Polycyclic Aromatic Hydrocarbons in Soil." May 28. ARCADIS. 2009. "Topock Compression Station - Final Technical Memorandum 4: Ecological Comparison Values for Additional Dectected Chemicals in Soil." July 1.

5 CH2M. 2017. Revised Ambient Study of Dioxins and Furans at the Pacific Gas and Electric Company, Topock Compressor Station, Needles, California. October.

Calculations:

TEQ = Sum of Result xToxic equivalency factor (TEF), 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TEQ Avian = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TEQMammals = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TABLE B-2b
Sample Results: Dioxins and Furans
AOC 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Teq Humans = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TABLE B-3a
Sample Results: Metals
AOC 9 – Southeast Fence Line
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
Category 1																					
AOC9-1	10/01/08	0 - 0.5	N	ND (2) *	6.2	93	ND (1) *	ND (1)	1.03	23	5.4	9.1	19	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	26	46
	10/01/08	2 - 3	N	ND (2) *	4.1	89	ND (1) *	ND (1)	ND (0.478)	9.7	4.3	5	4.5	ND (0.1) *	ND (1)	7.4	ND (1)	ND (1)	ND (2) *	17	17
AOC9-2	09/18/08	0 - 0.5	N	ND (2) *	3.2	120	ND (2) *	ND (1)	ND (0.401)	16	4.7	11	9.6	ND (0.099) *	ND (2) *	11	ND (1)	ND (2)	ND (4) *	25	33
	09/18/08	2 - 3	N	ND (2) *	3.3	150	ND (2) *	ND (1)	ND (0.406)	11	3	5.9	4.9	ND (0.1) *	ND (2) *	6.9	ND (1)	ND (2)	ND (4) *	20	20
AOC9-3	09/18/08	0 - 0.5	N	ND (2) *	3.2	110	ND (2) *	ND (1)	ND (0.402)	25	4.1	17	9	ND (0.1) *	ND (2) *	12	ND (1)	ND (2)	ND (4) *	24	49
	09/18/08	2 - 3	N	ND (2) *	3.5	130	ND (2) *	ND (1)	ND (0.454)	15	3.8	7.3	23	ND (0.1) *	ND (2) *	10	ND (1)	ND (2)	ND (4.1) *	23	92
AOC9-4	09/18/08	0 - 0.5	N	ND (2) *	3.7	120	ND (2) *	ND (1)	1.06	22	5	12	13	ND (0.1) *	ND (2) *	12	ND (1)	ND (2)	ND (4) *	29	53
	09/18/08	2 - 3	N	ND (2) *	3.9	110	ND (2) *	ND (1)	ND (0.402)	19	4.6	11	11	ND (0.1) *	ND (2) *	11	ND (1)	ND (2)	ND (4) *	25	42
AOC9-5	10/01/08	0 - 0.5	N	ND (2) *	4.9	90	ND (1) *	ND (1)	0.726	35	7.1	19	28	ND (0.1) *	ND (1)	17	ND (1)	ND (1)	ND (2) *	30	100
	10/01/08	2 - 3	N	ND (2) *	6	130	ND (2) *	ND (1)	1	38	7.6	21	25	0.27	ND (2) *	20	ND (1)	ND (2)	ND (4) *	31	76
	10/01/08	2 - 3	FD	ND (2) *	7	120	ND (2) *	ND (1)	0.791	43	7.7	19	24	0.23	ND (2) *	19	ND (1)	ND (2)	ND (4) *	34	85
AOC9-6	09/18/08	0 - 0.5	N	ND (2) *	3.8	180	ND (2) *	ND (1)	0.789	25	5.4	12	23	0.14	ND (2) *	13	ND (1)	ND (2)	ND (4) *	31	68
	09/18/08	2 - 3	N	ND (2.1) *	3.8	120	ND (2.1) *	ND (1)	ND (0.458)	16	5	9.3	5	ND (0.1) *	ND (2.1) *	14	ND (1)	ND (2.1)	ND (4.2) *	25	31
AOC9-7	09/18/08	0 - 0.5	N	ND (2) *	2.2	94	ND (2) *	ND (1)	4.37	72	4.2	14	15	ND (0.1) *	ND (2) *	11	ND (1)	ND (2)	ND (4) *	22	120
	09/18/08	2 - 3	N	ND (2) *	4.3	83	ND (1) *	ND (1)	ND (0.411)	13	2.9	6.7	20	ND (0.1) *	ND (1)	6.7	ND (1)	ND (1)	ND (2) *	18	29
AOC9-8	10/01/08	0 - 0.5	N	ND (2) *	3.6	100	ND (1) *	ND (1)	48.6 J	230	4.4	11	20	ND (0.1) *	1	10	ND (1)	ND (1)	ND (2) *	20	1,000
	10/01/08	2.5 - 3	N	ND (2.1) *	6.3	130	ND (2.1) *	ND (1)	2.41	41	5.3	13	59	ND (0.1) *	4.5	12	ND (1)	ND (2.1)	4.1	25	130
	10/01/08	5.5 - 6	N	ND (2) *	4	87	ND (1) *	ND (1)	1.32	13	3.7	5.5	4.4	ND (0.1) *	ND (1)	8.1	ND (1)	ND (1)	ND (2) *	17	21
AOC9-9	10/01/08	0 - 0.5	N	ND (2) *	5	120	ND (1) *	ND (1)	ND (0.404)	14	3.9	8	7	ND (0.1) *	ND (1)	8.1	ND (1)	ND (1)	ND (2) *	19	34
	10/01/08	2.5 - 3	N	ND (2.1) *	4.8	91	ND (1) *	ND (1)	ND (0.415)	21	6.9	10	3.8	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	32	41
	10/01/08	5.5 - 6	N	ND (2.1) *	4.9	97	ND (1) *	ND (1)	1.53	28	7.1	11	4.9	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	31	53
	10/01/08	5.5 - 6	FD	ND (2.1) *	4.5	87	ND (1) *	ND (1)	1.28	27	7.3	10	4.4	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	30	50
AOC9-10	10/01/08	0 - 0.5	N	ND (2) *	5.1	76	ND (1) *	ND (1)	0.418	28	6.8	11	18	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2) *	30	49
	10/01/08	2 - 3	N	ND (2) *	7.3	110	ND (2) *	ND (1)	0.494	30	8.1	15	15	0.11	ND (2) *	19	ND (1)	ND (2)	ND (4) *	35	110
AOC9-11	09/18/08	0 - 0.5	N	ND (2.1) *	3.6	130	ND (2.1) *	ND (1.1) *	ND (0.418)	18	4.5	8.5	7.7	0.13	ND (2.1) *	11	ND (1.1)	ND (2.1)	ND (4.3) *	25	35
	09/18/08	2 - 3	N	ND (2) *	3.4	120	ND (2) *	ND (1)	ND (0.406)	20	4.3	9.7	7.1	ND (0.1) *	ND (2) *	11	ND (1)	ND (2)	ND (4) *	24	30
AOC9-12	10/01/08	0 - 0.5	N	ND (2) J*	7.3	190 J	ND (2) *	ND (1)	0.727	34	9.4	19	13	ND (0.1) *	ND (2) *	24	ND (1)	ND (2)	ND (4.1) *	38	57
	10/01/08	2 - 3	N	ND (2.1) *	6.6	220	ND (2.1) *	ND (1)	ND (0.415)	40	11	17	11	ND (0.1) *	ND (2.1) *	29	ND (1)	ND (2.1)	ND (4.1) *	40	50
AOC9-13	09/19/08	0 - 0.5	N	ND (2) J*	5.2	180	ND (2) *	ND (1)	ND (0.404)	18	4.7	13	8.3	ND (0.099) *	ND (2) *	11	ND (1)	ND (2)	ND (4) *	27	36
	09/19/08	2 - 3	N	ND (2) *	3.8	130	ND (2) *	ND (1)	ND (0.409)	23 J	4.7	9.8	10	ND (0.1) *	ND (2) *	13	ND (1)	ND (2)	ND (4.1) *	27	35
	09/19/08	2 - 3	FD	ND (2) *	3.6	110	ND (2) *	ND (1)	ND (0.41)	18 J	4.5	9.6	5.6	ND (0.1) *	ND (2) *	13	ND (1)	ND (2)	ND (4.1) *	24	32
AOC9-14	10/02/08 ϴ	0 - 0.5	N	ND (2.1) *	12	170	ND (5.4) *	ND (1.1) *	1.7	31	ND (5.4)	24	34	ND (0.11) *	ND (5.4) *	10	ND (1.1)	ND (5.4) *	ND (11) *	19	81
	10/02/08	2 - 3	N	ND (2) *	7.1	160	ND (2) *	ND (1)	ND (0.412)	38	8.8	17	13	ND (0.1) *	ND (2) *	22	ND (1)	ND (2)	ND (4.1) *	33	61
AOC9-15	12/06/15	0 - 1	N	ND (2.2) *	2.6 J	160	ND (1.1) *	ND (1.1) *	ND (0.21)	24 J	5.5 J	17 J	15 J	ND (0.11) *	ND (1.1)	13	ND (1.1)	ND (1.1) J	ND (2.2) *	25 J	52
	12/06/15	2 - 3	N	ND (2.1) *	3.1	170	ND (1) *	ND (1)	0.58	25	5	14	23	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	23	46

TABLE B-3a
Sample Results: Metals
AOC 9 – Southeast Fence Line
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
AOC9-16	01/13/16	0 - 0.5	N	ND (2.1) *	3.3	72	ND (1) *	ND (1)	4.4	48	5.6	11	22	0.14	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	23	69
	01/13/16	2 - 3	N	ND (2) *	2.9	89	ND (1) *	ND (1)	ND (0.2)	17	5	18	6.8	0.11	ND (1)	11	ND (1)	ND (1)	ND (2) *	22	34
	01/13/16	5 - 6	N	ND (2) *	3.3	91	ND (1) *	ND (1)	ND (0.2)	14	4.5	6.3	7.1	ND (0.11) *	ND (1)	9.1	ND (1)	ND (1)	ND (2) *	19	26
	01/13/16	9 - 10	N	ND (2) *	3.3	84	ND (1) *	ND (1)	ND (0.2)	12	4	6.2	2.9	ND (0.1) *	ND (1)	8.9	ND (1)	ND (1)	ND (2) *	17	21
AOC9-17	01/10/16	9 - 10	N	---	---	---	---	---	1.2	---	---	---	---	---	---	---	---	---	---	---	---
	01/14/16	14 - 15	N	---	---	---	---	---	ND (0.21)	---	---	---	---	---	---	---	---	---	---	---	---
AOC9-18	01/10/16	5 - 6	N	ND (2) *	5.9	120	ND (1) *	ND (1)	0.55	25	7.4	17	14	0.18	ND (1)	15	ND (1)	ND (1)	ND (2) *	31	57
	01/10/16	9 - 10	N	ND (2.1) *	3.8	110	ND (1) *	ND (1)	0.94	20	5.3	11	28	0.75	ND (1)	9.9	ND (1)	ND (1)	ND (2.1) *	22	53
AOC9-19	01/13/16	0 - 0.5	N	ND (2.1) J*	4.2	110	ND (1) *	ND (1)	---	19	5.1	9.3	9.4	0.15	ND (1)	12	ND (1) J	ND (1)	ND (2.1) J*	21	42
	01/13/16	2 - 3	N	ND (2) *	3.7	89	ND (1) *	ND (1)	---	13	4	15	13	ND (0.1) *	ND (1)	7.8	ND (1)	ND (1)	ND (2) *	17	35
	01/13/16	5 - 6	N	ND (2) *	4.1	73	ND (1) *	ND (1)	---	13	4.5	7.6	7.4	0.12	ND (1)	9.9	ND (1)	ND (1)	ND (2) *	17	33
	01/13/16	9 - 10	N	ND (2) *	3.9	98	ND (1) *	ND (1)	---	17	5.5	14	5.1	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2) *	21	29
AOC9-20	01/13/16	0 - 0.5	N	---	---	---	---	---	---	---	---	---	7.1	0.11	---	---	---	---	---	---	---
	01/13/16	2 - 3	N	---	---	---	---	---	---	---	---	---	11	0.12	---	---	---	---	---	---	---
	01/13/16	2 - 3	FD	---	---	---	---	---	---	---	---	---	9.3	ND (0.1) *	---	---	---	---	---	---	---
	01/13/16	5 - 6	N	---	---	---	---	---	---	---	---	---	47	0.16	---	---	---	---	---	---	---
	01/13/16	9 - 10	N	---	---	---	---	---	---	---	---	---	2.2	ND (0.1) *	---	---	---	---	---	---	---
AOC9-21	01/08/17	0 - 0.5	N	ND (2.1) *	3.4	130 J	ND (1) *	ND (1)	---	34	7.2	11	3.8	ND (0.1) *	ND (1)	17	ND (1) J	ND (1)	ND (2.1) J*	30 J	47 J
	01/08/17	0 - 0.5	FD	ND (2.1) *	3.6	170 J	ND (1.1) *	ND (1.1) *	---	33	8.2	13	4	ND (0.1) *	ND (1.1)	18	ND (1.1) J	ND (1.1)	ND (2.1) J*	31	45 J
	01/08/17	2 - 3	N	ND (2.1) *	3.1	200	ND (1) *	1.1	---	48	15	23	2.7	ND (0.1) *	ND (1)	38	ND (1) J	ND (1)	ND (2.1) J*	46	44
	01/08/17	5 - 6	N	ND (2.1) *	3	220	ND (1) *	1.1	---	57	12	22	2.4	ND (0.1) *	ND (1)	38	ND (1) J	ND (1)	ND (2.1) J*	47	42
AOC9-22	01/04/17	0 - 0.5	N	ND (2.4) *	4.6	190	ND (1.2) *	ND (1.2) *	---	30	8.2	23	17	ND (0.12) *	ND (1.2)	18	ND (1.2) J	ND (1.2)	ND (2.4) J*	32	60
	01/04/17	2 - 3	N	ND (2.1) *	5.1	140	ND (1) *	ND (1)	---	62	6.8	27	20	0.17	ND (1)	16	ND (1) J	ND (1)	ND (2.1) J*	28	42
	01/04/17 Y	2.5 - 2.6	N	ND (2.9) *	4.6	220	ND (1.4) *	ND (1.4) *	0.79	64	14	16	5.4	ND (0.14) *	ND (1.4) *	39	ND (1.4) J	ND (1.4)	ND (2.9) J*	48	48
	01/04/17	4.5 - 5	N	ND (2.2) *	1.5	130	ND (1.1) *	ND (1.1) *	---	41	2.6	13	6.4	ND (0.11) *	ND (1.1)	5.9	ND (1.1) J	ND (1.1)	ND (2.2) J*	18	18
PA-05	11/09/15	0 - 1	N	ND (2) *	3.6	130	ND (1) *	ND (1)	0.42	27	6.9	16	7.4	ND (0.1) *	ND (1)	19	ND (1)	ND (1)	ND (2) *	33	83
PA-23	01/27/16	0 - 1	N	ND (2.1) *	11	64	ND (1.1) *	ND (1.1) *	0.52	8.9	3.3	6.7	5.1	ND (0.11) *	ND (1.1)	6.3	ND (1.1)	ND (1.1)	ND (2.1) *	18	49
#4	04/06/00	0 - 3	N	---	---	---	---	---	4.2	53.2	---	12.4	---	---	---	13.5	---	---	---	---	343
#5	04/06/00	0 - 3	N	---	---	---	---	---	2.7	29	---	13.8	---	---	---	16.3	---	---	---	---	64
#6	04/06/00	0 - 3	N	---	---	---	---	---	2.6	33	---	12.4	---	---	---	13.2	---	---	---	---	92.7
#7	04/06/00	0 - 3	N	---	---	---	---	---	1.3	32.1	---	15.3	---	---	---	16.3	---	---	---	---	68
#8	04/06/00	0 - 3	N	---	---	---	---	---	2.8	28.8	---	12.9	---	---	---	16.4	---	---	---	---	61.1
#9	04/06/00	0 - 3	N	---	---	---	---	---	2.7	92.7	---	50.4	---	---	---	10.1	---	---	---	---	215
#10	04/06/00	0 - 3	N	---	---	---	---	---	114	398	---	17.9	---	---	---	14.8	---	---	---	---	744
#11	04/06/00	0 - 3	N	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	80.3
#12	04/06/00	0 - 3	N	---	---	---	---	---	0.8	38.3	---	35.6	---	---	---	21.1	---	---	---	---	---

Notes:

Category 1: Validated data suitable for all uses, including risk assessment and remedial action decisions.
Category 2: Validated data suitable for use in characterization of the chemicals of potential concern at the facility and to help define the nature and extent of contamination.
Category 3: Validated data suitable only for use in qualitative characterization of the nature and extent of contamination.

Results greater than or equal to the interim screening level are circled; however, if the interim screening level is equal to the background value, only results greater than the interim screening level are circled.

ϴ	white powder sample.
Y	debris sample
*	Reporting limits greater than or equal to the interim screening level.
---	not analyzed
ft bgs	feet below ground surface
mg/kg	milligrams per kilogram
DTSC	California Department of Toxic Substances Control
DTSC-SL	DTSC Screening Levels
FD	field duplicate
J	concentration or reporting limit estimated by laboratory or data validation
N	primary sample
ND	not detected at the listed reporting limit
NE	not established
USEPA	United States Environmental Protection Agency

1 Interim screening level is background value. If background value is not available then the interim screening value is the lower of the Ecological Comparison Value , residential DTSC-SL, or USEPA residential regional screening value.

2 United States Environmental Protection Agency (USEPA). 2017. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. November.

3 California Department of Toxic Substances Control (DTSC). 2018. Human Health Risk Assessment (HHRA) Note Number 3. January.

4 ARCADIS. 2008. "Technical Memorandum 3: Ecological Comparison Values for Metals and Polycyclic Aromatic Hydrocarbons in Soil." May 28.

5 CH2M HILL. 2009. "Final Soil Background Technical Memorandum at Pacific Gas and Electric Company Topock Compressor Station, Needles, California." May.

TABLE B-3b

Sample Results: Dioxins and Furans
AOC 9 – Southeast Fence Line
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Dioxin/Furans (ng/kg)																			
Interim Screening Level[1] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
Residential Regional Screening Levels[2] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
Residential DTSC-SL[3] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
Ecological Comparison Values[4] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
Background[5] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
Location	Date	Depth (ft bgs)	Sample Type	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDF	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDF	2,3,4,6,7,8-HxCDF	2,3,4,7,8-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	OCDD	OCDF	TEQ Avian	TEQ Human	TEQ Mammals
Category 1																							
AOC9-2	09/18/08	0 - 0.5	N	67 J	5.3 J	0.6 J	ND (0.74) J	ND (0.29) J	1.8 J	ND (0.65) J	1.2 J	ND (0.35) J	ND (0.23) J	ND (0.46) J	ND (6) J	ND (0.2) J	ND (0.081) J	ND (0.31) J	610 J	12 J	1.1	1.8	1.8
	09/18/08	2 - 3	N	66 J	4.9 J	ND (0.27) J	ND (0.41) J	ND (0.22) J	ND (1.4) J	ND (0.25) J	ND (0.39) J	ND (0.33) J	ND (0.33) J	ND (0.35) J	ND (4.5) J	ND (0.37) J	ND (0.042) J	ND (0.12) J	810 J	9.9 J	0.95	1.6	1.6
AOC9-8	10/01/08	2.5 - 3	N	3,200 J	210 J	15 J	21 J	9.3 J	59 J	ND (6) J	19 J	3.3 J	6.1 J	ND (2.4) J	ND (350) J	3.1 J	ND (0.44) J	ND (1.2) J	34,000 J	490 J	42	81	81
AOC9-15	12/06/15	0 - 1	N	1,700 J	130 J	10 J	18 J	7.8 J	46 J	6.1 J	29 J	ND (2.4) J	11 J	2.9 J	ND (220) J	4.6 J	ND (0.09) J	3 J	18,000 J	310 J	41	59	59
	12/06/15	2 - 3	N	5,500 J	430 J	32 J	48 J	28 J	140 J	38 J	90 J	6.8 J	28 J	19 J	ND (350) J	12 J	ND (2) J	ND (0.73) J	41,000 J	940 J	95	160	160
AOC9-16	01/13/16	0 - 0.5	N	9,300 J	210 J	ND (17) J	110 J	20 J	150 J	12 J	60 J	5.5 J	17 J	ND (6.3) J	ND (420) J	6.9 J	ND (2.4) J	ND (3.5) J	51,000 J	400 J	82	190	190
	01/13/16	2 - 3	N	290 J	23 J	ND (1.7) J	2.9 J	ND (2.6) J	ND (6.1) J	ND (1.4) J	4 J	ND (0.55) J	ND (1.2) J	3.4 J	ND (23) J	ND (1.7) J	ND (0.22) J	1.5 J	2,800 J	70 J	6.2	7.6	7.6
	01/13/16	5 - 6	N	600 J	55 J	ND (3.4) J	ND (3.7) J	2.4 J	ND (10) J	ND (2.1) J	ND (7.3) J	ND (0.39) J	ND (2) J	ND (1.2) J	ND (34) J	ND (1.2) J	ND (0.26) J	ND (0.27) J	7,200 J	290 J	6.4	13	13
AOC9-18	01/10/16	5 - 6	N	2,000 J	150 J	9.8 J	12 J	9.7 J	46 J	6.5 J	17 J	ND (2.6) J	5.2 J	3.4 J	ND (240) J	3.6 J	ND (0.14) J	2.4 J	18,000 J	300 J	34	55	55
AOC9-19	01/13/16	0 - 0.5	N	1,000 J	70 J	6.3 J	6.6 J	5 J	ND (20) J	ND (3.5) J	9.6 J	ND (1.5) J	ND (1.2) J	ND (1.6) J	ND (110) J	ND (1.8) J	ND (0.17) J	1.2 J	9,400 J	170 J	13	24	24
	01/13/16	2 - 3	N	430 J	34 J	ND (2.3) J	ND (4.3) J	ND (1.8) J	10 J	ND (2.1) J	6.9 J	ND (0.67) J	ND (1.4) J	ND (2.6) J	ND (42) J	ND (0.77) J	ND (0.13) J	ND (0.99) J	4,000 J	90 J	6.2	11	11
	01/13/16	5 - 6	N	220 J	19 J	ND (0.88) J	1.7 J	ND (1.1) J	ND (4.8) J	ND (0.82) J	ND (1.6) J	ND (1) J	ND (0.97) J	1.6 J	ND (31) J	ND (0.63) J	ND (0.15) J	ND (0.57) J	2,000 J	46 J	3.8	5.9	5.9
AOC9-20	01/13/16	0 - 0.5	N	410 J	36 J	ND (2.3) J	ND (1.1) J	ND (1.2) J	ND (8.6) J	2.4 J	ND (5.1) J	ND (0.64) J	ND (1.6) J	ND (1.2) J	ND (39) J	ND (1.2) J	ND (0.25) J	ND (0.55) J	3,600 J	97 J	5.6	9.8	9.8
	01/13/16	2 - 3	N	540 J	38 J	2.7 J	4.6 J	ND (3.4) J	ND (12) J	ND (3.8) J	6.9 J	ND (1.2) J	ND (1.7) J	3.2 J	ND (44) J	ND (1.3) J	ND (0.23) J	2.8 J	3,500 J	72 J	9.6	13	13
	01/13/16	5 - 6	N	1,300 J	110 J	ND (7.6) J	11 J	ND (9.3) J	30 J	ND (7) J	ND (14) J	ND (0.91) J	ND (4.9) J*	9.9 J	ND (130) J	ND (4.7) J	ND (0.48) J	9.1 J	12,000 J	230 J	28	35	35
AOC9-21	01/08/17	0 - 0.5	N	3,500	360 J	27 J	14	ND (17)	77	ND (15)	23	ND (20)	ND (2.6)	ND (5.5)	ND (940)	ND (5.6)	ND (0.49)	ND (0.51)	24,000	820	68	110	110
	01/08/17	0 - 0.5	FD	3,600	380	25	ND (9.8)	ND (15)	81	ND (13)	22	ND (17)	ND (3.3)	ND (1)	ND (900)	ND (1)	ND (0.23)	ND (0.83)	34,000 J	870	64	110	110
	01/08/17	2 - 3	N	ND (18)	ND (0.3)	ND (0.8)	ND (0.19)	ND (0.22)	ND (0.26)	ND (0.17)	ND (0.17)	ND (0.25)	ND (0.17)	ND (0.39)	ND (1.5)	ND (0.19)	ND (0.12)	ND (0.098)	170	ND (2.9)	0.46	0.47	0.47
	01/08/17	5 - 6	N	ND (5.6)	ND (0.87)	ND (0.19)	ND (0.22)	ND (0.35)	ND (0.24)	ND (0.3)	ND (0.19)	ND (0.39)	ND (0.063)	ND (0.13)	ND (0.35)	ND (0.13)	ND (0.16)	ND (0.36)	ND (94)	ND (2.2)	ND (0.46)	ND (0.3)	ND (0.3)
AOC9-22	01/04/17	0 - 0.5	N	960	49	ND (2.6)	9.9 J	ND (1.4)	22	5.5 J	13	ND (1.6)	ND (5.2) *	11 J	ND (110)	ND (2.5)	ND (0.26)	11	8,100	87	27	28	28
	01/04/17	2 - 3	N	3,800	200	18	20	23	63	ND (32)	26	ND (6.4)	ND (73) *	ND (3.8)	ND (5.6)	ND (3.8)	ND (1.4)	ND (7.7)	24,000	480	60	100	100
	01/04/17	4.5 - 5	N	100	ND (5.3)	ND (6.5)	ND (0.34)	ND (0.35)	3.9 J	ND (0.75)	1.1 J	ND (0.41)	ND (0.32)	ND (1.6)	ND (44)	ND (0.15)	ND (0.1)	ND (0.19)	1,000	22 J	3.2	4.4	4.4
PA-23	01/27/16	0 - 1	N	680 J	67 J	5.7 J	ND (6.3) J	19 J	19 J	8.5 J	ND (9.5) J	ND (2.4) J	ND (1.9) J	28 J	ND (59) J	ND (11) J	ND (1.2) J	36 J	6,700 J	96 J	55	26	26

Notes:

Category 1: Validated data suitable for all uses, including risk assessment and remedial action decisions.
Category 2: Validated data suitable for use in characterization of the chemicals of potential concern at the facility and to help define the nature and extent of contamination.
Category 3: Validated data suitable only for use in qualitative characterization of the nature and extent of contamination.
Results greater than or equal to the Interim Screening Level are circled.

--	not analyzed
ft bgs	feet below ground surface
ng/kg	nanograms per kilogram
DTSC-SL	DTSC Screening Levels
DTSC	California Department of Toxic Substances Control
FD	Field Dupliicate

TABLE B-3b

Sample Results: Dioxins and Furans
AOC 9 – Southeast Fence Line
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

J	concentration or reporting limit estimated by laboratory or data validation
JR	estimated value, one or more input values is "R" qualified.
N	Primary Sample
NA	NA = not applicable
NE	not established
ND	not detected at the listed reporting limit
R	The result has been rejected; identification and/or quantitation could not be verified because critical QC specifications were not met (e.g., a non-detect result obtained for an archive sample following a hold time of greater than one year).
USEPA	USEPA = United States Environmental Protection Agency

1 For individual dioxins and furans, selected value is the lower of the ECV, residential DTSC-SL, or USEPA residential regional screening value, unless the background value is higher. For TEQ values, selected value is the DTSC-SL.

2 United States Environmental Protection Agency (USEPA). 2017. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. November.

3 California Department of Toxic Substances Control (DTSC). 2018. Human Health Risk Assessment (HHRA) Note Number 3. JanuaryCalifornia Department of Toxic Substances Control (DTSC). 2017. Human Health Risk Assessment (HHRA) Note 2, Soil Remedial Goals for Dioxins and Dioxin-like Compounds for Consideration at California Hazardous Waste Sites. April.

4 ARCADIS. 2008. "Technical Memorandum 3: Ecological Comparison Values for Metals and Polycyclic Aromatic Hydrocarbons in Soil." May 28. ARCADIS. 2009. "Topock Compression Station - Final Technical Memorandum 4: Ecological Comparison Values for Additional Dectected Chemicals in Soil." July 1.

5 CH2M. 2017. Revised Ambient Study of Dioxins and Furans at the Pacific Gas and Electric Company, Topock Compressor Station, Needles, California. October.

Calculations:

TEQ = Sum of Result xToxic equivalency factor (TEF), 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TEQ Avian = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TEQMammals = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

Teq Humans = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TABLE B-4a
Sample Results: Metals
AOC 10 – East Ravine
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Date	Depth (ft bgs)	Sample Type	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium, Hexavalent	Chromium, total	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Category 1																					
AOC10-1	10/02/08	0 - 0.5	N	ND (2) *	3.7	93	ND (1) *	ND (1)	ND (0.401)	6.6	2.7	4.9	9.2	ND (0.1) *	ND (1)	5.5	ND (1)	ND (1)	ND (2) *	13	20
	10/02/08	2 - 3	N	ND (2) *	4.2	81	ND (1) *	ND (1)	ND (0.405)	7.4	3	5.6	5.8	ND (0.1) *	ND (1)	6.3	ND (1)	ND (1)	ND (2) *	16	21
	10/02/08	5 - 6	N	ND (2) *	4.9	82	ND (1) *	ND (1)	ND (0.407)	7.5	3.2	5.8	5.4	ND (0.1) *	ND (1)	6.4	ND (1)	ND (1)	ND (2) *	17	20
	10/02/08	9 - 10	N	ND (2) *	4.7	110	ND (1) *	ND (1)	ND (0.406)	6.8	3	5.7	4.8	ND (0.1) *	ND (1)	6.2	ND (1)	ND (1)	ND (2) *	15	21
AOC10-10	01/22/16	0 - 1	N	ND (2.1) *	3.1	100	ND (1) *	ND (1)	0.45	36	6.2	15	4.7	ND (0.1) *	ND (1)	16	ND (1)	ND (1)	ND (2.1) *	23	63
	01/22/16	2 - 3	N	ND (2.2) *	2.6	100	ND (1.1) *	ND (1.1) *	ND (0.22)	27	9	13	2	ND (0.11) *	ND (1.1)	22	ND (1.1)	ND (1.1)	ND (2.2) *	38	41
	01/22/16	5 - 6	N	ND (2.1) *	3.2	120	ND (1.1) *	ND (1.1) *	0.35	34	11	13	2.1	ND (0.11) *	ND (1.1)	28	ND (1.1)	ND (1.1)	ND (2.1) *	43	44
	01/22/16	9 - 10	N	ND (2.2) *	3.4	100	ND (1.1) *	ND (1.1) *	0.35	32	9.5	11	2.6	ND (0.11) *	ND (1.1)	23	ND (1.1)	ND (1.1)	ND (2.2) *	42	43
	01/22/16	9 - 10	FD	ND (2.2) *	3.1	85	ND (1.1) *	ND (1.1) *	0.39	31	9.2	11	2.4	ND (0.11) *	ND (1.1)	21	ND (1.1)	ND (1.1)	ND (2.2) *	39	42
AOC10-11	01/22/16	0 - 1	N	ND (2.1) *	3.3	85	ND (1) *	ND (1)	0.87	31	5.8 J	9.1	2.7	ND (0.1) *	ND (1)	14 J	ND (1)	ND (1)	ND (2.1) *	24 J	40
	01/22/16	0 - 1	FD	ND (2.1) *	3.4	86	ND (1) *	ND (1)	0.44	27	8.6 J	14	2.4	ND (0.1) *	ND (1)	18 J	ND (1)	ND (1)	ND (2.1) *	31 J	45
	01/22/16	2 - 3	N	ND (2.1) J*	2.7	110	ND (1) *	ND (1)	0.9	45	7.3	13	2.6	ND (0.1) *	ND (1)	19	ND (1) J	ND (1)	ND (2.1) J*	30	44
	01/22/16	5 - 6	N	ND (2.1) *	2.4	110	ND (1) *	ND (1)	1.6	73	9.4	31	2.5	ND (0.1) *	ND (1)	24	ND (1)	ND (1)	ND (2.1) *	35	74
	01/22/16	9 - 10	N	ND (2) *	2.4	190	ND (1) *	ND (1)	0.72	42	10	19	2.4	ND (0.1) *	ND (1)	22	ND (1)	ND (1)	ND (2) *	36	160
AOC10-12	01/22/16	0 - 0.5	N	ND (2.1) *	4.3	89	ND (1) *	ND (1)	13	460	9.8	19	12	ND (0.11) *	ND (1)	21	ND (1)	ND (1)	ND (2.1) *	36	56
	01/22/16	2 - 3	N	ND (2.1) *	8.9	63	ND (1.1) *	ND (1.1) *	0.3	25	4.6	9	3.6	ND (0.1) *	1.4	11	ND (1.1)	ND (1.1)	ND (2.1) *	38	34
	01/22/16	5 - 6	N	ND (2.1) *	3	200	ND (1) *	ND (1)	5	130	8.4	11	6	ND (0.1) *	ND (1)	18	ND (1)	ND (1)	ND (2.1) *	31	70
	01/22/16	9 - 10	N	ND (2.1) *	4.4	120	ND (1) *	ND (1)	0.66	37	9.6	16	2.5	ND (0.11) *	ND (1)	22	ND (1)	ND (1)	ND (2.1) *	34	47
AOC10-13	12/03/15	0 - 1	N	ND (2.1) *	4.3	130	ND (1.1) *	ND (1.1) *	ND (0.21)	14	5.3	13	9.8	ND (0.11) *	1.4	12	ND (1.1)	ND (1.1)	ND (2.1) *	22	39
	12/03/15	0 - 1	FD	ND (2.1) *	4.5	130	ND (1.1) *	ND (1.1) *	ND (0.21)	16	5.7	14	10	ND (0.11) *	1.4	14	1.1	ND (1.1)	ND (2.1) *	23	41
AOC10-14	12/03/15	0 - 1	N	ND (2.1) *	6.3	380	ND (1) *	ND (1)	ND (0.21)	11	4.1	13	5.9	ND (0.1) *	1.3	9.1	9.1	ND (1)	ND (2.1) *	21	29
AOC10-15	12/15/15	0 - 1	N	ND (2) *	5.8	150	ND (1) *	ND (1)	2.6	67	6.1	23	21	ND (0.1) *	14	11	ND (1)	ND (1)	ND (2) *	24	98
	12/15/15	0 - 1	FD	ND (2) *	5.4	150	ND (1) *	ND (1)	2.6	70	5.9	27	20	ND (0.1) *	14	10	ND (1)	ND (1)	ND (2) *	22	110
	12/15/15	2 - 3	N	ND (2) *	4.7	210	ND (1) *	ND (1)	1.4	41	7.2	22	17 J	ND (0.1) *	8.2	14	ND (1) J	ND (1) J	ND (2) J*	26	70 J
	12/15/15	5 - 6	N	ND (2.1) *	4.4	320	ND (1) *	ND (1)	1.1	33	6.3	14	7.6	ND (0.1) *	4.2	15	ND (1)	ND (1)	ND (2.1) *	26	100
	12/15/15	9 - 10	N	ND (2.1) *	4.8	78	ND (1) *	ND (1)	ND (0.21)	17	8.1	11	1.5	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	30	44
AOC10-16	12/15/15	0 - 1	N	ND (2) *	3	69	ND (1) *	ND (1)	0.59	21	7.3	8.9	5.9	ND (0.1) *	ND (1)	16	ND (1)	ND (1)	ND (2) *	26	40
	12/15/15	2 - 3	N	ND (2.1) *	2.8	44	ND (1) *	ND (1)	0.24	21	7	9.7	2.5	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	27	44
	12/15/15	5 - 6	N	ND (2.1) *	3.1	170	ND (1) *	ND (1)	0.48	21	7.2	12	3.2	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	30	40
	12/15/15	9 - 10	N	ND (2) *	2.9	59	ND (1) *	ND (1)	ND (0.2)	14	6.6	9.4	2.4	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	28	38
AOC10-17	12/03/15	0 - 1	N	ND (2.1) *	3.8	110	ND (1) *	ND (1)	ND (0.21)	9.7	4.6	11	9.9	ND (0.1) *	7.8	10	1.9	ND (1)	ND (2.1) *	16	32
AOC10-18	12/06/15	0 - 1	N	ND (2) *	2.3	100	ND (1) *	ND (1)	ND (0.2)	5.6	2.3	2.8	1.9	ND (0.1) *	ND (1)	3.6	ND (1)	ND (1)	ND (2) *	14	13
	12/06/15	2 - 3	N	ND (2) *	2.2	160	ND (1) *	ND (1)	ND (0.2)	5.7	2.5	4.1	1.9	ND (0.1) *	ND (1)	4.2	ND (1)	ND (1)	ND (2) *	15	13
AOC10-19	02/24/16	0 - 1	N	ND (2) J*	4.2	120	ND (1) *	ND (1)	ND (0.2)	27	8.4	14	6.7 J	ND (0.1) *	ND (1)	20	ND (1)	ND (1)	ND (2) *	34	48
	02/24/16	2 - 3	N	ND (2.1) *	5	120	ND (1) *	ND (1)	0.3	34 J	10	18	5.8	ND (0.1) *	ND (1)	22	ND (1)	ND (1)	ND (2.1) *	40	55
	02/24/16	2 - 3	FD	ND (2.1) *	4.9	110	ND (1) *	ND (1)	ND (0.21)	27 J	9.1	17	5.8	ND (0.1) *	ND (1)	19	ND (1)	ND (1)	ND (2.1) *	36	52
	02/24/16	5 - 6	N	ND (2.1) *	5.8	130	ND (1) *	ND (1)	ND (0.21)	27	9.4	17	3.8	ND (0.11) *	ND (1)	19	ND (1)	ND (1)	ND (2.1) *	37	47

TABLE B-4a

Sample Results: Metals
AOC 10 – East Ravine
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
AOC10-2	10/02/08	0 - 0.5	N	ND (2) *	3.4	93	ND (1) *	ND (1)	ND (0.402)	4.9	2.3	4.1	5.1	ND (0.1) *	ND (1)	4.3	ND (1)	ND (1)	ND (2) *	12	14
	10/02/08	2 - 3	N	ND (2.1) *	5.5	370	ND (1) *	ND (1)	ND (0.417)	17	6.4	9.4	3.4	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	33	38
	10/02/08	5 - 6	N	ND (2.1) *	9.1	120	ND (2.1) *	ND (1)	ND (0.415)	19	7.4	9.5	4.2	ND (0.1) *	ND (2.1) *	14	ND (1)	ND (2.1)	ND (4.1) *	36	40
	10/02/08	7 - 8	N	ND (2.1) *	6	110	ND (1) *	ND (1)	ND (0.412)	17	6.3	9	3.2	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	30	32
AOC10-20	02/17/16	0 - 0.5	N	15	3.5	120	ND (1) *	ND (1)	2,700	2,800	3.4	11	6.1	ND (0.1) *	ND (1)	5.8	ND (1)	ND (1)	ND (2) *	14	38
	02/25/16	2 - 3	N	ND (2) *	3.3	100	ND (1) *	ND (1)	12	28	3.2	5	2.8	ND (0.1) *	ND (1)	5.8	ND (1)	ND (1)	ND (2) *	18	16
AOC10-21	02/25/16	0 - 0.5	N	ND (2) *	9.7	320	ND (1) *	7.4	1.4	270	8.5	3,100	920	35	9.4	28	ND (1)	ND (1)	ND (2) *	23	360
	02/25/16	2 - 3	N	ND (2) *	3	85	ND (1) *	ND (1)	0.2	8.1	3.2	5	2.9	ND (0.099) *	ND (1)	5.4	ND (1)	ND (1)	ND (2) *	16	16
AOC10-22	02/17/16	0 - 0.5	N	ND (2) *	4.1	140	ND (1) *	ND (1)	ND (0.2)	35	8.1	14	12	ND (0.1) *	ND (1)	20	ND (1)	ND (1)	ND (2) *	38	50
	02/17/16	1 - 2	N	ND (2.1) *	17	77	ND (1.1) *	4.4	0.91	85	36	200	38	ND (0.11) *	2.7	51	ND (1.1)	ND (1.1)	ND (2.1) *	19	39
	02/17/16	2 - 3	N	ND (2) *	5.5	140	ND (1) *	1.2	0.37	35	13	42	17	ND (0.1) *	ND (1)	25	ND (1)	ND (1)	ND (2) *	34	35
	02/17/16	5 - 6	N	ND (2) *	4.1	130	ND (1) *	ND (1)	ND (0.2)	8.6	3.4	5.1	3.4	ND (0.1) *	ND (1)	5.4	ND (1)	ND (1)	ND (2) *	19	18
AOC10-23	02/25/16	0 - 1	N	ND (2) *	11	57	ND (1) *	1.8	1.8	72	27	140	30	0.24	ND (1)	34	ND (1)	ND (1)	ND (2) *	12	26
	02/25/16	1 - 2	N	ND (2) *	5.1	59	ND (1) *	ND (1)	2.6	130	5.7	22	22	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	16	56
	02/25/16	2 - 3	N	ND (2) *	3	60	ND (1) *	ND (1)	ND (0.2)	5.5	2.5	4.2	2.2	ND (0.1) *	ND (1)	4.4	ND (1)	ND (1)	ND (2) *	13	11
AOC10-25	01/08/17	0 - 0.5	N	ND (2) *	3.1	120 J	ND (1) J*	ND (1)	ND (0.2)	15	5.9 J	8	7.9 J	ND (0.1) *	ND (1)	11 J	ND (1) J	ND (1)	ND (2) J*	23	32
	01/08/17	0 - 0.5	FD	ND (2) *	3.7	150 J	ND (1) J*	ND (1)	ND (0.2)	18	7.3 J	9.5	11 J	ND (0.1) *	ND (1)	14 J	ND (1) J	ND (1)	ND (2) J*	27	38
	01/08/17	2 - 3	N	ND (2) *	4.1	140 J	ND (1) J*	ND (1)	ND (0.2)	31	9.9	11	2.1 J	ND (0.1) *	1.4	21	ND (1) J	ND (1)	ND (2) J*	36 J	41
	01/08/17	5 - 6	N	ND (2.1) *	4.8	160	ND (1) *	ND (1)	ND (0.2)	25	8.2	11	1.5	ND (0.1) *	ND (1)	16	ND (1) J	ND (1)	ND (2.1) *	30	45
	01/08/17	9 - 10	N	ND (2) *	5.6	130	ND (1) *	ND (1)	ND (0.2)	26	10	13	1.5	ND (0.1) *	ND (1)	15	ND (1) J	ND (1)	ND (2) *	34	42
AOC10-26	02/21/17 ⊖	2.5 - 2.7	N	3.5	6.6	200	ND (1.4) *	1.5	9.5	340	6.5	40	18	0.15	ND (1.4) *	13	ND (1.4) J	ND (1.4)	ND (2.8) J*	31	110
AOC10-3	09/19/08	0 - 0.5	N	ND (2) J*	3.1	160	ND (2) *	ND (1)	1.91	62	4.6	14	7.8	ND (0.1) *	ND (2) *	12	ND (1)	ND (2)	ND (4) *	23	40
	09/19/08	0 - 0.5	FD	ND (2) *	2.6	150	ND (2) *	ND (1)	1.7	64	4.5	13	7.7	ND (0.1) *	ND (2) *	12	ND (1)	ND (2)	ND (4) *	22	41
	09/19/08	2 - 3	N	ND (2.1) *	3.3	160	ND (5.1) *	ND (1)	ND (0.412)	43	10	14	ND (5.1)	ND (0.1) *	ND (5.1) *	26	ND (1)	ND (5.1)	ND (10) *	43	47
	09/19/08	5 - 6	N	ND (2.1) *	5.4	220	ND (5.1) *	ND (1)	0.705	37	9.9	16	2.9	ND (0.1) *	ND (5.1) *	25	ND (1)	ND (5.1)	ND (10) *	46	61
	09/19/08	9 - 10	N	ND (2.1) *	7.4	110	ND (1) *	ND (1)	ND (0.412)	28	9	12	2.8	ND (0.1) J*	ND (1)	20	ND (1)	ND (1)	ND (2.1) *	33	50
AOC10-4	09/19/08	0 - 0.5	N	ND (2) *	3.5	110	ND (2) *	ND (1)	0.55	33	6.5	14	11	ND (0.1) *	ND (2) *	15	ND (1)	ND (2)	ND (4) *	32	52
	09/19/08	2 - 3	N	ND (2) *	2.5	130	ND (2) *	ND (1)	ND (0.409)	26	7.1	16	4.4	ND (0.1) *	ND (2) *	19	ND (1)	ND (2)	ND (4.1) *	33	38
	09/19/08	5 - 6	N	ND (2.1) *	5.9	75	ND (5.2) *	ND (1)	ND (0.418)	27	10	16	3	ND (0.11) *	ND (5.2) *	20	ND (1)	ND (5.2) *	ND (10) *	40	63
	09/19/08	9 - 10	N	ND (2.1) *	7.7	48	ND (1) *	ND (1)	ND (0.413)	18	7.9	12	2.7	ND (0.1) J*	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	27	48
AOC10-5	09/19/08	0 - 0.5	N	ND (2) *	9.6	500	ND (5.1) *	ND (1)	1.01	39	9.6	27	27	ND (0.1) *	ND (5.1) *	23	ND (1)	ND (5.1)	ND (10) *	52	97
	09/19/08	2 - 3	N	ND (2.1) *	8.2	380	ND (5.1) *	ND (1)	0.48	30	8.3	21	34	ND (0.1) *	ND (5.1) *	20	ND (1)	ND (5.1)	ND (10) *	43	77
	09/19/08	5 - 6	N	ND (4.1) *	12	1,100	ND (5.1) *	ND (2) *	ND (0.407)	19	8.8	40	6.7	ND (0.1) *	ND (5.1) *	16	ND (2) *	ND (5.1)	ND (10) *	36	80
	09/19/08	5 - 6	FD	ND (4.1) *	12	1,300	ND (5.1) *	ND (2) *	ND (0.407)	18	8.5	41	7.3	ND (0.1) *	ND (5.1) *	14	ND (2) *	ND (5.1)	ND (10) *	37	79
AOC10-6	09/20/08	0 - 0.5	N	ND (2) J*	7	220 J	ND (2) *	ND (1)	ND (0.402)	24	7.2	11	26	ND (0.1) *	ND (2) *	16	ND (1)	ND (2)	ND (4) *	32	58
	09/20/08	2 - 3	N	ND (2) *	4.2	220	ND (1) *	ND (1)	ND (0.404)	23	7	9.5	4.1	ND (0.1) *	ND (1)	16	ND (1)	ND (1)	ND (2) *	34	45
AOC10-7	09/20/08	0 - 0.5	N	ND (2) *	7.6	250	ND (1) *	ND (1)	ND (0.414)	22	6.7	12	8.6	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	29	54
	09/20/08	2 - 3	N	ND (2) *	8	210	ND (1) *	ND (1)	ND (0.406)	27	7.9	12	8.1	ND (0.1) *	1.1	14	ND (1)	ND (1)	ND (2) *	33	58
	09/20/08	5 - 6	N	ND (2) *	9.6	270	ND (2) *	ND (1)	ND (0.407)	33	8.7	13	4.4	ND (0.1) *	ND (2) *	20	ND (1)	ND (2)	ND (4.1) *	38	58

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
AOC10-8	08/22/08	0 - 0.5	N	ND (4) *	8.6	210	ND (2) *	ND (2) *	ND (0.402)	16	6.4	12	15 J	ND (0.1) *	ND (2) *	14	ND (2) *	ND (2)	ND (4) *	31	87
	08/22/08	0 - 0.5	FD	ND (4) *	8.2	180	ND (2) *	ND (2) *	ND (0.416)	18	7	12	12 J	ND (0.1) *	ND (2) *	14	ND (2) *	ND (2)	ND (4) *	33	75
AOC10-9	12/07/15	0 - 1	N	ND (2) *	9.1	82	ND (1) *	ND (1)	ND (0.2)	19	6.9	12	3.2	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2) *	29	41
	12/07/15	2 - 3	N	ND (2.1) *	4.8	140	ND (1) *	ND (1)	ND (0.2)	16	6.6	10	2.3	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	26	49
AOC10a-1	10/17/08	0 - 0.5	N	ND (2.1) J*	8.8	140	ND (1.1) *	ND (1.1) *	8.25	80	5.7	270 J	200 J	0.64	19	28	ND (1.1)	ND (1.1)	ND (2.1) *	17	1,000 J
AOC10a-2	01/13/16	0 - 1	N	ND (2.1) *	3.8	65	ND (1.1) *	ND (1.1) *	ND (0.21)	13	4.2	11	9.4	0.12	ND (1.1)	7.7	ND (1.1)	ND (1.1)	ND (2.1) *	18	36
	01/13/16	2 - 3	N	ND (2.1) *	3.1	77	ND (1) *	ND (1)	ND (0.21)	3.6	2.3	2.9	2.1	ND (0.1) *	ND (1)	3.4	ND (1)	ND (1)	ND (2.1) *	9.6	10
	01/13/16	5 - 6	N	ND (2.1) *	2.9	65	ND (1) *	ND (1)	ND (0.21)	3.7	1.9	2.6	1.9	ND (0.1) *	ND (1)	2.7	ND (1)	ND (1)	ND (2.1) *	9.3	9.5
	01/13/16	9 - 10	N	ND (2.1) *	2.9	290	ND (1.1) *	ND (1.1) *	ND (0.21)	4.6	2.2	3.6	2.4	ND (0.11) *	ND (1.1)	3.9	ND (1.1)	ND (1.1)	ND (2.1) *	9.9	12
AOC10a-3	01/13/16	0 - 1	N	ND (2.1) *	3.7	150	ND (1) *	ND (1)	5.3	100	7.6	27	4.2	0.13	ND (1)	19	ND (1)	ND (1)	ND (2.1) *	27	35
	01/13/16	2 - 3	N	ND (2.1) *	4.7	140	ND (1) *	ND (1)	1.3	68	5.7	25	22	0.21	1.4	16	ND (1)	ND (1)	ND (2.1) *	22	70
	01/13/16	5 - 6	N	ND (2.1) *	3.6	82	ND (1) *	ND (1)	ND (0.21)	45	9	12	1.7	0.19	ND (1)	28	ND (1)	ND (1)	ND (2.1) *	40	34
	01/13/16	9 - 10	N	ND (2.1) *	3.2	150	ND (1) *	ND (1)	ND (0.21)	39	10	31	2.3	0.16	ND (1)	32	ND (1)	ND (1)	ND (2.1) *	42	38
AOC10a-4	01/08/17	0 - 0.5	N	ND (2.1) *	3.6	140	ND (1.1) *	ND (1.1) *	---	33	10	30	4	ND (0.11) *	ND (1.1)	25	ND (1.1) J	ND (1.1)	ND (2.1) J*	34	41
	01/08/17	2 - 3	N	ND (2) *	3.8	130	ND (1) *	ND (1)	---	11	4.1	6.3	2.6	ND (0.1) *	ND (1)	7.7	ND (1) J	ND (1)	ND (2) J*	19	20
	01/08/17	5 - 6	N	ND (2) *	3.5	130	ND (1) *	ND (1)	---	11	3.9	6.9	2.5	ND (0.1) *	ND (1)	7.9	ND (1) J	ND (1)	ND (2) J*	17	19
	01/08/17	9 - 10	N	ND (2.1) *	2.2	310	ND (1) *	1.1	---	47	12	14	2.1	ND (0.1) *	ND (1)	35	ND (1) J	ND (1)	ND (2.1) J*	43	41
AOC10b-1	09/30/08	0 - 0.5	N	ND (2) *	3.6	130	ND (1) *	ND (1)	0.559	24	4.8	9.8	8.6	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	25	38
	09/30/08	2 - 3	N	ND (2) *	3.1	120	ND (1) *	ND (1)	1.39	63	4.8	28	8.4 J	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	20	110 J
	09/30/08	2 - 3	FD	ND (2) *	2.9	100	ND (1) *	ND (1)	1.39	61	4.2	27	12 J	ND (0.1) *	1.5	10	ND (1)	ND (1)	ND (2) *	18	160 J
	09/30/08	5 - 6	N	ND (2) *	3.1	110	ND (1) *	ND (1)	0.425	20	3.9	8	4.3	ND (0.1) *	ND (1)	8.4	ND (1)	ND (1)	ND (2) *	16	39
	09/30/08	9 - 10	N	ND (2) *	4.7	120	ND (2) *	ND (1)	ND (0.407)	29	6.2	10	3.7	ND (0.1) *	ND (2) *	16	ND (1)	ND (2)	ND (4) *	24	29
AOC10b-2	09/30/08	0 - 0.5	N	ND (2) *	3	89	ND (1) *	ND (1)	0.434	29	3.8	11	8.2	ND (0.1) *	1.1	8.9	ND (1)	ND (1)	ND (2) *	17	40
	09/30/08	2 - 3	N	ND (2) *	2.9	100	ND (1) *	ND (1)	1.05	47	4.3	15	5.2	ND (0.1) *	1.1	10	ND (1)	ND (1)	ND (2) *	17	44
	09/30/08	5 - 6	N	ND (2) *	4.1	100	ND (1) *	ND (1)	0.453	29	5.3	8.8	4.2	ND (0.1) *	1	14	ND (1)	ND (1)	ND (2) *	22	27
	09/30/08	9 - 10	N	ND (2) *	5.7	120	ND (2) *	ND (1)	0.759	39	8.2	15	3.8	ND (0.1) *	ND (2) *	22	ND (1)	ND (2)	ND (4) *	29	38
AOC10b-3	09/30/08	0 - 0.5	N	ND (2) *	ND (1)	120	ND (1) *	ND (1)	27.7	820	3.6	90	24	ND (0.1) *	1.5	9.2	ND (1)	ND (1)	ND (2) *	17	240
	10/01/08	2 - 3	N	ND (2) *	2.9	93	ND (1) *	ND (1)	1.82	90	5.8	23	5	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	22	59
	10/01/08	5 - 6	N	ND (2.1) *	5	110	ND (2.1) *	ND (1)	0.429	38	9.2	14	3.8	ND (0.1) *	ND (2.1) *	24	ND (1)	ND (2.1)	ND (4.1) *	33	40
	10/01/08	5 - 6	FD	ND (2.1) *	5	110	ND (2.1) *	ND (1)	ND (0.417)	36	10	16	3.6	ND (0.1) *	ND (2.1) *	25	ND (1)	ND (2.1)	ND (4.1) *	35	39
	10/01/08	9 - 10	N	ND (2.1) *	6.2	120	ND (2.1) *	ND (1)	ND (0.415)	36	11	13	3.5	ND (0.1) *	ND (2.1) *	26	ND (1)	ND (2.1)	ND (4.1) *	38	44
AOC10b-4	09/30/08	0 - 0.5	N	ND (2) *	3.4	76	ND (1) *	ND (1)	ND (0.401)	12	4	5.8	41	ND (0.1) *	ND (1)	9.1	ND (1)	ND (1)	ND (2) *	17	29
	09/30/08	2 - 3	N	ND (2) *	3.6	100	ND (1) *	ND (1)	ND (0.403)	14	4.7	6.7	10	ND (0.1) *	ND (1)	9.6	ND (1)	ND (1)	ND (2) *	21	31
	09/30/08	5 - 6	N	ND (2) *	3.8	150	ND (1) *	ND (1)	ND (0.407)	20	6.7	8.9	3.4	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	30	35
	09/30/08	9 - 10	N	ND (2.1) *	4	85	ND (1) *	ND (1)	ND (0.415)	26	7.4	11	2.8	ND (0.1) *	ND (1)	18	ND (1)	ND (1)	ND (2.1) *	30	42
AOC10c-1	10/01/08	0 - 0.5	N	ND (2) J*	4.2	110	ND (1) *	ND (1)	1.98	55	5.4	15	7.8	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	23	48
	10/01/08	2 - 3	N	ND (2) *	1.2	140	ND (1) *	ND (1)	27.3	490	5.6	41	18	ND (0.1) *	1.2	13	ND (1)	ND (1)	ND (2) *	21	76
	10/01/08	5 - 6	N	ND (2) *	3.4	110	ND (2) *	ND (1)	4.78	220	8.2	17	5.4	ND (0.1) *	ND (2) *	20	ND (1)	ND (2)	ND (4.1) *	28	42
	10/01/08	9 - 10	N	ND (2) *	4	180	ND (1) *	ND (1)	1.37	63	9.2	14	3.4	ND (0.1) *	1	23	ND (1)	ND (1)	ND (2) *	33	39

TABLE B-4a
Sample Results: Metals
AOC 10 – East Ravine
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
AOC10c-2	10/01/08	0 - 0.5	N	ND (2) *	5.9	130	ND (2) *	ND (1)	1.25	51	5.8	19	12	ND (0.1) *	ND (2) *	13	ND (1)	ND (2)	ND (4) *	24	61
	10/01/08	2 - 3	N	ND (2) *	4.1	150	ND (1) *	ND (1)	3.77	190	5.6	37	17	ND (0.1) *	2.2	13	ND (1)	ND (1)	ND (2) *	24	78
	10/01/08	2 - 3	FD	ND (2) *	4.1	150	ND (1) *	ND (1)	3.8	180	5.4	34	16	ND (0.1) *	1.9	13	ND (1)	ND (1)	ND (2) *	24	75
	10/01/08	5 - 6	N	ND (2) *	3.4	150	ND (1) *	ND (1)	1.92	110	8.4	24	7	ND (0.1) *	1.9	19	ND (1)	ND (1)	ND (2) *	31	51
	10/01/08	9 - 10	N	ND (2) *	4.5	86	ND (1) *	ND (1)	0.605	32	11	13	2.7	ND (0.1) *	ND (1)	22	ND (1)	ND (1)	ND (2) *	44	50
AOC10c-3	10/02/08	0 - 0.5	N	ND (2) *	9.4	270	ND (2) *	ND (1)	2.56	110	8	42	32	ND (0.1) *	ND (2) *	19	ND (1)	ND (2)	ND (4.1) *	36	140
	10/02/08	2 - 3	N	ND (2.1) *	3.6	230	ND (2.1) *	ND (1)	9.27	690	7	60	31	ND (0.11) *	ND (2.1) *	16	ND (1)	ND (2.1)	ND (4.1) *	29	140
	10/02/08	2 - 3	FD	ND (2.1) *	3.5	220	ND (2.1) *	ND (1)	7.97	660	6.9	60	26	ND (0.1) *	ND (2.1) *	16	ND (1)	ND (2.1)	ND (4.1) *	28	140
	10/02/08	5 - 6	N	ND (2) *	3.9	140	ND (1) *	ND (1)	0.512	29	7.8	9	4.5	ND (0.1) *	ND (1)	17	ND (1)	ND (1)	ND (2) *	28	36
	10/02/08	9 - 10	N	ND (2.1) *	4.4	64	ND (1) *	ND (1)	ND (0.412)	22	7.8	11	2.7	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	31	41
AOC10c-4	10/01/08	0 - 0.5	N	ND (2.1) *	11	310	ND (2.1) *	ND (1)	2.66	120	8.8	46	36	ND (0.1) *	ND (2.1) *	21	ND (1)	ND (2.1)	ND (4.1) *	42	150
	10/01/08	2 - 3	N	ND (2) *	5.9	170	ND (2) *	ND (1)	2.11	90	9.9	19	8.9	ND (0.1) *	ND (2) *	20	ND (1)	ND (2)	ND (4.1) *	31	52
	10/01/08	5 - 6	N	ND (2) *	4.6	120	ND (1) *	ND (1)	2.84	27	9.1	14	2.6	ND (0.1) *	ND (1)	17	ND (1)	ND (1)	ND (2) *	35	47
	10/01/08	9 - 10	N	ND (2.1) *	7.3	200	ND (2.1) *	ND (1)	0.436	92	5.4	25	13	ND (0.1) *	ND (2.1) *	13	ND (1)	ND (2.1)	ND (4.1) *	25	74
AOC10c-5	10/01/08	0 - 0.5	N	ND (2) *	6.6	170	ND (2) *	ND (1)	2.49	81	6.3	29	15	ND (0.1) *	ND (2) *	15	ND (1)	ND (2)	ND (4) *	27	80
	10/01/08	2 - 3	N	ND (2.1) *	ND (1)	230	ND (2.1) *	ND (1)	16.4	1,500	6.7	110	47	ND (0.1) *	2.9	16	ND (1)	ND (2.1)	ND (4.1) *	27	170
	10/01/08	5 - 6	N	ND (2.1) *	3.7	100	ND (2.1) *	ND (1)	1.48	82	8.6	12	4	ND (0.1) *	ND (2.1) *	19	ND (1)	ND (2.1)	ND (4.1) *	31	44
	10/01/08	9 - 10	N	ND (2) *	4.5	130	ND (1) *	ND (1)	0.423	47	9.1	15	3	ND (0.1) *	ND (1)	21	ND (1)	ND (1)	ND (2) *	34	46
AOC10c-6	01/21/16	14 - 15	N	---	---	---	---	---	0.54	40	---	---	---	---	---	---	---	---	---	---	---
	01/22/16	19 - 20	N	---	---	---	---	---	ND (0.21)	31	---	---	---	---	---	---	---	---	---	---	---
	01/22/16	29 - 30	N	---	---	---	---	---	ND (0.23)	39	---	---	---	---	---	---	---	---	---	---	---
	01/22/16	40 - 50	FD	---	---	---	---	---	ND (0.22)	32	---	---	---	---	---	---	---	---	---	---	---
	01/22/16	49 - 50	N	---	---	---	---	---	ND (0.26)	33	---	---	---	---	---	---	---	---	---	---	---
	01/22/16	59 - 60	N	---	---	---	---	---	ND (0.21)	32	---	---	---	---	---	---	---	---	---	---	---
AOC10d-1	09/18/08	0 - 0.5	N	ND (2) J*	3.4	120	ND (2) *	ND (1)	0.644	49	6.8	16	8.8	ND (0.1) *	ND (2) *	16	ND (1)	ND (2)	ND (4) *	31	58
	09/18/08	2 - 3	N	ND (2) *	3.9	120	ND (2) *	ND (1)	2.86	150	7.1	31	6.8	ND (0.1) *	ND (2) *	17	ND (1)	ND (2)	ND (4.1) *	35	76
	09/18/08	5 - 6	N	ND (2.1) *	6.9	200	ND (5.2) *	ND (1)	1.06	66	11	23	5.2	ND (0.11) *	ND (5.2) *	27	ND (1)	ND (5.2) *	ND (10) *	45	80
	09/18/08	5 - 6	FD	ND (2.1) *	7.1	210	ND (5.2) *	ND (1)	0.703	64	11	23	5.3	ND (0.1) *	ND (5.2) *	26	ND (1)	ND (5.2) *	ND (10) *	46	74
	09/18/08	9 - 10	N	ND (4.1) *	9.8	140	ND (2.1) *	ND (2.1) *	ND (0.414)	23	9.4	12	3.5	ND (0.1) J*	ND (2.1) *	17	ND (2.1) *	ND (2.1)	ND (4.1) *	31	58
AOC10d-2	09/17/08	0 - 0.5	N	ND (2) *	4.2	180	ND (2) *	ND (1)	ND (0.403)	22	6.2	17	21	ND (0.1) *	ND (2) *	16	ND (1)	ND (2)	ND (4) *	32	61
	09/17/08	2 - 3	N	ND (2) *	3.3	180	ND (2) *	ND (1)	1.16	40	5.4	14	16	ND (0.1) *	ND (2) *	14	ND (1)	ND (2)	ND (4.1) *	30	54
	09/17/08	5 - 6	N	ND (2) *	6.6	210	ND (5.1) *	ND (1)	0.597	33	10	16	6.2	ND (0.1) *	ND (5.1) *	21	ND (1)	ND (5.1)	ND (10) *	45	70
	09/17/08	9 - 10	N	ND (2) *	7.2	150	ND (5.1) *	ND (1)	ND (0.406)	22	8.5	16	3.2	ND (0.1) J*	ND (5.1) *	16	ND (1)	ND (5.1)	ND (10) *	38	73
AOC10d-3	09/17/08	0 - 0.5	N	ND (2) *	3.6	120	ND (2) *	ND (1)	ND (0.406)	20	5.9	12	22	ND (0.1) *	ND (2) *	15	ND (1)	ND (2)	ND (4) *	29	52
	09/18/08	2 - 3	N	ND (2) *	3.4	270	ND (2) *	ND (1)	1.91	64	6.3	18	21	ND (0.1) *	ND (2) *	15	ND (1)	ND (2)	ND (4.1) *	33	61
	09/18/08	5 - 6	N	ND (2) *	7.3	280	ND (5.1) *	ND (1)	ND (0.407)	30	10	18	3.3	ND (0.1) *	ND (5.1) *	23	ND (1)	ND (5.1)	ND (10) *	43	60
	09/18/08	5 - 6	FD	ND (2) *	6	330	ND (5.1) *	ND (1)	ND (0.407)	31	10	18	5.1	ND (0.1) *	ND (5.1) *	23	ND (1)	ND (5.1)	ND (10) *	42	59
	09/18/08	9 - 10	N	ND (4.1) *	8.2	150	ND (2) *	ND (2) *	ND (0.408)	21	8.5	11	3.6	ND (0.1) J*	ND (2) *	15	ND (2) *	ND (2)	ND (4.1) *	28	56

TABLE B-4a
Sample Results: Metals
AOC 10 – East Ravine
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				0.285	11	410	0.672	1.1	0.83	39.8	12.7	16.8	8.39	0.0125	1.37	27.3	1.47	5.15	0.78	52.2	58
Residential Regional Screening Levels [2]:				31	0.68	15,000	160	71	0.3	120,000	23	3,100	400	11	390	1,500	390	390	0.78	390	23,000
Residential DTSC-SL [3]:				NE	0.11	NE	15	5.2	NE	36,000	NE	NE	80	1	NE	490	NE	390	NE	390	NE
Ecological Comparison Values [4]:				0.285	11.4	330	23.3	0.0151	139.6	36.3	13	20.6	0.0166	0.0125	2.25	0.607	0.177	5.15	2.32	13.9	0.164
Background [5]:				NE	11	410	0.672	1.1	0.83	39.8	12.7	16.8	8.39	NE	1.37	27.3	1.47	NE	NE	52.2	58
Location	Date	Depth (ft bgs)	Sample Type	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium, Hexavalent	Chromium, total	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
AOC10d-4	09/18/08	0 - 0.5	N	ND (2.1) *	9.2	340	ND (5.2) *	ND (1)	0.92	29	8.3	25	25	ND (0.1) *	ND (5.2) *	21	ND (1)	ND (5.2) *	ND (10) *	42	85
	09/18/08	2 - 3	N	ND (2.1) *	5.4	260	ND (2.1) *	ND (1.1) *	3.93	130	6.7	27	26	ND (0.11) *	ND (2.1) *	17	ND (1.1)	ND (2.1)	ND (4.2) *	35	81
	09/18/08	5 - 6	N	ND (2) *	3.6	220	ND (2) *	ND (1)	ND (0.415)	66	6.5	21	17	ND (0.1) *	ND (2) *	15	ND (1)	ND (2)	ND (4.1) *	31	64
	09/18/08	9 - 10	N	ND (2) *	6.9	220	ND (5.1) *	ND (1)	ND (0.41)	32	11	16	5.2	ND (0.1) J*	ND (5.1) *	24	ND (1)	ND (5.1)	ND (10) *	43	68
AOC10d-9	12/15/15	0 - 1	N	ND (2) *	2.8	120	ND (1) *	ND (1)	ND (0.2)	20	7.3	8.9	20	ND (0.1) *	ND (1)	16	ND (1)	ND (1)	ND (2) *	28	44
	12/15/15	2 - 3	N	ND (2.1) *	5.3	130	ND (1) *	ND (1)	ND (0.21)	20	8.4	13	2.4	ND (0.1) *	ND (1)	16	ND (1)	ND (1)	ND (2.1) *	31	48
	12/15/15	5 - 6	N	ND (2.1) *	5.2	190	ND (1.1) *	ND (1.1) *	ND (0.21)	27	8.8	17	2.3	ND (0.1) *	ND (1.1)	18	ND (1.1)	ND (1.1)	ND (2.1) *	31	49
	12/15/15	9 - 10	N	ND (2.1) *	4.9	150	ND (1) *	ND (1)	ND (0.21)	24	9.1	17	2.6	ND (0.1) *	ND (1)	20	ND (1)	ND (1)	ND (2.1) *	35	54
AOC10-OS1	04/06/11	11 - 11.5	N	---	---	---	---	---	ND (0.4) J	43	---	---	---	---	5.9	---	---	---	---	---	---
AOC10-OS2	04/06/11	5.5 - 6	N	---	---	---	---	---	0.78 J	44	---	---	---	---	5.8	---	---	---	---	---	---
AOC10-OS4	04/06/11	6.5 - 7	N	---	---	---	---	---	ND (0.41) J	170	---	---	---	---	13	---	---	---	---	---	---
AOC10-XRF-01	08/25/08	0 - 0.5	N	---	---	---	---	---	ND (0.404)	9.2	---	---	---	---	---	---	---	---	---	---	---
AOC10-XRF-02	08/25/08	0 - 0.5	N	---	---	---	---	---	ND (0.404)	11	---	---	---	---	---	---	---	---	---	---	---
AOC10-XRF-03	08/25/08	0 - 0.5	N	---	---	---	---	---	ND (0.405)	10	---	---	---	---	---	---	---	---	---	---	---
AOC10-XRF-10	09/21/08	3 - 4	N	---	---	---	---	---	ND (0.416)	26	---	---	---	---	---	---	---	---	---	---	---
DTSC-AOC10d-1	01/18/08 ⊖	0	N	ND (4.42) *	8.28	163	ND (4.41) *	ND (8.83) *	31.5	652	ND (4.41)	137	14.3	ND (0.0193) *	ND (2.5) *	ND (4.41)	ND (4.42) *	ND (4.42)	ND (8.83) *	39.5	134
DTSC-AOC10d-2	01/18/08 ⊖	0	N	ND (4.89) *	7.36	595	ND (4.89) *	ND (9.78) *	6.03	243	ND (4.89)	66.5	13.1	ND (0.0192) *	ND (4.89) *	ND (4.89)	ND (4.89) *	ND (4.89)	ND (9.78) *	36.2	147
DTSC-AOC10d-3	01/18/08 ⊖	0	N	ND (4.65) *	5.87	264	ND (4.65) *	ND (9.3) *	4.38	224	ND (4.65)	46.5	12	ND (0.0198) *	ND (4.65) *	ND (4.65)	ND (4.65) *	ND (4.65)	ND (9.3) *	34.5	197
MW-57BR	01/14/09	3 - 4	N	ND (2) *	9.2	270	ND (2) *	ND (1)	ND (0.16)	26	7.8	11	6.7	ND (0.1) *	ND (2) *	17	ND (1)	ND (2)	ND (4.1) *	34	52
	01/14/09	8 - 9	N	ND (2.1) *	8	85	ND (1) *	ND (1)	ND (0.17)	20	7.9	11	2.7	ND (0.1) *	1.3	16	ND (1)	ND (1)	ND (2.1) *	28	46
	01/14/09	8 - 9	FD	ND (2.1) *	8.4	85	ND (1) *	ND (1)	ND (0.16)	22	8	11	2.9	ND (0.1) *	1.3	16	ND (1)	ND (1)	ND (2.1) *	27	48
	01/14/09	18 - 19	N	ND (4.1) *	9.9	240	ND (2.1) *	ND (2.1) *	ND (0.16)	25	10	12	4.3	ND (0.1) *	3	16	ND (2.1) *	ND (2.1)	ND (4.1) *	31	68
MW-58BR_S	01/29/09	1.5 - 2	N	ND (2.1) J*	ND (2.1)	410	ND (2.1) *	ND (1.1) *	150	4,000	8.2	300	160	0.33	3.5	24	ND (1.1)	ND (2.1)	6.1	23	300
	01/29/09	19 - 20	N	ND (2.1) *	12	240	ND (2.1) *	ND (1.1) *	0.43	33	12	24	4	ND (0.11) *	ND (2.1) *	25	ND (1.1)	ND (2.1)	4.7	38	63
	01/29/09	29 - 30	N	ND (2.1) *	13	110	ND (2.1) *	ND (1.1) *	ND (0.17)	26	11	14	3.6	ND (0.11) *	ND (2.1) *	19	ND (1.1)	ND (2.1)	4.8	33	64
	01/29/09	39 - 40	N	ND (2.1) *	12	150	ND (2.1) *	ND (1.1) *	0.43	35	12	17	4.2	ND (0.11) *	ND (2.1) *	22	ND (1.1)	ND (2.1)	4.7	34	51
	01/29/09	49 - 50	N	ND (2.1) *	8.3	180	ND (1.1) *	ND (1.1) *	ND (0.17)	24	8.7	17	3.7	ND (0.11) *	ND (1.1)	16	ND (1.1)	ND (1.1)	ND (2.1) *	28	46
	01/29/09	59 - 60	N	ND (2.2) *	8.4	37	ND (1.1) *	ND (1.1) *	ND (0.18)	27	13	58	3.4	ND (0.11) *	ND (1.1)	22	ND (1.1)	ND (1.1)	ND (2.2) *	28	41
PA-06	11/09/15	0 - 1	N	ND (2) *	2.4	69	ND (1) *	ND (1)	0.89	30	8.1	15	5.2	ND (0.1) *	ND (1)	20	ND (1)	ND (1)	ND (2) *	23	74
PA-18	01/27/16	0 - 1	N	ND (2.1) *	5.2	130	ND (1) *	ND (1)	0.28	65	7.3	64	47	ND (0.1) *	1.4	22	ND (1)	ND (1)	ND (2.1) *	33	190
PA-19	01/27/16	0 - 1	N	ND (2.3) *	5.8	150	ND (1.1) *	ND (1.1) *	ND (0.46)	34	5.8	160	30	ND (0.12) *	9.8	15	ND (1.1)	ND (1.1)	ND (2.3) *	28	550
PA-20	01/27/16	0 - 1	N	ND (2.1) *	5.2	96	ND (1) *	ND (1)	0.82 J	33	5.5	11	23	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2.1) *	27	84
PA-21	01/27/16	0 - 1	N	ND (2) *	5.5	96	ND (1) *	ND (1)	ND (0.2)	49	5.8	26	32	ND (0.1) *	1.2	12	ND (1)	ND (1)	ND (2) *	28	150
SD-01	01/13/16	0 - 0.5	N	ND (2.1) *	3	78 J	ND (1.1) *	ND (1.1) *	0.24	14	3.9	29	7.6	ND (0.1) *	ND (1.1)	7.8	ND (1.1) J	ND (1.1)	ND (2.1) *	16	190
	01/13/16	2 - 3	N	ND (2.2) *	5.2	210	ND (1.1) *	ND (1.1) *	ND (0.22)	36	11	14	3.2	ND (0.11) *	ND (1.1)	30	ND (1.1)	ND (1.1)	ND (2.2) *	43	41
	01/13/16	5 - 6	N	ND (2.2) *	4.1	100	ND (1.1) *	ND (1.1) *	ND (0.22)	49	11	15	2.5	ND (0.11) *	ND (1.1)	37	ND (1.1)	ND (1.1)	ND (2.2) *	44	43
	01/13/16	9 - 10	N	ND (2.1) *	2.9	100	ND (1.1) *	ND (1.1) *	ND (0.21)	40	11	12	1.9	ND (0.11) *	ND (1.1)	34	ND (1.1)	ND (1.1)	ND (2.1) *	46	40
SD-02	11/10/15	0 - 1	N	ND (2) *	3.2	100	ND (1) *	ND (1)	0.66	26	5.8	16	29	0.17 J	ND (1)	12	ND (1)	ND (1)	ND (2) *	28	48
	11/10/15	2 - 3	N	ND (2) *	5	590	ND (1) *	ND (1)	11	280	5.8	590	170	3.2	9.1	17	ND (1)	ND (1)	ND (2) *	26	300

TABLE B-4a

Sample Results: Metals
AOC 10 – East Ravine
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
SD-03	11/10/15	0 - 1	N	ND (2) *	4	91	ND (1) *	ND (1)	0.28	12	3.7	7.3	9.7	ND (0.099) *	ND (1)	8.6	ND (1)	ND (1)	ND (2) *	17	31
	11/10/15	2 - 3	N	ND (2) *	2.6	52	ND (1) *	ND (1)	ND (0.2)	6.4	2.3	3.4	2.5	ND (0.1) *	ND (1)	4.7	ND (1)	ND (1)	ND (2) *	11	13
SD-04	11/10/15	0 - 1	N	ND (2) J*	3	90 J	ND (1) *	ND (1)	ND (0.2)	10	4	5.1	2.7	ND (0.1) *	ND (1)	8.3	ND (1)	ND (1)	ND (2) *	21	22
	11/10/15	2 - 3	N	ND (2) *	2.9	83	ND (1) *	ND (1)	ND (0.2)	8	3.2	4.4	2.5	ND (0.1) *	ND (1)	5.9	ND (1)	ND (1)	ND (2) *	16	19
SD-05	11/10/15	0 - 1	N	ND (2) *	3.2	100 J	ND (1) *	ND (1)	ND (0.2)	13 J	3.3	9.2	13 J	ND (0.1) *	2.5	6.3 J	ND (1)	ND (1)	ND (2) *	17	46
	11/10/15	0 - 1	FD	ND (2) *	4.5	130 J	ND (1) *	ND (1)	ND (0.2)	19 J	3.9	10	37 J	ND (0.1) *	1.1	9.5 J	ND (1)	ND (1)	ND (2) *	19	42
	11/10/15	2 - 3	N	ND (2.1) *	3.8	110	ND (1) *	ND (1)	ND (0.21)	30	7.3	12	10	ND (0.1) *	ND (1)	24	ND (1)	ND (1)	ND (2.1) *	33	41
SD-06	11/10/15	0 - 1	N	ND (2) *	3.3	82	ND (1) *	ND (1)	ND (0.2)	17	6.4	9.4	3.9	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	30	39
	11/10/15	2 - 3	N	ND (2.1) *	3.6	97	ND (1) *	ND (1)	ND (0.2)	21	7.8	10	4.2	ND (0.1) *	ND (1)	16	ND (1)	ND (1)	ND (2.1) *	37	40
	11/10/15	5 - 6	N	ND (2.1) *	3.1	77	ND (1) *	ND (1)	ND (0.21)	20	7.6	9.5	2.8	ND (0.1) *	ND (1)	19	ND (1)	ND (1)	ND (2.1) *	34	40
SD-21	03/10/16	0 - 1	N	ND (2) *	3.2	71	ND (1) *	ND (1)	ND (0.2)	21	7	8.7	2.4	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	32	44
	03/10/16	2 - 3	N	ND (2.1) *	5.4	79	ND (1) *	ND (1)	0.81	31	6.4	10	4.5	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	34	60
SD-22	03/09/16	0 - 1	N	ND (2.1) *	3.3	100	ND (1) *	ND (1)	ND (0.21)	22	6.4	13	10	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	30	61
	03/09/16	2 - 3	N	ND (2.1) *	3.2	110	ND (1) *	ND (1)	ND (0.21)	27	7.4	10	4.7	ND (0.1) *	ND (1)	17	ND (1)	ND (1)	ND (2.1) *	32	49
Bank 1	03/07/03	0	N	---	---	---	---	---	ND (4) *	21.5	---	13.7	---	---	---	14.3	---	---	---	---	55
L-1	02/20/03	0	N	---	---	---	---	---	ND (4.1) *	88.4	---	34.8	---	---	---	17	---	---	---	---	99.7
	02/20/03	2	N	---	---	---	---	---	2.5	217	---	69.6	---	---	---	10.8	---	---	---	---	123
L-2	02/20/03	0	N	---	---	---	---	---	ND (4.7) *	86.8	---	42.7	---	---	---	22.8	---	---	---	---	122
	02/20/03	2	N	---	---	---	---	---	13	3,360	---	211	---	---	---	18	---	---	---	---	278
L-2-2	03/05/03	- 2	N	---	---	---	---	---	41	1,610	---	139	---	---	---	19	---	---	---	---	203
L-2-3	03/05/03	- 2	N	---	---	---	---	---	99	2,740	---	288	---	---	---	25	---	---	---	---	299
L-3	02/20/03	0	N	---	---	---	---	---	ND (4.5) *	28.4	---	22.7	---	---	---	18.1	---	---	---	---	74.3
	02/20/03	1	N	---	---	---	---	---	1.2 J	379	---	79.7	---	---	---	10.1	---	---	---	---	252
	02/20/03	1.5	N	---	---	---	---	---	ND (4) *	77.7	---	17.2	---	---	---	11.9	---	---	---	---	61.9
L-3-2	03/05/03	0 - 0.5	N	---	---	---	---	---	9.4	228	---	40.5	---	---	---	15.1	---	---	---	---	129
PS-21	04/13/99	0	N	---	---	---	---	---	0.9	16.5	---	14.2	---	---	---	10.5	---	---	---	---	43.9
	04/13/99	2	N	---	---	---	---	---	ND (0.51)	90	---	12.6	---	---	---	10.8	---	---	---	---	59.1
PS-22	04/13/99	0	N	---	---	---	---	---	ND (0.5)	24.7	---	11.4	---	---	---	10.5	---	---	---	---	85.3

Notes:

Category 1: Validated data suitable for all uses, including risk assessment and remedial action decisions.
Category 2: Validated data suitable for use in characterization of the chemicals of potential concern at the facility and to help define the nature and extent of contamination.
Category 3: Validated data suitable only for use in qualitative characterization of the nature and extent of contamination.

Results greater than or equal to the interim screening level are circled; however, if the interim screening level is equal to the background value, only results greater than the interim screening level are circled.

ϴ	white powder sample.
*	Reporting limits greater than or equal to the interim screening level.
---	not analyzed
ft bgs	feet below ground surface
mg/kg	milligrams per kilogram
DTSC	California Department of Toxic Substances Control
DTSC-SL	DTSC Screening Levels
FD	field duplicate
J	concentration or reporting limit estimated by laboratory or data validation
N	primary sample
ND	not detected at the listed reporting limit
NE	not established
USEPA	United States Environmental Protection Agency

1 Interim screening level is background value. If background value is not available then the interim screening value is the lower of the Ecological Comparison Value , residential DTSC-SL, or USEPA residential regional screening value.

2 United States Environmental Protection Agency (USEPA). 2017. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. November.

3 California Department of Toxic Substances Control (DTSC). 2018. Human Health Risk Assessment (HHRA) Note Number 3. January.

4 ARCADIS. 2008. "Technical Memorandum 3: Ecological Comparison Values for Metals and Polycyclic Aromatic Hydrocarbons in Soil." May 28.

5 CH2M HILL. 2009. "Final Soil Background Technical Memorandum at Pacific Gas and Electric Company Topock Compressor Station, Needles, California." May.

TABLE B-4b
Sample Results: Dioxins and Furans
AOC 10 – East Ravine
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Dioxin/Furans (ng/kg)																			
		Interim Screening Level[1] :		NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
		Residential Regional Screening Levels[2] :		NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
		Residential DTSC-SL[3] :		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
		Ecological Comparison Values[4] :		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
		Background[5] :		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**1,2,3,4,6,7,8-HpCDD**	**1,2,3,4,6,7,8-HpCDF**	**1,2,3,4,7,8,9-HpCDF**	**1,2,3,4,7,8-HxCDD**	**1,2,3,4,7,8-HxCDF**	**1,2,3,6,7,8-HxCDD**	**1,2,3,6,7,8-HxCDF**	**1,2,3,7,8,9-HxCDD**	**1,2,3,7,8,9-HxCDF**	**1,2,3,7,8-PeCDD**	**1,2,3,7,8-PeCDF**	**2,3,4,6,7,8-HxCDF**	**2,3,4,7,8-PeCDF**	**2,3,7,8-TCDD**	**2,3,7,8-TCDF**	**OCDD**	**OCDF**	**TEQ Avian**	**TEQ Human**	**TEQ Mammals**
Category 1																							
AOC10-10	01/22/16	0 - 1	N	650	79	6.7 J	4.9 J	ND (2.3)	17	ND (3.9)	13	ND (1.6)	ND (2.1)	ND (1)	ND (110)	ND (1)	ND (0.23)	ND (0.13)	6,300	190	12	20	20
	01/22/16	2 - 3	N	ND (6.9)	ND (2)	ND (1.8)	ND (0.52)	ND (0.23)	ND (0.4)	ND (0.23)	ND (0.57)	1.3 J	ND (0.25)	ND (0.11)	ND (0.87)	ND (0.11)	ND (0.16)	ND (0.081)	31	ND (6.7)	0.57	0.56	0.56
	01/22/16	5 - 6	N	ND (8.4)	ND (1.8)	4.9 J	ND (0.14)	ND (0.14)	ND (0.12)	ND (0.13)	1.2 J	1.4 J	ND (0.27)	ND (0.14)	ND (0.2)	ND (0.071)	ND (0.043)	ND (0.13)	50	ND (5.1)	0.62	0.59	0.59
AOC10-11	01/22/16	0 - 1	N	550 J	47	6.1 J	ND (2.5)	ND (0.93)	14	ND (0.93)	5.5 J	ND (1.1)	0.74 J	ND (0.33)	ND (160)	ND (0.62)	ND (0.11)	ND (0.13)	3,500 J	170 J	12	18	18
	01/22/16	0 - 1	FD	190 J	23	ND (1.3)	ND (1.5)	ND (0.63)	8.6 J	ND (11)	3.4 J	ND (0.74)	ND (0.58)	ND (0.53)	ND (140)	ND (0.57)	ND (0.077)	ND (0.088)	1,100 J	65 J	9.3	12	12
	01/22/16	2 - 3	N	590	46	5 J	ND (2.1)	ND (1.2)	13	ND (11)	ND (5.4)	ND (0.42)	ND (0.68)	ND (1)	ND (140)	ND (1.1)	ND (0.077)	ND (0.22)	4,800	190	11	18	18
	01/22/16	5 - 6	N	3,500	760	ND (110)	15	ND (6.8)	150	ND (6.3)	32	ND (7.9)	3.7 J	ND (0.55)	ND (2,400)	ND (2.8)	ND (0.28)	ND (0.33)	33,000	2,700	150	200	200
	01/22/16	9 - 10	N	170	ND (3.8)	ND (0.54)	4.5 J	ND (0.24)	ND (0.38)	ND (2.2)	ND (0.99)	ND (0.28)	ND (0.25)	ND (0.15)	ND (23)	ND (0.16)	ND (0.093)	ND (0.066)	1,100	15 J	2.2	4.1	4.1
AOC10-12	01/22/16	0 - 0.5	N	770	ND (1.9)	ND (6.2)	ND (4.7)	ND (3.4)	48	32	25	ND (3.9)	ND (3.3)	ND (2.1)	ND (380)	ND (2.1)	ND (0.34)	ND (0.88)	4,800	310	30	42	42
	01/22/16	2 - 3	N	540	57	3.8 J	ND (2)	5.6 J	19	3.7 J	ND (1.7)	ND (1.6)	ND (1.4)	ND (1.4)	ND (130)	3 J	ND (0.32)	ND (0.51)	6,100	110	14	19	19
	01/22/16	5 - 6	N	320	ND (18)	ND (21)	ND (3.8)	5.8 J	21	18	18	ND (2.4)	ND (4.3)	2.1 J	ND (100)	3 J	ND (0.35)	ND (1)	1,400	55	16	19	19
AOC10-15	12/15/15	0 - 1	N	9,000	630	ND (96)	33	ND (19)	210	ND (17)	59	ND (22)	ND (12) *	ND (11)	ND (2,300)	ND (16)	4.1 J	ND (8.6)	110,000	2,600	180	290	290
	12/15/15	0 - 1	FD	8,200	650	72	30	62	190	17	56	ND (2.8)	ND (11) *	ND (8.2)	ND (2,000)	ND (8.8)	ND (2.5)	8.2	110,000	2,100	160	270	270
	12/15/15	2 - 3	N	3,100	230	ND (18)	14	26	85	ND (8.1)	27	ND (10)	8.4 J	ND (3.3)	ND (820)	ND (7.8)	ND (2.4)	ND (4.5)	38,000	920	74	110	110
	12/15/15	5 - 6	N	2,300	180	21	9.3 J	ND (9.4)	55	ND (5)	19	ND (6.3)	ND (4)	ND (4.4)	ND (570)	ND (4.7)	ND (2.3)	3.1 J	31,000	700	49	77	77
	12/15/15	9 - 10	N	34	ND (3.1)	ND (1.5)	ND (1.1)	1.4 J	ND (1.9)	1.3 J	ND (1.7)	ND (1.1)	ND (1.1)	ND (1.4)	ND (11)	ND (0.47)	ND (1.3)	ND (1.2)	340	10 J	3.2	2.9	2.9
AOC10-16	12/15/15	0 - 1	N	23	ND (1.8)	ND (1.7)	1.6 J	ND (1.3)	2.3 J	ND (0.66)	ND (0.76)	ND (0.83)	ND (0.85)	ND (1.4)	ND (1)	ND (0.48)	ND (0.36)	ND (0.86)	110	ND (1.9)	1.7	1.6	1.6
	12/15/15	2 - 3	N	40	ND (4.2)	1.5 J	ND (0.69)	1 J	ND (2.3)	ND (1.1)	2.7 J	ND (0.63)	1.4 J	ND (1.1)	ND (7.2)	ND (1.1)	ND (1.5)	1.6 J	240	ND (5)	5.3	4	4
	12/15/15	5 - 6	N	22	ND (6.6)	ND (1)	1.6 J	1.3 J	2.2 J	2.1 J	ND (0.95)	ND (0.42)	ND (1.2)	1.2 J	ND (12)	ND (0.7)	ND (0.17)	ND (1.1)	89	ND (4.9)	2.9	2.6	2.6
	12/15/15	9 - 10	N	6.9 J	ND (2)	ND (1)	ND (0.74)	1.2 J	ND (1.4)	ND (1)	ND (0.62)	ND (0.79)	ND (0.38)	ND (0.41)	ND (0.88)	ND (1)	ND (1.5)	ND (1.1)	ND (25)	2.6 J	2.3	1.6	1.6
AOC10-18	12/06/15	0 - 1	N	24	ND (2.5)	ND (0.92)	ND (1)	ND (0.8)	1.5 J	ND (0.81)	1.6 J	ND (0.57)	ND (0.2)	0.82 J	0.56 J	0.77 J	0.6 J	0.46 J	190	4.3 J	2.4	1.8	1.8
	12/06/15	2 - 3	N	ND (4.8)	ND (1.2)	ND (0.8)	ND (0.98)	ND (0.23)	0.97 J	ND (0.61)	ND (0.75)	0.79 J	0.8 J	ND (0.84)	0.7 J	0.86 J	ND (0.26)	0.45 J	30	2 J	2.6	1.7	1.7
AOC10-19	02/24/16	0 - 1	N	83 J	6.3 J	ND (0.41) J	ND (0.47) J	ND (0.4) J	2.3 J	ND (0.37) J	1.2 J	ND (0.44) J	0.31 J	ND (0.19) J	ND (6) J	ND (0.091) J	ND (0.067) J	ND (0.27) J	820 J	14 J	1.3	2.3	2.3
	02/24/16	2 - 3	N	180 J	13 J	ND (0.98) J	1.7 J	ND (0.89) J	4.8 J	1 J	2.4 J	ND (0.12) J	ND (0.29) J	ND (0.088) J	ND (10) J	ND (0.34) J	ND (0.11) J	ND (0.22) J	1,600 J	25 J	2	4.2	4.2
AOC10-20	02/17/16	0 - 0.5	N	ND (5.5)	ND (0.83)	ND (1.1)	ND (0.18)	ND (0.19)	ND (0.17)	ND (0.17)	ND (0.35)	ND (0.5)	ND (0.12)	ND (0.17)	ND (0.15)	ND (0.17)	ND (0.11)	ND (0.13)	35 J	ND (3)	0.36	0.28	0.28
	02/25/16	2 - 3	N	1.2 J	ND (0.35)	ND (0.086)	ND (0.044)	ND (0.12)	ND (0.038)	ND (0.1)	ND (0.059)	ND (0.13)	ND (0.047)	ND (0.11)	ND (0.24)	ND (0.27)	ND (0.051)	ND (0.064)	ND (8.9)	ND (0.21)	0.26	0.15	0.15
AOC10-21	02/25/16	0 - 0.5	N	1,700	270	ND (11)	ND (25)	ND (6.9)	ND (39)	ND (6.8)	ND (14)	ND (8.1)	ND (35) *	ND (2.9)	ND (7.2)	ND (3.1)	ND (2.6)	ND (5.2) J	26,000	250	33	53	53
	02/25/16	2 - 3	N	2.6 J	ND (0.41)	ND (0.082)	ND (0.088)	ND (0.18)	ND (0.076)	ND (0.16)	ND (0.1)	ND (0.2)	ND (0.071)	ND (0.27)	ND (0.18)	ND (0.27)	ND (0.11)	ND (0.078)	ND (22)	ND (0.72)	0.33	0.22	0.22
AOC10-22	02/17/16	0 - 0.5	N	800	ND (4.2)	ND (5)	ND (3.3)	ND (5.2)	21	ND (6.7)	ND (2.1)	ND (4.7)	ND (3.1)	ND (2.3)	ND (4.2)	ND (2.4)	ND (2)	ND (3.7)	6,400	90	8.6	17	17
	02/17/16	1 - 2	N	2,100	ND (0.79)	11 J	12 J	12 J	49	6.8 J	23	2.9 J	ND (5.4) *	ND (1.4)	ND (160)	4.9 J	1 J	1.8 J	9,000	240	27	48	48
	02/17/16	2 - 3	N	770	ND (280)	ND (14)	9.6 J	ND (7.1)	22	ND (13)	ND (1.4)	ND (2.1)	ND (2.9)	ND (1.9)	ND (120)	3.9 J	ND (0.89)	ND (1.4)	7,100	ND (5.5)	17	25	25
	02/17/16	5 - 6	N	7.9 J	ND (1.1)	ND (0.29)	ND (0.16)	ND (0.094)	ND (0.33)	ND (0.13)	ND (0.25)	ND (0.31)	ND (0.075)	ND (0.11)	ND (0.83)	ND (0.053)	ND (0.04)	ND (0.18)	51	1.7 J	0.29	0.28	0.28

				Dioxin/Furans (ng/kg)																			
Interim Screening Level[1] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
Residential Regional Screening Levels[2] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
Residential DTSC-SL[3] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
Ecological Comparison Values[4] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
Background[5] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**1,2,3,4,6,7,8-HpCDD**	**1,2,3,4,6,7,8-HpCDF**	**1,2,3,4,7,8,9-HpCDF**	**1,2,3,4,7,8-HxCDD**	**1,2,3,4,7,8-HxCDF**	**1,2,3,6,7,8-HxCDD**	**1,2,3,6,7,8-HxCDF**	**1,2,3,7,8,9-HxCDD**	**1,2,3,7,8,9-HxCDF**	**1,2,3,7,8-PeCDD**	**1,2,3,7,8-PeCDF**	**2,3,4,6,7,8-HxCDF**	**2,3,4,7,8-PeCDF**	**2,3,7,8-TCDD**	**2,3,7,8-TCDF**	**OCDD**	**OCDF**	**TEQ Avian**	**TEQ Human**	**TEQ Mammals**
AOC10-23	02/25/16	0 - 1	N	63,000	2,300 J	120 J	ND (31) J	ND (45) J	980 J	110 J	140 J	ND (51) J	ND (21) J*	ND (7.9) J	ND (3,300) J	100 J	2.7 J	ND (25) J	230,000	11,000 J	440	1,100	1,100
	02/25/16	1 - 2	N	230	ND (150)	ND (3.8)	ND (3.1)	ND (3)	10 J	ND (6)	ND (3)	ND (2)	ND (5.1) *	ND (0.54)	ND (1.7)	ND (2.1)	ND (0.46)	ND (0.63)	2,000	94	6.3	8.8	8.8
	02/25/16	2 - 3	N	890	34	ND (5.7)	ND (0.68)	4.1 J	13	1.9 J	ND (3.8)	ND (1.9)	ND (0.62)	1.1 J	ND (64)	2 J	ND (0.38)	1.2 J	4,300	55	9.7	17	17
AOC10-24	03/07/16	0 - 1	N	590	41	ND (2.4)	6.5 J	ND (0.26)	17	2.5 J	11 J	ND (1)	3.4 J	ND (0.32)	ND (96)	2.6 J	ND (0.41)	ND (1.2)	5,300	130	15	21	21
	03/07/16	2 - 3	N	3,000	ND (37)	ND (44)	22	ND (23)	140	ND (23)	49	ND (27)	8.1 J	4.7 J	ND (2,300)	7.9 J	0.22 J	1 J	28,000	2,100	150	190	190
AOC10-25	01/08/17	0 - 0.5	N	30 J	ND (2.4)	ND (0.59)	ND (0.25)	ND (0.35)	ND (0.75)	ND (0.31)	0.63 J	ND (0.63)	ND (0.16)	ND (0.31)	ND (3.8)	ND (0.66)	ND (0.054)	ND (0.13)	200 J	ND (4.5)	0.91	0.96	0.96
	01/08/17	0 - 0.5	FD	130 J	ND (11)	ND (1.4)	ND (2.8)	ND (0.62)	ND (0.66)	ND (1.7)	ND (0.68)	ND (0.7)	ND (0.53)	ND (0.8)	8 J	ND (5.2)	ND (0.2)	1.5 J	1,500 J	29	5.9	4.3	4.3
	01/08/17	2 - 3	N	ND (0.24)	ND (1.1)	ND (0.73)	ND (0.34)	ND (0.16)	ND (0.54)	ND (0.28)	ND (0.41)	ND (0.7)	ND (0.14)	ND (0.1)	ND (0.51)	ND (0.14)	ND (0.14)	ND (0.41)	ND (41)	ND (1.6)	ND (0.55)	ND (0.35)	ND (0.35)
	01/08/17	5 - 6	N	ND (2.3)	ND (0.23)	ND (1.3)	ND (0.47)	ND (0.26)	ND (0.27)	ND (0.56)	ND (0.55)	1 J	ND (0.5)	ND (0.097)	0.73 J	ND (0.1)	ND (0.064)	ND (0.095)	ND (18)	ND (1.8)	0.65	0.6	0.6
	01/08/17	9 - 10	N	2.2 J	ND (0.49)	ND (0.56)	ND (0.3)	ND (0.13)	ND (0.22)	ND (0.12)	ND (0.11)	ND (0.39)	ND (0.14)	ND (0.076)	ND (0.36)	ND (0.2)	ND (0.12)	ND (0.082)	ND (14)	ND (1.7)	0.35	0.28	0.28
AOC10-26	02/21/17	0 - 0.5	N	220	21	2.6 J	3 J	ND (1.2)	7.8 J	1.3 J	4.9 J	ND (0.2)	1.7 J	0.51 J	ND (50)	1.8 J	ND (0.15)	ND (0.39)	1,500	41	7.8	9.5	9.5
	02/21/17	2 - 3	N	1,200	170	17	13	8 J	49	28	24	ND (2.5)	5.6 J	3 J	ND (910)	ND (3.7)	ND (0.04)	ND (0.1)	6,500	250	64	80	80
	02/21/17	2 - 3	FD	3,400	410	44	29	19	120	60	57	5.6 J	13	5.1 J	ND (1,900)	6.7 J	ND (0.16)	1.1 J	16,000	610	140	180	180
	02/21/17	2.5 - 2.7	N	9,300	1,100	110	73	48	300	120	140	13	28	ND (8.9)	ND (3,800)	13	ND (0.17)	0.75 J	54,000	2,000	300	410	410
	02/21/17	4.5 - 5	N	1,800	440	36	11 J	12 J	80	15	25	3.9 J	ND (5.7) *	2.5 J	ND (1,100)	12 J	ND (0.1)	1.1 J	15,000	830	86	100	100
AOC10-27	01/04/17	0 - 0.5	N	450	44	ND (4.4)	ND (3.4)	ND (6.3)	12 J	ND (5.5)	7.9 J	ND (7.2)	ND (1.1)	ND (2)	ND (6.5)	7.7 J	ND (0.14)	ND (0.71)	6,100	71	13	13	13
	01/04/17	2 - 3	N	260	36	4.6 J	3.3 J	ND (2.3)	9.9 J	5.7 J	5.3 J	ND (1.7)	ND (1.8)	ND (1.4)	ND (100)	ND (5)	ND (0.2)	ND (0.47)	1,800	72	11	13	13
	01/04/17	4 - 5	N	30	6.8 J	ND (1.2)	ND (0.22)	ND (0.3)	ND (0.22)	ND (0.59)	ND (0.22)	ND (0.36)	ND (0.21)	ND (0.3)	ND (18)	ND (0.32)	ND (0.13)	ND (0.25)	260	17 J	1.6	1.7	1.7
AOC10-6	09/20/08	0 - 0.5	N	170 J	13 J	ND (1.7) J	2.2 J	ND (1) J	4.5 J	ND (1.4) J	3.4 J	ND (0.75) J	ND (0.26) J	ND (0.34) J	ND (17) J	1.9 J	ND (0.099) J	ND (0.39) J	1,800 J	ND (28)	4.3	5.2	5.2
	09/20/08	2 - 3	N	ND (6.3) J	ND (1.4) J	ND (1.7) J	ND (1.3) J	ND (2) J	ND (1.6) J	ND (1.8) J	ND (1.6) J	ND (2.3) J	ND (1.5) J	ND (1.4) J	ND (2) J	ND (1.4) J	ND (1.1) J	ND (1.6) J	ND (5) J	ND (5.9) J	ND (3.4)	ND (2.3)	ND (2.3)
AOC10a-2	01/13/16	0 - 1	N	650 J	38 J	ND (2.2) J	7.2 J	3.2 J	17 J	ND (3.8) J	ND (10) J	ND (0.76) J	ND (2.8) J	3.3 J	ND (49) J	ND (0.85) J	ND (0.18) J	0.89 J	6,600 J	66 J	8.9	17	17
	01/13/16	2 - 3	N	ND (2.5) J	ND (0.24) J	ND (0.2) J	ND (0.21) J	ND (0.062) J	ND (0.14) J	ND (0.058) J	ND (0.15) J	ND (0.075) J	ND (0.093) J	ND (0.083) J	ND (0.53) J	ND (0.088) J	ND (0.066) J	ND (0.097) J	ND (18) J	ND (0.36) J	ND (0.23)	ND (0.18)	ND (0.18)
AOC10a-3	01/13/16	0 - 1	N	2,700	550	ND (87)	ND (5.1)	ND (9.7)	100	ND (8.5)	31	ND (11)	7.3 J	ND (1)	ND (1,200)	4 J	ND (0.22)	ND (0.38)	22,000	1,200	88	120	120
	01/13/16	2 - 3	N	5,400	660	ND (76)	18	ND (15)	110	ND (13)	43	ND (17)	8 J	ND (2.7)	ND (1,000)	ND (3.5)	0.66 J	2.3 J	44,000	2,200	88	150	150
	01/13/16	5 - 6	N	ND (9.5)	ND (1.3)	ND (0.52)	ND (0.39)	ND (0.67)	ND (0.24)	ND (0.59)	ND (0.25)	ND (1.6)	ND (0.15)	ND (0.2)	ND (0.67)	ND (0.13)	ND (0.15)	ND (0.092)	75	ND (2.3)	0.49	0.48	0.48
	01/13/16	9 - 10	N	ND (4.8)	ND (0.52)	ND (0.22)	ND (0.12)	ND (0.4)	ND (0.15)	ND (0.35)	ND (0.16)	ND (0.45)	ND (0.21)	ND (0.1)	ND (0.65)	ND (0.11)	ND (0.14)	ND (0.29)	34	ND (1.8)	0.49	0.36	0.36
AOC10a-4	01/08/17	0 - 0.5	N	770	62	5.5 J	ND (5)	3.7 J	17	ND (1.6)	8.5 J	ND (1.3)	2.2 J	ND (1)	ND (120)	1.3 J	ND (0.11)	ND (0.65)	8,400	150	14	23	23
	01/08/17	2 - 3	N	4.6 J	1 J	ND (0.26)	ND (0.16)	ND (0.13)	ND (0.23)	ND (0.13)	ND (0.61)	ND (0.2)	ND (0.2)	ND (0.21)	ND (0.66)	ND (0.079)	ND (0.061)	ND (0.085)	43	ND (1.9)	0.33	0.33	0.33
AOC10b-1	09/30/08	0 - 0.5	N	820 J	88 J	ND (5.3) J	5.8 J	ND (2.2) J	20 J	ND (4.1) J	12 J	ND (2.5) J	2.7 J	ND (0.59) J	ND (100) J	ND (0.59) J	ND (0.14) J	ND (0.36) J	7,900 J	230 J	13	24	24
	09/30/08	2 - 3	N	4,600 J	980 J	ND (83) J	33 J	25 J	170 J	42 J	67 J	ND (9.6) J	16 J	ND (1.7) J	ND (1,700) J	ND (5.7) J	ND (0.62) J	ND (1.6) J	38,000 J	1,800 J	140	200	200
	09/30/08	5 - 6	N	2,600 J	650 J	56 J	27 J	ND (11) J	ND (1.2) J	ND (56) J	54 J	ND (12) J	15 J	ND (8.3) J	ND (1,600) J	ND (8.3) J	ND (0.17) J	ND (0.38) J	17,000 J	930 J	120	150	150

TABLE B-4b
Sample Results: Dioxins and Furans
AOC 10 – East Ravine
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Dioxin/Furans (ng/kg)																			
Interim Screening Level[1] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
Residential Regional Screening Levels[2] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
Residential DTSC-SL[3] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
Ecological Comparison Values[4] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
Background[5] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
Location	Date	Depth (ft bgs)	Sample Type	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDF	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDF	2,3,4,6,7,8-HxCDF	2,3,4,7,8-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	OCDD	OCDF	TEQ Avian	TEQ Human	TEQ Mammals
AOC10c-4	10/01/08	0 - 0.5	N	10,000 J	1,600 J	120 J	73 J	ND (100) J	330 J	ND (92) J	150 J	ND (120) J	ND (1.7) J	ND (3.6) J	ND (2,600) J	ND (14) J	2.4 J	6.9 J	110,000 J	3,400 J	220	360	360
	10/01/08	2 - 3	N	1,700 J	280 J	21 J	12 J	8.6 J	54 J	16 J	24 J	ND (2.6) J	ND (5.1) J*	ND (1.2) J	ND (530) J	ND (1.2) J	ND (0.23) J	1.4 J	15,000 J	580 J	44	66	66
	10/01/08	5 - 6	N	74 J	10 J	ND (0.4) J	ND (2.2) J	ND (0.46) J	ND (0.38) J	ND (0.41) J	1.2 J	ND (0.53) J	0.22 J	ND (0.12) J	ND (30) J	ND (0.12) J	ND (0.058) J	ND (0.091) J	550 J	12 J	2.3	3.1	3.1
AOC10c-6	01/21/16	14 - 15	N	320	19	ND (4.7)	ND (2)	ND (1.1)	9.6 J	3.7 J	4.3 J	ND (1.2)	ND (0.26)	ND (0.28)	ND (110)	ND (0.3)	ND (0.11)	ND (0.39)	3,300	39	8	12	12
AOC10d-9	12/15/15	0 - 1	N	40 J	ND (2.9) J	ND (0.49) J	ND (0.88) J	ND (0.22) J	1.4 J	ND (0.4) J	1.4 J	ND (0.25) J	ND (0.13) J	ND (0.31) J	ND (2.7) J	ND (0.32) J	ND (0.13) J	ND (0.3) J	300 J	6.4 J	0.9	1.2	1.2
	12/15/15	2 - 3	N	ND (1.6) J	ND (0.14) J	ND (0.14) J	ND (0.19) J	ND (0.13) J	ND (0.17) J	ND (0.11) J	ND (0.18) J	ND (0.15) J	ND (0.087) J	ND (0.26) J	ND (0.21) J	ND (0.28) J	ND (0.071) J	ND (0.14) J	13 J	ND (0.33) J	0.35	0.2	0.2
	12/15/15	5 - 6	N	ND (2.2) J	ND (1.1) J	ND (0.93) J	ND (0.2) J	ND (0.12) J	ND (0.19) J	ND (0.1) J	ND (0.28) J	ND (0.084) J	ND (0.32) J	ND (0.16) J	0.61 J	ND (0.17) J	ND (0.068) J	ND (0.082) J	11 J	ND (1.5) J	0.44	0.36	0.36
	12/15/15	9 - 10	N	ND (0.17) J	ND (0.097) J	ND (0.11) J	ND (0.088) J	ND (0.14) J	ND (0.077) J	ND (0.12) J	ND (0.083) J	ND (0.16) J	ND (0.068) J	ND (0.15) J	ND (0.14) J	ND (0.15) J	ND (0.074) J	ND (0.12) J	ND (1.4) J	ND (0.21) J	ND (0.25)	ND (0.14)	ND (0.14)
PA-18	01/27/16	0 - 1	N	11,000 J	760 J	43 J	86 J	41 J	280 J	53 J	140 J	8.6 J	43 J	10 J	ND (470) J	16 J	ND (3.5) J	8.1 J	87,000 J	1,700 J	150	280	280
	01/26/17	5 - 6	N	550	41	3.4 J	2.4 J	2.6 J	13	ND (1.3)	4.7 J	1.1 J	ND (1.2)	ND (0.92)	ND (76)	ND (1.1)	ND (0.099)	ND (0.69)	4,500	84	8	14	14
PA-19	01/27/16	0 - 1	N	6,700 J	570 J	ND (35) J	69 J	ND (38) J	190 J	ND (26) J	110 J	ND (4.2) J	48 J	16 J	ND (450) J	14 J	ND (6.1) J*	19 J	71,000 J	2,000 J	150	220	220
	01/31/17	2 - 3	N	2.9 J	ND (0.38)	ND (0.17)	ND (0.23)	ND (0.22)	ND (0.22)	ND (0.19)	ND (0.22)	ND (0.25)	ND (0.54)	ND (0.4)	ND (1.2)	ND (0.41)	ND (0.18)	ND (0.49)	32	ND (0.94)	0.95	0.62	0.62
	01/31/17	5 - 6	N	16	2.1 J	0.29 J	ND (0.45)	ND (0.079)	0.6 J	ND (0.071)	0.38 J	ND (0.091)	ND (0.33)	ND (0.31)	ND (2.4)	ND (0.2)	ND (0.27)	0.81 J	130	3.5 J	1.5	0.89	0.89
PA-20	01/27/16	0 - 1	N	55,000 J	4,700 J	240 J	140 J	550 J	1,900 J	130 J	260 J	170 J	44 J	120 J	ND (7,400) J	270 J	ND (10) J*	77 J	440,000 J	13,000 J	1,100	1,600	1,600
	01/31/17	2 - 3	N	2,400	100	ND (5.3)	ND (2.1)	10 J	42	2.8 J	6.9 J	4.1 J	ND (1)	2.4 J	ND (190)	6.1 J	ND (0.25)	ND (1.7)	29,000	220	27	53	53
	01/31/17	5 - 6	N	6,200	240	14	3.7 J	30	92	7.5 J	12 J	12 J	ND (1.2)	5.4 J	ND (460)	13	ND (0.14)	3.5 J	64,000	430	63	130	130
PA-21	01/27/16	0 - 1	N	25,000 J	1,300 J	65 J	79 J	150 J	550 J	ND (46) J	120 J	45 J	30 J	42 J	ND (1,800) J	66 J	3.7 J	23 J	250,000 J	3,100 J	320	580	580
	01/31/17	2 - 3	N	590	24	ND (1.4)	ND (0.77)	2.9 J	11 J	0.83 J	ND (1.2)	ND (1.3)	ND (0.24)	ND (1.3)	ND (58)	2.8 J	ND (0.17)	1.5 J	5,300	47	9.5	14	14
	01/31/17	5 - 6	N	3,400	130	ND (7.3)	4.3 J	16	56	4.7 J	11 J	6.2 J	2.2 J	ND (5.9)	ND (270)	ND (7.6)	ND (0.46)	5.1	32,000	270	38	73	73
SD-21	03/10/16	0 - 1	N	31	ND (2.3)	ND (0.32)	ND (0.45)	ND (0.34)	ND (1.5)	ND (0.31)	ND (0.46)	ND (0.39)	ND (0.54)	ND (0.23)	ND (2.9)	ND (0.23)	ND (0.53)	ND (0.14)	270	4.4 J	1	1.3	1.3
	03/10/16	2 - 3	N	110	8.5 J	ND (0.4)	1.6 J	ND (0.39)	3.6 J	ND (0.46)	ND (2.3)	ND (0.27)	ND (0.65)	ND (0.16)	ND (8.6)	ND (0.42)	ND (0.11)	ND (0.25)	920	12 J	1.7	3	3

Notes:

Category 1: Validated data suitable for all uses, including risk assessment and remedial action decisions.
Category 2: Validated data suitable for use in characterization of the chemicals of potential concern at the facility and to help define the nature and extent of contamination.
Category 3: Validated data suitable only for use in qualitative characterization of the nature and extent of contamination.
Results greater than or equal to the Interim Screening Level are circled.

ϴ	white powder sample.
--	not analyzed
ft bgs	feet below ground surface
ng/kg	nanograms per kilogram
DTSC-SL	DTSC Screening Levels
DTSC	California Department of Toxic Substances Control
FD	Field Dupliicate
J	concentration or reporting limit estimated by laboratory or data validation
JR	estimated value, one or more input values is “R” qualified.
N	Primary Sample

TABLE B-4b

Sample Results: Dioxins and Furans
AOC 10 – East Ravine
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

NA	NA = not applicable
NE	not established
ND	not detected at the listed reporting limit
R	The result has been rejected; identification and/or quantitation could not be verified because critical QC specifications were not met (e.g., a non-detect result obtained for an archive sample following a hold time of greater than one year).
USEPA	USEPA = United States Environmental Protection Agency

1 For individual dioxins and furans, selected value is the lower of the ECV, residential DTSC-SL, or USEPA residential regional screening value, unless the background value is higher. For TEQ values, selected value is the DTSC-SL.

2 United States Environmental Protection Agency (USEPA). 2017. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. November.

3 California Department of Toxic Substances Control (DTSC). 2018. Human Health Risk Assessment (HHRA) Note Number 3. JanuaryCalifornia Department of Toxic Substances Control (DTSC). 2017. Human Health Risk Assessment (HHRA) Note 2, Soil Remedial Goals for Dioxins and Dioxin-like Compounds for Consideration at California Hazardous Waste Sites. April.

4 ARCADIS. 2008. "Technical Memorandum 3: Ecological Comparison Values for Metals and Polycyclic Aromatic Hydrocarbons in Soil." May 28. ARCADIS. 2009. "Topock Compression Station - Final Technical Memorandum 4: Ecological Comparison Values for Additional Dectected Chemicals in Soil." July 1.

5 CH2M. 2017. Revised Ambient Study of Dioxins and Furans at the Pacific Gas and Electric Company, Topock Compressor Station, Needles, California. October.

Calculations:

TEQ = Sum of Result xToxic equivalency factor (TEF), 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TEQ Avian = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TEQMammals = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

Teq Humans = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TABLE B-5a

Sample Results: Metals

AOC 11 – Topographic Low Areas

Soil Engineering Evaluation/Cost Analysis

PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium, Hexavalent	Chromium, total	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Category 1																					
AOC11-4-OS4	06/11/14	0	N	ND (2) *	3.4	150	ND (1) *	ND (1)	ND (0.2)	16	6.2	9.6	3.5	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	32	40
AOC11-4-OS6	06/11/14	0	N	ND (2) *	3.1	140	ND (1) *	ND (1)	0.22	18	5.7	9.2	7.2	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	27	39
AOC11-4-OS5	06/11/14	0	N	ND (2) *	3.4	110	ND (1) *	ND (1)	ND (0.2)	21	6.8	12	6.4	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2) *	32	43
AOC11-4-OS3	06/11/14	0	N	ND (2) *	3	150	ND (1) *	ND (1)	ND (0.2)	14	5	8.6	5.3	ND (0.099) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	27	35
AOC11-4-OS1	06/11/14	0	N	ND (2) J*	7.2 J	200 J	ND (1) J*	ND (1) J	ND (0.2)	18 J	7 J	11 J	4.2 J	ND (0.1) *	ND (1) J	14 J	ND (1) J	ND (1) J	ND (2) J*	32 J	47 J
AOC11-4-OS6	06/11/14	2 - 3	N	ND (2.1) *	3	120	ND (1.1) *	ND (1.1) *	ND (0.21)	20	6.7	7.7	3.2	ND (0.11) *	ND (1.1)	15	ND (1.1)	ND (1.1)	ND (2.1) *	29	36
AOC11-4-OS5	06/11/14	2 - 3	N	ND (2.1) *	2.7	97	ND (1) *	ND (1)	ND (0.21)	18	5.7	9.3	5.4	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	28	36
AOC11-4-OS4	06/11/14	2 - 3	N	ND (2) *	3.4	120	ND (1) *	ND (1)	ND (0.2)	14	5.9	8.6	3.2	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	33	37
AOC11-4-OS3	06/11/14	2 - 3	N	ND (2) *	3.1	120	ND (1) *	ND (1)	0.43	18	5	7.3	6.4	ND (0.1) *	ND (1)	8.9	ND (1)	ND (1)	ND (2) *	23	30
AOC11-4-OS1	06/11/14	2 - 3	N	ND (2.1) *	6.7	170	ND (1.1) *	ND (1.1) *	ND (0.21)	16	6.5	11	3.5	ND (0.11) *	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.1) *	30	41
AOC11-4-OS3	06/11/14	2 - 3	FD	ND (2) *	3	120	ND (1) *	ND (1)	0.43	17	4.2	7.7	6.2	ND (0.1) *	ND (1)	9	ND (1)	ND (1)	ND (2) *	23	30
AOC11-4-OS4	06/11/14	5 - 6	N	ND (2) *	3.6	150	ND (1) *	ND (1)	ND (0.21)	17	6.4	10	5.5	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	30	38
AOC11-4-OS5	06/11/14	5 - 6	FD	ND (2.1) *	3.4	110	ND (1) *	ND (1)	ND (0.21)	20	6.2	8.9	5.6	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	30	40
AOC11-1	01/05/16	0 - 1	N	ND (2.1) *	4.9	110 J	ND (1) *	ND (1)	ND (0.21)	11	4.8	9.7	7.8 J	ND (0.1) *	ND (1)	9.5	ND (1)	ND (1)	ND (2.1) *	19	67 J
	01/05/16	0 - 1	FD	ND (2) *	5.2	200 J	ND (1) *	ND (1)	ND (0.21)	11	4.5	8.1	5.4 J	ND (0.1) *	ND (1)	8.9	ND (1)	ND (1)	ND (2) *	21	50 J
	01/05/16	2 - 3	N	ND (2.1) *	3.3	140	ND (1) *	ND (1)	ND (0.21)	11	3.9	9.5	5.2	ND (0.1) *	ND (1)	8.3	ND (1)	ND (1)	ND (2.1) *	22	32
	01/05/16	5 - 6	N	ND (2.4) *	3.9	120	ND (1.2) *	ND (1.2) *	ND (0.24)	18	5.8	8.1	5.3	ND (0.12) *	ND (1.2)	12	ND (1.2)	ND (1.2)	ND (2.4) *	29	38
	01/05/16	9 - 10	N	ND (2.8) *	6.1	140	ND (1.4) *	ND (1.4) *	ND (0.28)	15	6	9.2	6.1	ND (0.14) *	ND (1.4) *	12	ND (1.4)	ND (1.4)	ND (2.8) *	30	37
AOC11-2	01/05/16	0 - 1	N	ND (2.1) *	5.1	100	ND (1) *	ND (1)	ND (0.21)	21	7.4	8.7	2.4	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	36	51
	01/05/16	2 - 3	N	ND (2.1) *	3.5	73	ND (1) *	ND (1)	ND (0.21)	21	7.9	10	1.9	ND (0.1) *	ND (1)	16	ND (1)	ND (1)	ND (2.1) *	39	44
	01/05/16	5 - 6	N	ND (2.1) *	2.9	81	ND (1) *	ND (1)	ND (0.21)	30	9.4	12	2.2	ND (0.1) *	ND (1)	21	ND (1)	ND (1)	ND (2.1) *	45	45
	01/05/16	9 - 10	N	ND (2.1) *	2.6	37 J	ND (1) *	ND (1)	ND (0.21)	23 J	9.4	9.4	1.8	ND (0.11) *	ND (1)	17	ND (1)	ND (1)	ND (2.1) *	38	45
	01/05/16	9 - 10	FD	ND (2.1) *	2.8	26 J	ND (1) *	ND (1)	ND (0.21)	17 J	8.6	12	2.7	ND (0.1) *	ND (1)	16	ND (1)	ND (1)	ND (2.1) *	38	46
AOC11-3	01/05/16	0 - 1	N	ND (2) *	3.3	98	ND (1) *	ND (1)	ND (0.2)	15	5.6	8	2.6	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	29	31
	01/05/16	2 - 3	N	ND (2.1) *	3.6	120	ND (1) *	ND (1)	ND (0.21)	20	7.9	10	2.3	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	40	43
	01/05/16	5 - 6	N	ND (2.1) *	3.7	110	ND (1) *	ND (1)	ND (0.21)	20	7.7	11	2.4	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2.1) *	35	38
	01/05/16	9 - 10	N	ND (2.1) *	3.4	110	ND (1.1) *	ND (1.1) *	ND (0.21)	23	8.6	10	2.2	ND (0.11) *	ND (1.1)	17	ND (1.1)	ND (1.1)	ND (2.1) *	42	45
	01/05/16	9 - 10	FD	ND (2.1) *	3.2	90	ND (1.1) *	ND (1.1) *	ND (0.21)	14	6.3	7.7	1.8	ND (0.1) *	ND (1.1)	11	ND (1.1)	ND (1.1)	ND (2.1) *	27	34
AOC11-4	01/05/16	0 - 1	N	ND (2.1) *	3.3	120	ND (1) *	ND (1)	ND (0.2)	25	5.5	9.1	4.1	ND (0.1) *	1.3	12	ND (1)	ND (1)	ND (2.1) *	24	33
	01/05/16	2 - 3	N	ND (2.1) *	3.5	140	ND (1) *	ND (1)	1	16	5.8	9	4.1	ND (0.1) *	ND (1)	12	ND (1.1)	ND (1)	ND (2.1) *	24	33
AOC11-5	02/03/16	0 - 0.5	N	ND (2.5) *	7.1	170	ND (1.2) *	ND (1.2) *	ND (0.25) J	27	7.4	22	14	ND (0.13) *	ND (1.2)	16	ND (1.2)	ND (1.2)	ND (2.5) *	34	70
	02/03/16	2 - 3	N	ND (2.1) *	5.8	150	ND (1.1) *	ND (1.1) *	ND (0.21) J	18	6.9	8.9	1.7	ND (0.11) *	ND (1.1)	13	ND (1.1)	ND (1.1)	ND (2.1) *	30	46
	02/03/16	5 - 6	N	ND (2.1) *	5.3	210	ND (1) *	ND (1)	ND (0.21) J	25	9.1	10	1.7	ND (0.1) *	ND (1)	16	ND (1)	ND (1)	ND (2.1) *	37	48
	02/03/16	9 - 10	N	ND (2) *	7.1	140	ND (1) *	ND (1)	ND (0.2) J	21	8.1	9.3	2	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2) *	32	56
AOC11-6	01/06/16	0 - 1	N	ND (2.2) *	8.7	500	ND (1.1) *	ND (1.1) *	ND (0.22)	20	7.2	12	21	ND (0.11) *	1.7	18	ND (1.1)	ND (1.1)	ND (2.2) *	31	67
	01/06/16	2 - 3	N	ND (2) *	8.3	490	ND (1) *	ND (1)	ND (0.2)	20	7.4	9.5	24	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	32	62
	01/06/16	5 - 6	N	ND (2.1) *	7.9	300	ND (1) *	ND (1)	ND (0.21)	25	8.9	10	2.4	ND (0.1) *	ND (1)	18	ND (1)	ND (1)	ND (2.1) *	34	59
	01/06/16	9 - 10	N	ND (2) *	11	150	ND (1) *	ND (1)	ND (0.21)	14	7.4	9.1	6.1	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	45	79

TABLE B-5a
Sample Results: Metals
AOC 11 – Topographic Low Areas
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
AOC11-7	01/06/16	0 - 1	N	ND (2.2) *	4.6	120	ND (1.1) *	ND (1.1) *	ND (0.22)	11	6.1	8	220	ND (0.11) *	ND (1.1)	8	ND (1.1)	ND (1.1)	ND (2.2) *	25	40
	01/06/16	2 - 3	N	ND (2.1) *	4.1	170	ND (1) *	ND (1)	0.52	15	5.7	11	30	ND (0.1) *	ND (1)	9	ND (1)	ND (1)	ND (2.1) *	23	70
	01/06/16	5 - 6	N	ND (2) *	9	250	ND (1) *	ND (1)	ND (0.2)	15	9	7.5	8.5	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	55	79
AOC11-8	12/06/15	0 - 1	N	ND (2) *	4	77	ND (1) *	ND (1)	ND (0.2)	12	5	9.3	26	ND (0.1) *	ND (1)	7.5	ND (1)	ND (1)	ND (2) *	29	43
	12/06/15	2 - 3	N	ND (2) *	3.1	62	ND (1) *	ND (1)	ND (0.2)	9.6	4.6	8.1	28	ND (0.1) *	ND (1)	7.1	ND (1)	ND (1)	ND (2) *	25	45
AOC11-9	12/06/15	0 - 1	N	ND (2) *	3.3	57	ND (1) *	ND (1)	ND (0.2)	9.6	5.1	7.5	23	ND (0.1) *	ND (1)	7.8	ND (1)	ND (1)	ND (2) *	26	61
	12/06/15	2 - 3	N	ND (2) *	3.2	72	ND (1) *	ND (1)	ND (0.2)	11	5.5	8.6	13	ND (0.1) *	ND (1)	8.6	ND (1)	ND (1)	ND (2) *	32	63
AOC11a-1	09/21/08	0 - 0.5	N	ND (2) *	6	170	ND (2) *	ND (1)	ND (0.403)	19	5.8	12	9.9	ND (0.1) *	ND (2) *	13	ND (1)	ND (2)	ND (4) *	23	46
	09/21/08	2 - 3	N	ND (2.1) J*	6.4	190	ND (2.1) *	ND (1)	ND (0.411)	23	6.6	14	20	ND (0.1) *	ND (2.1) *	14	ND (1)	ND (2.1)	ND (4.1) *	30	58
	09/21/08	5 - 6	N	ND (2) *	4.6	190	ND (1) *	ND (1)	ND (0.41)	22	7.1	9	4.7	ND (0.1) *	ND (1)	14	1.6	ND (1)	ND (2) *	31	44
	09/21/08	9 - 10	N	ND (2) *	6.9	190	ND (2) *	ND (1)	3	19	5.8	10	9.2	ND (0.1) J*	ND (2) *	13	ND (1)	ND (2)	ND (4) *	22	44
AOC11a-2	09/21/08	0 - 0.5	N	ND (2.1) *	8.3	210	ND (2.1) *	ND (1)	0.417	32	6.8	20	15	ND (0.11) *	ND (2.1) *	18	ND (2.1) *	ND (2.1)	ND (4.1) *	32	75
	09/21/08	2 - 3	N	ND (2.1) *	5.5	220	ND (2.1) *	ND (1)	ND (0.413)	19	6.9	10	7.7	ND (0.11) *	ND (2.1) *	14	ND (1)	ND (2.1)	ND (4.2) *	32	42
	09/21/08	5 - 6	N	ND (2) *	5.5	1,300	ND (2) *	ND (1)	ND (0.408)	25	8.9	14	3.4	ND (0.1) *	ND (2) *	19	ND (2) *	ND (2)	ND (4.1) *	41	56
	09/21/08	9 - 10	N	ND (2) *	5.2	480	ND (1) *	ND (1)	ND (0.412)	19	8.3	6.5	2.2	ND (0.1) J*	1	14	ND (1)	ND (1)	ND (2) *	35	47
AOC11a-3	09/20/08	0 - 0.5	N	ND (2) *	6.9	190	ND (2) *	ND (1)	ND (0.411)	22	6.1	16	13	ND (0.1) *	ND (2) *	15	ND (1)	ND (2)	ND (4.1) *	24	62
	09/20/08	2 - 3	N	ND (2.1) *	6.6	220	ND (2.1) *	ND (1)	ND (0.423)	24	7	14	17	ND (0.1) *	2.2	16	ND (1)	ND (2.1)	ND (4.2) *	30	63
	09/20/08	2 - 3	FD	ND (2.1) *	7.4	220	ND (2.1) *	ND (1)	ND (0.418)	24	7.1	14	16	ND (0.1) *	2.4	16	ND (1)	ND (2.1)	ND (4.2) *	31	61
	09/20/08	5 - 6	N	ND (2.1) *	6.8	410	ND (2.1) *	ND (1)	0.634	76	7.4	15	25	ND (0.1) *	ND (2.1) *	17	ND (1)	ND (2.1)	ND (4.1) *	36	75
	09/20/08	9 - 10	N	ND (2) *	5.4	110	ND (1) *	ND (1)	ND (0.407)	23	8.1	11	2.9	ND (0.1) J*	1.1	17	ND (1)	ND (1)	ND (2) *	33	48
AOC11a-4	09/20/08	0 - 0.5	N	ND (2) *	7.7	180	ND (2) *	ND (1)	ND (0.409)	25	6.4	18	17	ND (0.1) *	ND (2) *	17	ND (1)	ND (2)	ND (4.1) *	28	79
	09/20/08	2 - 3	N	ND (2) *	6.2	210	ND (2) *	ND (1)	ND (0.41)	27	8.5	13	8	ND (0.1) *	ND (2) *	20	ND (1)	ND (2)	ND (4.1) *	37	52
	09/20/08	5 - 6	N	ND (2) *	5	140	ND (2) *	ND (1)	ND (0.407) J	25	8.7	11	3.7	ND (0.1) *	ND (2) *	19	ND (1)	ND (2)	ND (4.1) *	38	54
	09/20/08	9 - 10	N	ND (2) *	7.5	640	ND (2) *	ND (1)	ND (0.41)	27	9.6	14	3.5	ND (0.1) J*	ND (2) *	22	ND (1)	ND (2)	ND (4.1) *	43	59
AOC11a-5	09/21/08	0 - 0.5	N	ND (2.1) *	7.8	210	ND (2.1) *	ND (1)	0.652	32	6.8	17	14	ND (0.1) *	ND (2.1) *	16	ND (1)	ND (2.1)	ND (4.1) *	32	71
	09/21/08	2 - 3	N	ND (2.1) *	6	370	ND (2.1) *	ND (1)	ND (0.412)	30	8.5	12	9.4	ND (0.1) *	2.5	18	ND (1)	ND (2.1)	ND (4.2) *	38	57
	09/21/08	5 - 6	N	ND (2.1) *	4.4	82	ND (1) *	ND (1)	ND (0.411)	18	8.7	9.2	3	ND (0.1) *	1.5	14	ND (1)	ND (1)	ND (2.1) *	34	53
	09/21/08	5 - 6	FD	ND (2) *	4.1	84	ND (1) *	ND (1)	ND (0.412)	18	8	9.6	3.1	ND (0.1) *	1.6	14	3.2	ND (1)	ND (2) *	33	51
	09/21/08	9 - 10	N	ND (2.1) J*	7.6	1,000	ND (2.1) *	ND (1)	ND (0.415)	24	8.4	9.8	3.1	ND (0.1) J*	2.5	19	ND (1)	ND (2.1)	ND (4.1) *	37	62
AOC11a-SS-1	09/21/08	0 - 0.5	N	ND (2) *	3.6	88	ND (1) *	ND (1)	ND (0.402)	13	3.2	9.4	5.6	ND (0.1) J*	1.1	7.8	ND (1)	ND (1)	ND (2) *	13	54
	09/21/08	2 - 3	N	ND (2) *	7.2	130	ND (2) *	ND (1)	ND (0.404)	19	6.7	8.9	6	ND (0.1) J*	ND (2) *	14	ND (1)	ND (2)	ND (4) *	29	48
	09/21/08	5 - 6	N	ND (2) *	6.1	77	ND (1) *	ND (1)	ND (0.408)	16	6.7	7.6	3	ND (0.1) J*	ND (1)	13	ND (1)	ND (1)	ND (2) *	29	42
	09/21/08	9 - 10	N	ND (2) *	6.6	230	ND (1) *	ND (1)	ND (0.414)	13	6.2	7	3	ND (0.1) J*	ND (1)	11	ND (1)	ND (1)	ND (2) *	29	40
AOC11a-SS-2	09/21/08	0 - 0.5	N	ND (2) *	5.2	120	ND (1) *	ND (1)	ND (0.414)	15	5.1	8.1	7.1	ND (0.1) J*	ND (1)	11	ND (1)	ND (1)	ND (2) *	21	42
	09/21/08	2 - 3	N	ND (2) *	5.3	140	ND (1) *	ND (1)	ND (0.402)	19	6	15	5.9	ND (0.1) J*	ND (1)	14	ND (1)	ND (1)	ND (2) *	26	53
AOC11a-SS-3	09/20/08	0 - 0.5	N	ND (2) *	9	240	ND (2) *	ND (1)	0.622	29	6.8	17	16	ND (0.1) J*	ND (2) *	17	ND (1)	ND (2)	ND (4) *	27	73
	09/20/08	2 - 3	N	ND (2) *	8.8	270	ND (2) *	ND (1)	ND (0.409)	27	8.5	15	5.7	ND (0.1) J*	ND (2) *	19	ND (1)	ND (2)	ND (4.1) *	38	57
	09/20/08	5 - 6	N	ND (2) *	8.5	51	ND (1) *	ND (1)	ND (0.412)	19	6.8	9.5	3.7	ND (0.1) J*	1.1	14	ND (1)	ND (1)	ND (2) *	32	46
	09/20/08	9 - 10	N	ND (2.1) *	7.1	150	ND (1) *	ND (1)	ND (0.413)	24	7.7	11	3	ND (0.1) J*	1.4	19	ND (1)	ND (1)	ND (2.1) *	30	48

TABLE B-5a
Sample Results: Metals
AOC 11 – Topographic Low Areas
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
AOC11b-1	09/17/08	0 - 0.5	N	ND (2) J*	6.7	200 J	ND (5) *	ND (1)	ND (0.402)	27	8.1	16	25	ND (0.1) *	ND (5) *	20	ND (1)	ND (5)	ND (10) *	41	71
	09/17/08	0 - 0.5	FD	ND (2) *	6.4	180	ND (5) *	ND (1)	0.553	25	8.1	15	12	ND (0.1) *	ND (5) *	19	ND (1)	ND (5)	ND (10) *	38	68
	09/17/08	2 - 3	N	ND (2) *	5.2	110	ND (2) *	ND (1)	ND (0.404)	17	3.6	7	8.2	ND (0.1) *	ND (2) *	8.9	ND (1)	ND (2)	ND (4) *	33	28
	09/17/08	5 - 6	N	ND (2) *	6.2	230	ND (2) *	ND (1)	ND (0.411)	21	6.5	15	22	ND (0.1) *	ND (2) *	15	ND (1)	ND (2)	ND (4.1) *	37	72
	09/17/08	9 - 10	N	ND (2.1) *	6	250	ND (2.1) *	ND (1)	ND (0.411)	20	5.7	13	13	ND (0.1) J*	ND (2.1) *	15	ND (1)	ND (2.1)	ND (4.1) *	33	65
AOC11b-2	09/17/08	0 - 0.5	N	ND (2) *	4.8	190	ND (2) *	ND (1)	0.645	21	5.6	13	45	ND (0.1) *	ND (2) *	13	ND (1)	ND (2)	ND (4) *	30	76
	09/17/08	2 - 3	N	ND (2) *	13	270	ND (5.1) *	ND (1)	ND (0.41)	32	9.1	15	7.6	ND (0.1) *	ND (5.1) *	20	ND (1)	ND (5.1)	ND (10) *	43	74
	09/17/08	5 - 6	N	ND (2) *	10	150	ND (5.1) *	ND (1)	ND (0.411)	24	8.3	14	5.9	ND (0.1) *	ND (5.1) *	18	ND (1)	ND (5.1)	ND (10) *	40	75
	09/17/08	9 - 10	N	ND (2) *	9	330	ND (5.1) *	ND (1)	ND (0.407)	24	8.3	15	8.2	ND (0.1) J*	ND (5.1) *	18	ND (1)	ND (5.1)	ND (10) *	40	86
AOC11c-1	09/21/08	0 - 0.5	N	ND (2) *	4.8	120	ND (2) *	ND (1)	ND (0.4)	26	4.8	9.7	30	ND (0.098) *	2.7	9.8	ND (1)	ND (2)	ND (4) *	19	47
	09/22/08	2 - 3	N	ND (2.1) *	7.9	220	ND (2.1) *	ND (1)	2.03	64	6.5	20	26	ND (0.11) *	2.1	16	ND (1)	ND (2.1)	ND (4.1) *	32	110
	09/22/08	2 - 3	FD	ND (2.1) *	7.4	220	ND (2.1) *	ND (1)	1.47	63	6.5	19	25	ND (0.11) *	2.3	16	ND (1)	ND (2.1)	ND (4.1) *	31	110
	09/22/08	5 - 6	N	ND (2.1) *	7.7	200	ND (2.1) *	ND (1)	2.03	64	7.4	20	24	ND (0.1) *	ND (2.1) *	18	ND (1)	ND (2.1)	ND (4.1) *	35	110
	09/22/08	9 - 10	N	ND (2) *	5.3	140	ND (2) *	ND (1)	3.33	130	5.8	17	11	ND (0.1) J*	ND (2) *	13	ND (1)	ND (2)	ND (4.1) *	24	62
AOC11c-2	09/21/08	0 - 0.5	N	ND (2) *	5.1	170	ND (2) *	ND (1)	0.744	26	5.7	12	11	ND (0.1) *	ND (2) *	12	ND (1)	ND (2)	ND (4) *	23	52
	09/22/08	2 - 3	N	ND (2.1) *	7.6	220	ND (2.1) *	ND (1.1) *	2.74	81	6.8	21	28	ND (0.11) *	2.7	16	ND (1.1)	ND (2.1)	ND (4.3) *	32	130
	09/22/08	5 - 6	N	ND (2.1) *	6.6	190	ND (2.1) *	ND (1)	1.3	56	6	16	18	ND (0.11) *	ND (2.1) *	14	ND (1)	ND (2.1)	ND (4.2) *	27	93
	09/22/08	9 - 10	N	ND (2) *	6.3	160	ND (2) *	ND (1)	2.05	70	6.2	16	10	ND (0.1) J*	ND (2) *	14	ND (1)	ND (2)	ND (4) *	27	70
AOC11C-3	02/03/16	14 - 15	N	ND (2.1) *	4.3	38	ND (1.1) *	ND (1.1) *	0.67 J	18	7.7	8.4	2.2	ND (0.1) *	ND (1.1)	15	ND (1.1)	ND (1.1)	ND (2.1) *	33	42
	02/03/16	19 - 20	N	ND (2.1) *	4.3	53	ND (1) *	ND (1)	ND (0.21) J	17	8.1	9.7	1.6	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	36	42
	02/03/16	29 - 30	N	ND (2) *	2.9	53	ND (1) *	ND (1)	ND (0.2) J	27	10	14	ND (1)	ND (0.1) *	ND (1)	19	ND (1)	ND (1)	ND (2) *	42	39
AOC11c-4	01/28/16	0 - 1	N	ND (2.1) J*	3.6	89 J	ND (1) *	ND (1)	0.38	16	5.4	7.4	3.1	ND (0.1) *	ND (1)	11	ND (1) J	ND (1)	ND (2.1) *	21	31
	01/28/16	2 - 3	N	ND (2) *	3.6	58	ND (1) *	ND (1)	ND (0.2)	12	6.2	9.2	1.8	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	29	34
	01/28/16	5 - 6	N	ND (2) *	3.5	39	ND (1) *	ND (1)	ND (0.2)	13	7.4	8.9	2.5	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	35	62
	01/28/16	9 - 10	N	ND (2) *	3.3	70 J	ND (1) *	ND (1)	ND (0.2)	18	8.4	8.4	1.7	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	36	67
	01/28/16	9 - 10	FD	ND (2) *	3.2	53 J	ND (1) *	ND (1)	ND (0.2)	16	8	7.7	1.5	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	35	63
	02/02/16	14 - 15	N	ND (2) *	2.4	240	ND (1) *	ND (1)	0.25	21	7.8	7.8	ND (1)	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	32	38
	02/02/16	19 - 20	N	ND (2) *	3.4	270	ND (1) *	ND (1)	ND (0.2)	17	6.8	8.1	1.1	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	30	37
AOC11c-SS-1	09/21/08	0 - 0.5	N	ND (2) *	3.6	75	ND (1) *	ND (1)	ND (0.401)	12	3.3	5.2	6.8	ND (0.1) J*	ND (1)	6.8	ND (1)	ND (1)	ND (2) *	14	23
	09/22/08	2 - 3	N	ND (2) *	4.3	91	ND (1) *	ND (1)	ND (0.403)	16	4.4	11	5.5	ND (0.1) J*	ND (1)	8.6	ND (1)	ND (1)	ND (2) *	17	30
	09/22/08	5 - 6	N	ND (2) *	6.9	160	ND (2) *	ND (1)	1.14	37	6.1	13	11	ND (0.1) J*	2.9	14	ND (1)	ND (2)	ND (4.1) *	25	57
	09/22/08	9 - 10	N	ND (2) *	5.8	110	ND (2) *	ND (1)	ND (0.408)	19	5.9	6.2	5	ND (0.1) J*	ND (2) *	12	ND (1)	ND (2)	ND (4.1) *	21	31
AOC11c-SS-2	09/22/08	0 - 0.5	N	ND (2) *	3.5	71	ND (1) *	ND (1)	ND (0.401)	14	3.4	4.9	8	ND (0.1) J*	ND (1)	6.6	ND (1)	ND (1)	ND (2) *	14	25
	09/22/08	2 - 3	N	ND (2) *	3.6	77	ND (1) *	ND (1)	ND (0.402)	16	3.9	4.9	6.5	ND (0.1) J*	ND (1)	7.5	ND (1)	ND (1)	ND (2) *	16	30
	09/22/08	5 - 6	N	ND (2) *	3.6	100	ND (1) *	ND (1)	7.78	32	4.2	11	8.9	ND (0.1) J*	ND (1)	9.2	ND (1)	ND (1)	ND (2) *	18	54
	09/22/08	9 - 10	N	ND (2.1) *	3.4	98	ND (1) *	ND (1)	2.06	73	3.4	30	8.6	ND (0.1) J*	ND (1)	7.7	ND (1)	ND (1)	ND (2.1) *	15	290

TABLE B-5a
Sample Results: Metals
AOC 11 – Topographic Low Areas
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
AOC11d-1	09/23/08	0 - 0.5	N	ND (2.1) J*	9.5	310 J	ND (2.1) *	ND (1)	0.677	31	8.2	19	16	ND (0.1) *	ND (2.1) *	18	ND (1)	ND (2.1)	ND (4.1) *	43	73
	09/23/08	0 - 0.5	FD	ND (2) *	9.2	250 J	ND (2) *	ND (1)	0.628	33	8.6	20	14	ND (0.1) *	ND (2) *	19	ND (1)	ND (2)	ND (4) *	44	76
	09/23/08	2.5 - 3	N	ND (2.1) *	4.5	86	ND (1) *	ND (1)	ND (0.414)	24	9	12	4.8	ND (0.1) *	1.2	17	ND (1)	ND (1)	ND (2.1) *	32	48
	09/23/08	5 - 6	N	ND (2.1) *	5.9	94	ND (2.1) *	ND (1)	ND (0.416)	29	8.4	12	5	ND (0.1) *	ND (2.1) *	21	ND (1)	ND (2.1)	ND (4.1) *	39	52
	09/23/08	9 - 10	N	ND (2.1) *	8.6	180	ND (2.1) *	ND (1)	0.659	28	7.1	11	9.3	ND (0.1) J*	ND (2.1) *	16	ND (1)	ND (2.1)	ND (4.1) *	31	49
AOC11e-1	09/23/08	0 - 0.5	N	ND (2) *	5.8	180	ND (2) *	ND (1)	0.959	43	5.4	10	10	ND (0.098) *	ND (2) *	11	ND (1)	ND (2)	ND (4) *	22	54
	09/23/08	2.5 - 3	N	ND (2) *	3.4	110	ND (1) *	ND (1)	3.19	92	5.8	41	9	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	26	170
	09/23/08	5.5 - 6	N	ND (2) *	4	100	ND (1) *	ND (1)	0.961	48	5.8	17	6.4	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	28	59
	09/23/08	9.5 - 10	N	ND (2) *	4.6	110	ND (1) *	ND (1)	3.2	84	4.6	31	13	ND (0.1) J*	ND (1)	9.8	ND (1)	ND (1)	ND (2) *	20	140
AOC11e-2	09/24/08	0 - 0.5	N	ND (2) *	4.8	140	ND (1) *	ND (1)	1.4	37	5.1	12	28	ND (0.1) *	1.1	11	ND (1)	ND (1)	ND (2) *	24	160
	09/24/08	2 - 3	N	ND (2) *	3	88	ND (1) *	ND (1)	3.78	130	3.4	19	11	ND (0.099) *	2.6	7.1	ND (1)	ND (1)	ND (2) *	14	130
	09/24/08	2 - 3	FD	ND (2.2) *	3.3	78	ND (1.1) *	ND (1.1) *	3.51	130	3.5	18	11	ND (0.11) *	2.9	7.3	ND (1.1)	ND (1.1)	ND (2.2) *	15	120
	09/24/08	5 - 6	N	ND (2) *	3.3	100	ND (1) *	ND (1)	2.25	98	4.7	30	9.6	ND (0.1) *	1.3	9.3	ND (1)	ND (1)	ND (2) *	20	150
	09/24/08	9 - 10	N	ND (2.1) *	5.2	100	ND (2.1) *	ND (1)	ND (0.436)	36	8.6	19	4.6	ND (0.11) J*	ND (2.1) *	19	ND (1)	ND (2.1)	ND (4.2) *	38	53
AOC11e-3	01/08/16	0 - 1	N	ND (2) *	3.8	80 J	ND (1) *	ND (1)	2.3 J	16	3.4	6.3	5.9	ND (0.1) *	ND (1)	6	ND (1)	ND (1)	ND (2) *	17	24
	01/08/16	0 - 1	FD	ND (2) *	3.3	100 J	ND (1) *	ND (1)	0.44 J	17	3.7	6.5	5.5	ND (0.1) *	ND (1)	6.5	ND (1)	ND (1)	ND (2) *	17	27
	01/10/16	2 - 3	N	ND (2) *	3.6	110	ND (1) *	ND (1)	ND (0.2)	11	4.1	6.7	3.6	ND (0.1) *	ND (1)	7.3	ND (1)	ND (1)	ND (2) *	19	21
	01/10/16	5 - 6	N	ND (2.2) *	4.9	180	ND (1.1) *	ND (1.1) *	ND (0.22)	19	5.4	7.5	4.5	ND (0.11) *	ND (1.1)	12	ND (1.1)	ND (1.1)	ND (2.2) *	26	29
	01/10/16	9 - 10	N	ND (2.1) *	4.5	170	ND (1) *	ND (1)	ND (0.21)	12	4.7	6.9	4.4	ND (0.1) *	ND (1)	8.9	ND (1)	ND (1)	ND (2.1) *	22	25
	01/10/16	13 - 14	N	ND (2) *	4	120	ND (1) *	ND (1)	ND (0.2)	11	3.9	5.9	3.3	ND (0.1) *	ND (1)	7.3	ND (1)	ND (1)	ND (2) *	18	35
AOC11e-4	01/28/16	0 - 1	N	ND (2) *	4.8	58	ND (1) *	ND (1)	1.2	16	4.1	7.4	4.3	ND (0.1) *	ND (1)	9.1	ND (1)	ND (1)	ND (2) *	20	33
	01/28/16	2 - 3	N	ND (2.1) *	2.7	51	ND (1) *	ND (1)	2.1	32	4.2	9	7	ND (0.1) *	ND (1)	7.2	ND (1)	ND (1)	ND (2.1) *	16	42
	01/28/16	5 - 6	N	ND (2.1) *	2.7	45	ND (1.1) *	ND (1.1) *	0.74	27	3.4	22	3.5	ND (0.1) *	ND (1.1)	6.8	ND (1.1)	ND (1.1)	ND (2.1) *	15	76
	01/28/16	14 - 15	N	ND (2) *	1.8	36	ND (1) *	ND (1)	ND (0.2)	17	8	22	1.7	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2) *	34	35
AOC11e-5	01/19/16	14 - 15	N	ND (2.1) *	2.7	93 J	ND (1.1) *	ND (1.1) *	ND (0.21)	34 J	11	21 J	2	ND (0.11) *	ND (1.1)	25 J	ND (1.1) J	ND (1.1)	ND (2.1) *	41 J	48 J
	01/19/16	19 - 20	N	ND (2.1) *	2.2	60	ND (1) *	ND (1)	ND (0.21)	40	11	16	2.4	ND (0.1) *	1.5	19	ND (1)	ND (1)	ND (2.1) *	35	38
	01/19/16	29 - 30	N	ND (2.1) *	2.3	30	ND (1.1) *	ND (1.1) *	ND (0.21)	18	8	11	1.7	ND (0.1) *	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.1) *	30	34
	01/19/16	39 - 40	N	ND (2.2) *	3.8	37	ND (1.1) *	ND (1.1) *	ND (0.21)	30	9.1	8.3	2	ND (0.11) *	ND (1.1)	21	ND (1.1)	ND (1.1)	ND (2.2) *	36	38
	01/20/16	49 - 50	N	ND (2.1) *	2	55	ND (1) *	ND (1)	ND (0.21)	17	8.9	11	1.4	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	31	36
	01/21/16	59 - 60	N	ND (2.1) *	3.1	54	ND (1.1) *	ND (1.1) *	ND (0.21)	25	10	12	2	ND (0.1) *	ND (1.1)	20	ND (1.1)	ND (1.1)	ND (2.1) *	41	45
	01/21/16	69 - 70	N	ND (2.2) *	4.7	28	ND (1.1) *	ND (1.1) *	ND (0.22)	24	8.5	12	2.8	ND (0.11) *	ND (1.1)	22	ND (1.1)	ND (1.1)	ND (2.2) *	41	47
AOC11e-6	12/03/15	0 - 1	N	ND (2.1) *	4.6	130	ND (1) *	ND (1)	16	320	4.9	12	8.4	ND (0.1) *	1.6	9.6	ND (1)	ND (1)	ND (2.1) *	18	37
AOC11e-SS-1	09/23/08	0 - 0.5	N	ND (2) J*	4.6	96 J	ND (1) *	ND (1)	0.698	20	3.9	8.7	8.6	ND (0.1) J*	ND (1)	8.7	ND (1)	ND (1)	ND (2) *	18	35 J
	09/23/08	2.5 - 3	N	ND (2) *	4.6	87	ND (1) *	ND (1)	ND (0.411)	21	4.5	7.7	4.8	ND (0.1) J*	ND (1)	8.3	ND (1)	ND (1)	ND (2) *	20	27
	09/23/08	5.5 - 6	N	ND (2) *	4.6	110	ND (1) *	ND (1)	ND (0.407)	9.2	3.8	5.1	5.2	ND (0.1) J*	ND (1)	6	ND (1)	ND (1)	ND (2) *	16	20
	09/23/08	9.5 - 10	N	ND (2) *	4.7	100	ND (1) *	ND (1)	ND (0.407)	10	3.2	10	5.4	ND (0.1) J*	ND (1)	6.3	ND (1)	ND (1)	ND (2) *	15	19

TABLE B-5a
Sample Results: Metals
AOC 11 – Topographic Low Areas
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
AOC11e-SS-2	09/23/08	0 - 0.5	N	ND (2) *	4.5	120	ND (1) *	ND (1)	1.38	28	4.3	8.1	9.5	ND (0.1) J*	ND (1)	8.7	ND (1)	ND (1)	ND (2) *	17	39
	09/23/08	2.5 - 3	N	ND (2) *	6.6	110	ND (2) *	ND (1)	0.438	21	6.2	9.7	7.4	ND (0.1) J*	ND (2) *	13	ND (1)	ND (2)	ND (4.1) *	24	35
	09/23/08	5.5 - 6	N	ND (2.1) *	4.8	98	ND (1) *	ND (1)	0.466	26	6.3	10	5.1	ND (0.1) J*	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	28	39
	09/23/08	5.5 - 6	FD	ND (2) *	4.5	100	ND (1) *	ND (1)	0.437	27	5.6	9.6	5.5	ND (0.1) J*	ND (1)	11	ND (1)	ND (1)	ND (2) *	24	37
	09/23/08	9.5 - 10	N	ND (2.1) *	4.5	100	ND (1.1) *	ND (1.1) *	0.5	21	7.4	11	3.8	ND (0.11) J*	ND (1.1)	15	ND (1.1)	ND (1.1)	ND (2.1) *	34	37
AOC11g-OS1	04/06/11	8.5 - 9	N	ND (2) *	8.3	220	ND (1) *	ND (1)	ND (0.4) J	26	9.6	11	4.1	ND (0.1) J*	7.1	18	ND (1)	ND (1)	ND (2) *	45	61
PA-07	11/09/15	0 - 1	N	ND (2) *	4.9	160	ND (1) *	ND (1)	1.9	66	4.9	19	17	ND (0.1) *	1.3	13	ND (1)	ND (1)	ND (2) *	22	170
PA-09	01/27/16	0 - 1	N	ND (2) *	4.2	95	ND (1) *	ND (1)	ND (0.2)	21	6.7	13	150	0.18	ND (1)	13	ND (1)	ND (1)	ND (2) *	32	130
PA-10	01/27/16	0 - 1	N	ND (2.1) *	7	150	ND (1) *	ND (1)	0.95	40	4.3	24	56	ND (0.1) *	ND (1)	8	ND (1)	ND (1)	ND (2.1) *	20	190
PA-11	01/27/16	0 - 1	N	ND (2.1) *	4.3	140	ND (1) *	ND (1)	0.35	63	5.6	23	28	ND (0.1) *	3.3	16	ND (1)	ND (1)	ND (2.1) *	20	300
	01/25/17	2 - 3	N	ND (2.1) *	4.9	180	ND (1) *	ND (1)	---	10	4	7.1	4.7	ND (0.1) *	ND (1)	7.4	ND (1) J	ND (1)	ND (2.1) *	19	29
	01/25/17	2 - 3	FD	ND (2.1) *	4.7	160	ND (1) *	ND (1)	---	10	3.9	6.9	3.7	ND (0.1) *	ND (1)	7.4	ND (1) J	ND (1)	ND (2.1) *	18	24
PA-12	01/27/16	0 - 1	N	ND (2.1) *	6	190	ND (1) *	ND (1)	0.56	50	5.3	31	12	ND (0.1) *	3.1	13	ND (1)	ND (1)	ND (2.1) *	25	130
	01/25/17	2 - 3	N	ND (2.1) *	5.6	150	ND (1) *	ND (1)	---	13	4.7	9.7	5.7	ND (0.1) *	ND (1)	8.3	ND (1) J	ND (1)	ND (2.1) *	18	37 J
SD-08	11/11/15	0 - 1	N	ND (2) *	3.2	91	ND (1) *	ND (1)	ND (0.2)	9.2 J	5.2	6	5.3 J	ND (0.1) *	ND (1)	6.7 J	ND (1)	ND (1)	ND (2) *	16	31
	11/11/15	0 - 1	FD	ND (2) *	3.1	88	ND (1) *	ND (1)	0.26	12 J	3.8	13	6.8 J	ND (0.1) *	ND (1)	8.7 J	ND (1)	ND (1)	ND (2) *	18	37
	11/11/15	2 - 3	N	ND (2) *	8.9	92	ND (1) *	ND (1)	2.7	34	4	35	7.8	ND (0.1) *	ND (1)	8.4	ND (1)	ND (1)	ND (2) *	23	97
SD-09	11/10/15	0 - 1	N	ND (2.1) *	4.3	260	ND (1) *	ND (1)	ND (0.21)	11	4.3	6.4	3.8	ND (0.11) *	ND (1)	9.4	ND (1)	ND (1)	ND (2.1) *	22	25
	11/10/15	2 - 3	N	ND (2.1) *	4.6	240	ND (1.1) *	ND (1.1) *	ND (0.21)	11	4.3	5.6	3.1	ND (0.1) *	ND (1.1)	8.7	ND (1.1)	ND (1.1)	ND (2.1) *	21	21
	11/10/15	5 - 6	N	ND (2.1) J*	5.3	260	ND (1.1) *	ND (1.1) *	ND (0.21)	12	4.4	7.1	4.3	ND (0.1) *	ND (1.1)	8.9	ND (1.1)	ND (1.1)	ND (2.1) *	25	24
SD-10	11/10/15	0 - 1	N	ND (2) *	3.3	83	ND (1) *	ND (1)	ND (0.2)	7.9	2.7	6.7	6.1	ND (0.1) *	ND (1)	5.6	ND (1)	ND (1)	ND (2) *	14	36
	11/10/15	2 - 3	N	ND (2) *	2.4	82	ND (1) *	ND (1)	1.4	27	4.2	9	16	0.37	ND (1)	8.8	ND (1)	ND (1)	ND (2) *	19	180
SD-11	12/06/15	0 - 0.5	N	ND (2) *	2.9	99	ND (1) *	ND (1)	ND (0.2)	38	4.5	14	22	ND (0.1) *	ND (1)	9.6	ND (1)	ND (1)	ND (2) *	22	1,100
	12/06/15	2 - 3	N	ND (2) *	2.7	62	ND (1) *	ND (1)	1	21	3.3	10	6.2	ND (0.1) *	ND (1)	6	ND (1)	ND (1)	ND (2) *	17	42
SD-11A	03/07/16	0 - 1	N	ND (2) *	3.7	88	ND (1) *	ND (1)	0.51	110	3.8	19	20	ND (0.1) *	ND (1)	7.3	ND (1)	ND (1)	ND (2) *	18	170
	03/07/16	2 - 3	N	ND (2.1) *	2.9	90	ND (1) *	ND (1)	0.63	90	4.5	44	36	ND (0.1) *	ND (1)	8.8	ND (1)	ND (1)	ND (2.1) *	21	310
	03/07/16	5 - 6	N	ND (2.1) *	2.6	71	ND (1) *	ND (1)	0.79	23	3.7	11	11	ND (0.1) *	ND (1)	6.6	ND (1)	ND (1)	ND (2.1) *	18	88
SD-12	11/10/15	0 - 1	N	ND (2) *	2.8	79	ND (1) *	ND (1)	ND (0.2)	8.1	2.7	5.1	7.2	ND (0.1) *	ND (1)	5.1	ND (1)	ND (1)	ND (2) *	15	38
	11/10/15	2 - 3	N	ND (2) *	2.5	92	ND (1) *	ND (1)	0.51	16	4.4	8.9	4.1	ND (0.1) *	ND (1)	7.7	ND (1)	ND (1)	ND (2) *	19	27
SD-13	11/10/15	0 - 1	N	ND (2) *	3.2	100	ND (1) *	ND (1)	0.92	33	4.7	7.8	3.6	ND (0.1) *	ND (1)	7.9	ND (1)	ND (1)	ND (2) *	19	30
	11/10/15	2 - 3	N	ND (2.1) *	2.4	70	ND (1.1) *	ND (1.1) *	0.34	25	7.7	9.4	3	ND (0.11) *	ND (1.1)	15	ND (1.1)	ND (1.1)	ND (2.1) *	33	40
SD-20	11/11/15	0 - 1	N	ND (2) J*	3.4	100 J	ND (1) *	ND (1)	0.5	18 J	4.2	7.1	5.3	ND (0.1) *	ND (1)	8.8	ND (1)	ND (1)	ND (2) *	21	48 J
	11/11/15	0 - 1	FD	ND (2) *	3.1	74 J	ND (1) *	ND (1)	0.61	14 J	3.5	7.3	4.6	ND (0.099) *	ND (1)	7.4	ND (1)	ND (1)	ND (2) *	18	71 J
	11/11/15	2 - 3	N	ND (2) *	3.8	75	ND (1) *	ND (1)	ND (0.2)	8.9	2.6	4.3	2.7	ND (0.1) *	ND (1)	4.3	ND (1)	ND (1)	ND (2) *	13	17
SD-23	03/09/16	0 - 1	N	ND (2.1) *	2.4	65	ND (1.1) *	ND (1.1) *	0.27	19	6.3	11	5.6	ND (0.11) *	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.1) *	26	87
	03/09/16	2 - 3	N	ND (2.2) *	2.2	51	ND (1.1) *	ND (1.1) *	ND (0.22)	31	9.2	14	3	ND (0.11) *	ND (1.1)	21	ND (1.1)	ND (1.1)	ND (2.2) *	38	39
SD-27	02/15/17	2 - 3	N	ND (2.1) *	2.4	56	ND (1) *	1.2	ND (0.21)	20	6.1	9	ND (1)	ND (0.1) *	ND (1)	12	ND (1) J	ND (1) J	ND (2.1) J*	23	34

TABLE B-5a
Sample Results: Metals
AOC 11 – Topographic Low Areas
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
SD-OS37	11/30/16	0 - 0.5	N	ND (2) *	3.5	120	ND (1) *	ND (1)	0.41	35	5.2	21	36	ND (0.1) *	ND (1)	12	ND (1) J	ND (1)	ND (2) J*	20	92
	11/30/16	3 - 3.5	N	ND (2) *	3.1	93	ND (1) *	ND (1)	0.24	16	3.2	9.4	5.4	ND (0.1) *	2.7	7	ND (1) J	ND (1)	ND (2) J*	13	24
	11/30/16	5 - 5.5	N	ND (2) *	2.9	110	ND (1) *	ND (1)	ND (0.2)	14	4.1	7.4	3.3	ND (0.1) *	ND (1)	11	ND (1) J	ND (1)	ND (2) J*	16	20

Notes:

Category 1: Validated data suitable for all uses, including risk assessment and remedial action decisions.
Category 2: Validated data suitable for use in characterization of the chemicals of potential concern at the facility and to help define the nature and extent of contamination.
Category 3: Validated data suitable only for use in qualitative characterization of the nature and extent of contamination.
Results greater than or equal to the interim screening level are circled; however, if the interim screening level is equal to the background value, only results greater than the interim screening level are circled.

*	Reporting limits greater than or equal to the interim screening level.
---	not analyzed
ft bgs	feet below ground surface
mg/kg	milligrams per kilogram
DTSC	California Department of Toxic Substances Control
DTSC-SL	DTSC Screening Levels
FD	field duplicate
J	concentration or reporting limit estimated by laboratory or data validation
N	primary sample
ND	not detected at the listed reporting limit
NE	not established
USEPA	United States Environmental Protection Agency

1 Interim screening level is background value. If background value is not available then the interim screening value is the lower of the Ecological Comparison Value , residential DTSC-SL, or USEPA residential regional screening value.
2 United States Environmental Protection Agency (USEPA). 2017. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. November.
3 California Department of Toxic Substances Control (DTSC). 2018. Human Health Risk Assessment (HHRA) Note Number 3. January.
4 ARCADIS. 2008. "Technical Memorandum 3: Ecological Comparison Values for Metals and Polycyclic Aromatic Hydrocarbons in Soil." May 28.
5 CH2M HILL. 2009. "Final Soil Background Technical Memorandum at Pacific Gas and Electric Company Topock Compressor Station, Needles, California." May.

TABLE B-5b
Sample Results: Dioxins and Furans
AOC 11 – Topographic Low Areas
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Date	Depth (ft bgs)	Sample Type	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDF	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDF	2,3,4,6,7,8-HxCDF	2,3,4,7,8-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	OCDD	OCDF	TEQ Avian	TEQ Human	TEQ Mammals
				Dioxin/Furans (ng/kg)																			
Interim Screening Level[1] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
Residential Regional Screening Levels[2] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
Residential DTSC-SL[3] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
Ecological Comparison Values[4] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
Background[5] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
Category 1																							
AOC11-4-OS5	06/11/14	0	N	490	28	ND (2.3)	2 J	3 J	11 J	1.1 J	3.4 J	ND (0.44)	1 J	ND (0.43)	ND (46)	ND (1.3)	ND (0.15)	ND (0.48)	6,200	82	6.7	13	13
AOC11-4-OS6	06/11/14	0	N	230	22	2 J	2.2 J	2 J	6.9 J	1 J	ND (3.3)	ND (0.51)	ND (1.2)	ND (0.47)	ND (28)	1.3 J	ND (0.12)	ND (0.65)	2,200	65	5.1	7.1	7.1
AOC11-4-OS4	06/11/14	0	N	14	1.2 J	ND (0.12)	ND (0.28)	ND (0.097)	0.6 J	ND (0.093)	ND (0.29)	ND (0.12)	ND (0.11)	ND (0.11)	ND (1.8)	ND (0.12)	ND (0.095)	ND (0.1)	120	ND (2.4)	0.39	0.51	0.51
AOC11-4-OS3	06/11/14	0	N	100	8.2 J	0.89 J	ND (0.67)	1 J	2.6 J	0.5 J	1.3 J	ND (0.23)	ND (0.49)	ND (0.26)	ND (18)	ND (0.45)	ND (0.15)	ND (0.19)	1,000	25	2.2	3.3	3.3
AOC11-4-OS1	06/11/14	0	N	12 J	1.1 J	ND (0.13)	ND (0.42)	ND (0.16)	ND (0.22)	ND (0.15)	ND (0.21)	ND (0.2)	ND (0.12)	ND (0.11)	ND (1.4)	ND (0.12)	ND (0.11)	ND (0.098)	100	2.4 J	0.38	0.44	0.44
AOC11-4-OS6	06/11/14	2 - 3	N	76	4.1 J	ND (0.18)	ND (0.31)	ND (0.39)	1.7 J	ND (0.19)	ND (0.58)	ND (0.26)	ND (0.15)	ND (0.16)	ND (7.5)	ND (0.18)	ND (0.11)	ND (0.11)	980	11 J	0.97	1.9	1.9
AOC11-4-OS5	06/11/14	2 - 3	N	560 J	ND (0.27)	4 J	1.5 J	4.3 J	15	1.4 J	3 J	1.6 J	ND (0.55)	ND (0.24)	ND (100)	3.7 J	ND (0.1)	0.83 J	7,000	130	12	17	17
AOC11-4-OS4	06/11/14	2 - 3	N	7.8 J	ND (0.78)	ND (0.15)	ND (0.2)	ND (0.12)	ND (0.28)	ND (0.12)	ND (0.18)	ND (0.16)	ND (0.15)	ND (0.12)	ND (1.3)	ND (0.13)	ND (0.11)	ND (0.11)	70	ND (2)	0.38	0.38	0.38
AOC11-4-OS3	06/11/14	2 - 3	N	390	32	ND (2.7)	2.9 J	2.7 J	9.4 J	1.5 J	4.7 J	ND (0.76)	ND (1.3)	ND (0.87)	ND (48)	1.2 J	ND (0.088)	ND (0.49)	4,900	140	7	11	11
AOC11-4-OS1	06/11/14	2 - 3	N	8.1 J	0.81 J	ND (0.18)	ND (0.22)	ND (0.12)	ND (0.22)	ND (0.12)	ND (0.21)	ND (0.16)	ND (0.13)	ND (0.14)	1.3 J	ND (0.16)	ND (0.24)	ND (0.071)	70	1.6 J	0.5	0.51	0.51
AOC11-4-OS3	06/11/14	2 - 3	FD	360	27	2.4 J	ND (2.6)	2.7 J	9.7 J	1.5 J	4.7 J	0.88 J	ND (1.3)	0.87 J	ND (49)	1 J	ND (0.15)	ND (0.85)	3,500	77	6.8	11	11
AOC11-4-OS4	06/11/14	5 - 6	N	65	4.9 J	ND (0.53)	0.75 J	ND (0.42)	2.1 J	ND (0.41)	ND (0.99)	ND (0.22)	ND (0.38)	ND (0.19)	ND (9.7)	ND (0.21)	ND (0.13)	ND (0.18)	600	16 J	1.3	2.1	2.1
AOC11-4-OS5	06/11/14	5 - 6	FD	350 J	ND (0.35)	2.9 J	1.4 J	ND (2.9)	11 J	ND (0.96)	2.1 J	ND (1.2)	ND (0.29)	ND (0.47)	ND (71)	ND (2.6)	ND (0.14)	ND (0.72)	4,700	100	7	11	11
AOC11-1	01/05/16	0 - 1	N	ND (6.2) J	ND (0.83) J	ND (0.21) J	ND (0.099) J	ND (0.17) J	ND (0.099) J	ND (0.16) J	0.16 J	ND (0.2) J	ND (0.068) J	ND (0.064) J	ND (1.1) J	ND (0.066) J	ND (0.055) J	ND (0.051) J	70 J	ND (0.99) J	0.24	0.24	0.24
	01/05/16	2 - 3	N	ND (0.93) J	ND (0.11) J	ND (0.079) J	ND (0.033) J	ND (0.03) J	ND (0.033) J	ND (0.028) J	ND (0.057) J	ND (0.023) J	ND (0.033) J	ND (0.032) J	ND (0.07) J	ND (0.033) J	ND (0.036) J	ND (0.026) J	ND (8.7)	ND (0.12) J	ND (0.079)	ND (0.062)	ND (0.062)
AOC11-2	01/05/16	0 - 1	N	13	ND (1.2)	ND (0.15)	ND (0.12)	ND (0.11)	ND (0.32)	ND (0.1)	ND (0.12)	ND (0.13)	ND (0.059)	ND (0.15)	ND (1.6)	ND (0.16)	ND (0.052)	ND (0.08)	120	5.3 J	0.32	0.39	0.39
	01/05/16	2 - 3	N	ND (0.88)	ND (0.056)	ND (0.071)	0.32 J	ND (0.042)	0.3 J	ND (0.03)	ND (0.039)	ND (0.049)	ND (0.05)	ND (0.088)	ND (0.034)	ND (0.095)	ND (0.054)	ND (0.16)	ND (0.095)	ND (0.13)	0.21	0.15	0.15
	01/05/16	5 - 6	N	ND (0.65)	ND (0.06)	ND (0.076)	ND (0.054)	ND (0.056)	ND (0.059)	ND (0.052)	ND (0.056)	ND (0.065)	ND (0.027)	ND (0.049)	ND (0.18)	ND (0.053)	ND (0.065)	ND (0.063)	6.9 J	ND (0.54)	0.13	0.09	0.09
	01/05/16	9 - 10	N	ND (0.23)	ND (0.028)	ND (0.041)	ND (0.025)	ND (0.044)	ND (0.024)	ND (0.041)	ND (0.023)	ND (0.051)	ND (0.061)	ND (0.066)	ND (0.14)	ND (0.071)	ND (0.035)	ND (0.098)	ND (0.77)	ND (0.04)	ND (0.15)	ND (0.084)	ND (0.084)
	01/05/16	9 - 10	FD	ND (0.044)	ND (0.03)	ND (0.12)	ND (0.041)	ND (0.028)	ND (0.041)	ND (0.026)	ND (0.039)	ND (0.033)	ND (0.1)	ND (0.097)	ND (0.061)	ND (0.04)	ND (0.046)	ND (0.12)	ND (0.43)	ND (0.05)	ND (0.17)	ND (0.1)	ND (0.1)
AOC11-3	01/05/16	0 - 1	N	100	9.3 J	ND (0.68)	ND (0.8)	ND (1.1)	3.9 J	ND (1)	1.7 J	ND (1.3)	ND (0.36)	ND (0.12)	ND (14)	ND (0.13)	ND (0.096)	ND (0.25)	990	33	1.8	3.1	3.1
	01/05/16	2 - 3	N	4 J	0.47 J	ND (0.11)	ND (0.1)	ND (0.13)	ND (0.1)	ND (0.12)	ND (0.097)	ND (0.15)	ND (0.044)	ND (0.04)	ND (1.1)	ND (0.043)	ND (0.028)	ND (0.17)	36	ND (0.97)	0.24	0.2	0.2
	01/05/16	5 - 6	N	58	5.9 J	ND (0.23)	ND (0.62)	ND (0.23)	ND (2.1)	ND (0.16)	ND (1)	ND (0.16)	ND (0.14)	ND (0.11)	ND (9.2)	ND (0.26)	ND (0.051)	ND (0.19)	520	20 J	1.1	1.6	1.6
	01/05/16	9 - 10	N	6.6 J	1.3 J	ND (0.18)	ND (0.066)	ND (0.091)	ND (0.065)	ND (0.33)	ND (0.062)	ND (0.11)	ND (0.043)	ND (0.15)	ND (3)	ND (0.16)	ND (0.042)	ND (0.12)	71	5.6 J	0.4	0.36	0.36
	01/05/16	9 - 10	FD	5.8 J	1.3 J	ND (0.32)	0.083 J	ND (0.14)	ND (0.35)	ND (0.13)	ND (0.12)	ND (0.16)	ND (0.066)	ND (0.13)	ND (0.14)	ND (0.14)	ND (0.043)	ND (0.045)	51	3.6 J	0.22	0.23	0.23
AOC11-4	01/05/16	0 - 1	N	43	3.7 J	ND (0.25)	ND (0.35)	ND (0.11)	ND (1.1)	ND (0.27)	0.89 J	ND (0.34)	ND (0.15)	ND (0.14)	ND (5.2)	ND (0.15)	ND (0.038)	ND (0.28)	390	8.8 J	0.84	1.2	1.2
	01/05/16	2 - 3	N	120	5.1 J	ND (0.59)	ND (0.76)	ND (0.3)	2.4 J	ND (0.28)	ND (1.2)	ND (0.35)	ND (0.2)	ND (0.14)	ND (7.9)	ND (0.15)	ND (0.053)	ND (0.16)	1,200	16 J	1.1	2.6	2.6
AOC11-5	02/03/16	0 - 0.5	N	920	92	7.5 J	5.9 J	7.3 J	25	3.2 J	11 J	ND (2.2)	3.1 J	ND (0.95)	ND (140)	ND (3.1)	1 J	ND (2.3)	9,700	290	20	30	30
	02/03/16	2 - 3	N	19	2.4 J	ND (0.37)	0.26 J	ND (0.19)	0.73 J	ND (0.22)	ND (0.36)	ND (0.26)	ND (0.093)	ND (0.13)	ND (3.4)	ND (0.081)	ND (0.16)	ND (0.24)	180	ND (5.3)	0.6	0.74	0.74
	02/03/16	5 - 6	N	3.5 J	0.57 J	ND (0.23)	ND (0.13)	ND (0.089)	ND (0.13)	ND (0.087)	ND (0.13)	ND (0.1)	ND (0.085)	ND (0.081)	ND (1.2)	ND (0.086)	ND (0.037)	ND (0.24)	28	ND (0.97)	0.33	0.23	0.23
	02/03/16	9 - 10	N	ND (0.83)	ND (0.22)	0.27 J	ND (0.12)	ND (0.084)	ND (0.1)	ND (0.093)	ND (0.049)	ND (0.24)	ND (0.051)	ND (0.059)	ND (0.3)	ND (0.062)	ND (3.7)	ND (0.24)	ND (3.5)	ND (0.049)	2.1	2	2

TABLE B-5b
Sample Results: Dioxins and Furans
AOC 11 – Topographic Low Areas
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Date	Depth (ft bgs)	Sample Type	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDF	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDF	2,3,4,6,7,8-HxCDF	2,3,4,7,8-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	OCDD	OCDF	TEQ Avian	TEQ Human	TEQ Mammals
				Dioxin/Furans (ng/kg)																			
Interim Screening Level[1] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
Residential Regional Screening Levels[2] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
Residential DTSC-SL[3] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
Ecological Comparison Values[4] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
Background[5] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
AOC11-6	01/06/16	0 - 1	N	19 J	2.3 J	ND (0.3) J	ND (0.22) J	ND (0.45) J	ND (0.66) J	ND (0.43) J	ND (0.22) J	ND (0.51) J	ND (0.24) J	ND (0.14) J	ND (2.6) J	ND (0.37) J	ND (0.074) J	ND (0.11) J	180 J	4 J	0.69	0.74	0.74
	01/06/16	2 - 3	N	8.5 J	1.5 J	ND (0.23) J	ND (0.2) J	ND (0.31) J	ND (0.2) J	ND (0.29) J	ND (0.19) J	ND (0.35) J	ND (0.25) J	ND (0.23) J	ND (1.2) J	ND (0.24) J	ND (0.055) J	ND (0.067) J	95 J	ND (1.6) J	0.47	0.46	0.46
AOC11-7	01/06/16	0 - 1	N	27 J	3.7 J	1.4 J	ND (1.1) J	ND (1.2) J	1.9 J	ND (1.1) J	ND (1.7) J	1.4 J	1.1 J	1 J	ND (5.1) J	ND (1.7) J	0.63 J	ND (0.23) J	230 J	7 J	3.5	3.3	3.3
	01/06/16	2 - 3	N	5.8 J	2.3 J	ND (0.4) J	ND (0.41) J	ND (0.25) J	ND (0.41) J	ND (0.24) J	ND (0.4) J	ND (0.29) J	ND (0.35) J	ND (0.45) J	ND (2.7) J	ND (1.3) J	ND (0.2) J	ND (0.49) J	79 J	4.8 J	1.4	0.84	0.84
AOC11-8	12/06/15	0 - 1	N	26 J	ND (2.2) J	ND (0.56) J	ND (0.22) J	ND (0.45) J	ND (0.71) J	ND (0.43) J	ND (0.42) J	ND (0.52) J	ND (0.18) J	ND (0.1) J	ND (5.1) J	ND (0.11) J	ND (0.046) J	ND (0.072) J	340 J	16 J	0.64	0.91	0.91
	12/06/15	2 - 3	N	12 J	2.2 J	ND (0.1) J	ND (0.23) J	ND (0.16) J	ND (0.23) J	0.4 J	ND (0.28) J	ND (0.18) J	ND (0.19) J	ND (0.23) J	ND (2.6) J	ND (0.24) J	ND (0.15) J	ND (0.19) J	140 J	4.4 J	0.65	0.63	0.63
AOC11-9	12/06/15	0 - 1	N	22 J	2.5 J	ND (0.23) J	0.39 J	ND (0.15) J	ND (0.9) J	ND (0.15) J	ND (0.43) J	ND (0.18) J	0.47 J	ND (0.15) J	ND (2.5) J	ND (0.15) J	ND (0.075) J	ND (0.076) J	190 J	ND (3.4) J	0.89	1.1	1.1
	12/06/15	2 - 3	N	7.4 J	ND (0.83) J	ND (0.17) J	ND (0.11) J	ND (0.12) J	ND (0.25) J	0.58 J	ND (0.21) J	ND (0.14) J	ND (0.09) J	ND (0.1) J	ND (0.7) J	ND (0.1) J	ND (0.036) J	ND (0.11) J	59 J	ND (0.83) J	0.31	0.32	0.32
AOC11a-3	09/20/08	0 - 0.5	N	1,300 J	140 J	13 J	8.1 J	5.5 J	30 J	9.9 J	14 J	ND (1.4) J	ND (2.9) J	1.7 J	ND (290) J	1.8 J	ND (0.41) J	ND (1.1) J	12,000 J	440 J	26	42	42
	09/20/08	2 - 3	N	910 J	73 J	6.3 J	4.7 J	3.6 J	20 J	ND (2.6) J	9.2 J	ND (0.86) J	ND (2.5) J	ND (0.95) J	ND (130) J	1.6 J	ND (0.15) J	0.98 J	9,100 J	210 J	15	25	25
	09/20/08	5 - 6	N	3,600 J	470 J	41 J	19 J	18 J	110 J	8.5 J	33 J	4.4 J	6.7 J	ND (2.4) J	ND (1,400) J	4.4 J	ND (0.14) J	ND (0.12) J	32,000 J	1,200 J	100	150	150
	09/20/08	9 - 10	N	6 J	0.71 J	ND (0.18) J	ND (0.26) J	ND (0.17) J	ND (0.25) J	ND (0.16) J	ND (0.25) J	ND (0.16) J	ND (0.12) J	ND (0.11) J	ND (2.2) J	ND (0.11) J	ND (0.11) J	ND (0.13) J	57 J	ND (1) J	0.41	0.4	0.4
AOC11a-5	09/21/08	0 - 0.5	N	2,600 J	230 J	21 J	16 J	9.6 J	61 J	ND (3.8) J	ND (26) J	ND (0.84) J	ND (8) J*	4 J	ND (400) J	2.7 J	ND (0.86) J	2.6 J	26,000 J	750 J	42	72	72
	09/21/08	2 - 3	N	630 J	55 J	ND (4.7) J	4.7 J	ND (1.7) J	15 J	ND (1.7) J	ND (5.1) J	ND (0.5) J	2.6 J	ND (1) J	ND (97) J	ND (0.49) J	ND (0.26) J	ND (0.52) J	6,800 J	150 J	11	19	19
	09/21/08	5 - 6	N	ND (4.5) J	ND (0.46) J	ND (0.29) J	ND (0.18) J	ND (0.11) J	ND (0.18) J	ND (0.098) J	ND (0.17) J	ND (0.13) J	ND (0.12) J	ND (0.08) J	ND (0.4) J	ND (0.079) J	ND (0.11) J	ND (0.12) J	53 J	ND (1.4) J	0.28	0.24	0.24
	09/21/08	9 - 10	N	ND (0.93) J	ND (2.7) J	ND (0.32) J	ND (0.43) J	ND (0.22) J	ND (0.41) J	ND (0.2) J	ND (0.32) J	ND (0.26) J	ND (0.55) J	ND (0.26) J	ND (0.22) J	ND (0.26) J	ND (0.44) J	ND (0.31) J	ND (9.3) J	ND (0.54) J	ND (0.88)	ND (0.68)	ND (0.68)
AOC11a-SS-1	09/21/08	0 - 0.5	N	9.6 J	1.3 J	ND (0.52) J	ND (0.31) J	ND (0.28) J	ND (0.57) J	ND (0.26) J	ND (0.42) J	ND (0.35) J	ND (0.36) J	ND (0.17) J	ND (1.5) J	ND (0.2) J	ND (0.17) J	ND (0.27) J	68 J	ND (2.2)	0.69	0.63	0.63
	09/21/08	2 - 3	N	47 J	4.5 J	ND (0.95) J	ND (1) J	ND (0.71) J	ND (0.97) J	ND (1.1) J	ND (1.6) J	ND (0.94) J	ND (1.1) J	ND (0.68) J	ND (8.1) J	1.3 J	ND (0.29) J	ND (1.1) J	440 J	11 J	3.4	2.5	2.5
	09/21/08	5 - 6	N	1.8 J	ND (0.14) J	ND (0.3) J	ND (0.17) J	ND (0.084) J	ND (0.24) J	ND (0.076) J	ND (0.16) J	ND (0.2) J	ND (0.16) J	ND (0.2) J	ND (0.065) J	ND (0.2) J	ND (0.12) J	ND (0.22) J	9.7 J	ND (0.54) J	0.4	0.26	0.26
AOC11a-SS-3	09/20/08	0 - 0.5	N	2,000 J	190 J	15 J	ND (14) J	ND (0.45) J	47 J	ND (3.9) J	29 J	ND (1.5) J	ND (6) J*	2.4 J	ND (240) J	ND (2.8) J	ND (0.54) J	2.2 J	20,000 J	480 J	29	53	53
	09/20/08	5 - 6	N	4.3 J	ND (0.22) J	ND (0.25) J	ND (0.23) J	ND (0.12) J	ND (0.22) J	ND (0.11) J	ND (0.22) J	ND (0.14) J	ND (0.17) J	ND (0.096) J	ND (0.18) J	ND (0.096) J	ND (0.12) J	ND (0.11) J	33 J	ND (1.2) J	0.31	0.28	0.28
AOC11b-1	09/17/08	0 - 0.5	N	4.9 J	1.1 J	ND (0.13) J	ND (0.12) J	ND (0.099) J	ND (0.23) J	ND (0.23) J	ND (0.28) J	ND (0.11) J	ND (0.11) J	ND (0.16) J	ND (1.3) J	ND (0.57) J	ND (0.041) J	ND (0.039) J	54 J	ND (2)	0.52	0.36	0.36
	09/17/08	2 - 3	N	77 J	7.5 J	0.88 J	ND (0.87) J	0.55 J	2.2 J	ND (0.76) J	ND (1.5) J	ND (0.21) J	ND (0.5) J	ND (0.33) J	ND (13) J	0.66 J	ND (0.061) J	ND (0.24) J	720 J	18 J	2.2	2.7	2.7
	09/17/08	5 - 6	N	100 J	10 J	ND (0.83) J	ND (0.84) J	0.87 J	3.2 J	1.3 J	2 J	ND (0.36) J	ND (0.65) J	0.41 J	ND (16) J	1.4 J	ND (0.06) J	ND (0.21) J	920 J	21 J	3.5	3.8	3.8
AOC11c-4	01/28/16	0 - 1	N	520 J	56 J	4.6 J	4.1 J	ND (2.5) J	15 J	ND (1.7) J	6.4 J	ND (0.38) J	2 J	1.3 J	ND (110) J	ND (1) J	ND (0.19) J	0.81 J	4,800 J	180 J	12	18	18
	01/28/16	2 - 3	N	22 J	2.4 J	ND (0.28) J	ND (0.15) J	ND (0.19) J	ND (0.15) J	ND (0.18) J	ND (0.14) J	ND (0.22) J	ND (0.16) J	ND (0.28) J	ND (5.7) J	ND (0.24) J	ND (0.12) J	ND (0.19) J	510 J	3.7 J	0.79	0.93	0.93
	01/28/16	5 - 6	N	26 J	ND (3.8) J	ND (0.13) J	ND (0.26) J	ND (0.22) J	ND (0.19) J	ND (0.34) J	ND (0.4) J	ND (0.26) J	ND (0.14) J	ND (0.14) J	ND (20) J	ND (0.15) J	ND (0.031) J	ND (0.14) J	230 J	3.1 J	1.4	1.6	1.6
AOC11d-1	09/23/08	0 - 0.5	N	180 J	15 J	1.2 J	3.1 J	ND (1) J	6.6 J	1.4 J	4.8 J	ND (0.27) J	1.8 J	0.44 J	ND (19) J	0.73 J	ND (0.078) J	ND (0.42) J	1,800 J	38 J	5.2	7.2	7.2
	09/23/08	2.5 - 3	N	20 J	2.9 J	ND (0.22) J	ND (0.25) J	ND (0.11) J	0.64 J	ND (0.11) J	ND (0.53) J	ND (0.13) J	ND (0.1) J	ND (0.059) J	ND (2.5) J	ND (0.062) J	ND (0.047) J	ND (0.11) J	210 J	4.7 J	0.42	0.63	0.63
	09/23/08	5 - 6	N	8.8 J	1.2 J	ND (0.25) J	ND (0.11) J	ND (0.059) J	ND (0.33) J	ND (0.13) J	0.4 J	ND (0.069) J	ND (0.13) J	ND (0.056) J	ND (1.3) J	ND (0.099) J	ND (0.032) J	ND (0.036) J	81 J	2.2 J	0.3	0.36	0.36
AOC11e-1	09/23/08	0 - 0.5	N	4,100 J	510 J	52 J	39 J	28 J	130 J	16 J	70 J	5.9 J	26 J	11 J	ND (710) J	8.9 J	2.6 J	9.2 J	49,000 J	1,500 J	110	160	160
	09/23/08	2.5 - 3	N	88,000 J	17,000 J	1,600 J	250 J	430 J	2,200 J	610 J	430 J	100 J	90 J	30 J	ND (31,000) J	40 J	1.9 J	5.5 J	300,000 J	60,000 J	2,200	3,200	3,200

TABLE B-5b

Sample Results: Dioxins and Furans
AOC 11 – Topographic Low Areas
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Date	Depth (ft bgs)	Sample Type	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDF	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDF	2,3,4,6,7,8-HxCDF	2,3,4,7,8-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	OCDD	OCDF	TEQ Avian	TEQ Human	TEQ Mammals
				Dioxin/Furans (ng/kg)																			
Interim Screening Level[1] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
Residential Regional Screening Levels[2] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
Residential DTSC-SL[3] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
Ecological Comparison Values[4] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
Background[5] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
AOC11e-2	09/24/08	0 - 0.5	N	3,000 J	380 J	31 J	29 J	30 J	120 J	ND (26) J	46 J	ND (2.2) J	ND (18) J*	ND (5.1) J	ND (850) J	ND (8.8) J	ND (1.5) J	ND (4) J	23,000 J	670 J	80	120	120
	09/24/08	2 - 3	N	17,000 J	ND (6) J	260 J	110 J	ND (7.2) J	610 J	ND (6.5) J	ND (9.8) J	ND (8.4) J	71 J	ND (11) J	ND (6,700) J	ND (11) J	ND (2.3) J	8.7 J	140,000 J	9,200 J	470	700	700
	09/24/08	5 - 6	N	38,000 J	10,000 J	860 J	140 J	220 J	1,300 J	70 J	270 J	49 J	72 J	17 J	ND (18,000) J	25 J	ND (1.8) J	ND (4) J	210,000 J	89,000 J	1,300	1,800	1,800
	09/24/08	9 - 10	N	9,700 J	2,000 J	140 J	28 J	46 J	250 J	72 J	ND (49) J	ND (9) J	12 J	ND (3.4) J	ND (4,200) J	ND (5) J	ND (0.51) J	ND (0.86) J	200,000 J	9,800 J	300	450	450
AOC11e-3	01/08/16	0 - 1	N	240 J	21 J	2 J	ND (2.4) J	ND (1.4) J	7.8 J	ND (1.9) J	5 J	ND (0.79) J	ND (1.6) J	ND (0.87) J	ND (31) J	1.5 J	ND (0.43) J	ND (0.31) J	1,800 J	39 J	5.8	7.8	7.8
	01/10/16	2 - 3	N	110 J	14 J	ND (0.9) J	ND (1.4) J	ND (1.1) J	ND (2.9) J	ND (0.73) J	ND (0.71) J	ND (0.42) J	ND (1.3) J	ND (0.4) J	ND (14) J	ND (0.3) J	ND (0.14) J	ND (0.14) J	830 J	17 J	2.2	3.3	3.3
	01/10/16	5 - 6	N	54 J	5.7 J	ND (0.33) J	ND (0.25) J	ND (0.33) J	ND (0.25) J	ND (0.32) J	ND (1.1) J	ND (0.38) J	ND (0.29) J	ND (0.25) J	ND (9.2) J	ND (0.6) J	ND (0.074) J	ND (0.17) J	430 J	9.8 J	1.3	1.6	1.6
	01/10/16	9 - 10	N	76 J	7.2 J	ND (0.88) J	ND (0.86) J	ND (0.39) J	ND (2.3) J	ND (0.66) J	1.8 J	ND (0.45) J	ND (0.79) J	ND (0.22) J	ND (11) J	ND (0.4) J	ND (0.1) J	ND (0.15) J	570 J	13 J	1.8	2.5	2.5
AOC11e-4	01/28/16	0 - 1	N	470 J	39 J	ND (3) J	4 J	ND (1.4) J	14 J	ND (1.8) J	6.3 J	ND (0.34) J	ND (2.5) J	ND (0.46) J	ND (80) J	ND (0.48) J	ND (0.15) J	ND (0.32) J	3,200 J	100 J	8.1	14	14
	01/28/16	2 - 3	N	19,000 J	5,000 J	390 J	110 J	130 J	680 J	73 J	180 J	22 J	53 J	14 J	ND (8,900) J	25 J	ND (0.45) J	3 J	220,000 J	30,000 J	680	940	940
	01/28/16	5 - 6	N	6,900 J	920 J	76 J	27 J	29 J	160 J	ND (14) J	54 J	9.2 J	17 J	4 J	ND (2,000) J	4.9 J	ND (0.25) J	ND (1.1) J	82,000 J	3,200 J	160	250	250
AOC11e-6	12/03/15	0 - 1	N	49 J	ND (3.5) J	ND (0.7) J	ND (0.3) J	ND (1.6) J	1.6 J	ND (1.4) J	ND (0.97) J	ND (0.54) J	ND (0.63) J	4.6 J	ND (24) J	2.6 J	ND (0.093) J	10 J	230 J	ND (5.5) J	15	4.5	4.5
PA-09	01/27/16	0 - 1	N	480 J	28 J	1.9 J	5.8 J	2.8 J	16 J	ND (3.2) J	7.9 J	ND (1.3) J	3.7 J	ND (1.8) J	ND (22) J	ND (1.8) J	ND (0.6) J	1.9 J	2,400 J	45 J	11	15	15
PA-10	01/27/16	0 - 1	N	4,600 J	320 J	20 J	47 J	27 J	130 J	22 J	66 J	4.8 J	28 J	9.1 J	ND (260) J	10 J	ND (2.3) J	3.9 J	41,000 J	530 J	85	140	140
	01/26/17	2 - 3	N	2.4 J	0.54 J	ND (0.11)	ND (0.15)	ND (0.09)	ND (0.13)	ND (0.13)	ND (0.13)	ND (0.1)	ND (0.25)	ND (0.17)	ND (0.89)	ND (0.37)	ND (0.14)	ND (0.14)	24 J	0.69 J	0.54	0.38	0.38
	01/26/17	5 - 6	N	7.2 J	0.93 J	ND (0.1)	ND (0.13)	ND (0.092)	ND (0.12)	ND (0.083)	ND (0.24)	ND (0.11)	ND (0.25)	ND (0.092)	ND (1.1)	ND (0.16)	ND (0.051)	ND (0.16)	79	1.6 J	0.43	0.38	0.38
PA-11	01/27/16	0 - 1	N	3,300 J	340 J	23 J	40 J	23 J	120 J	29 J	60 J	4.4 J	25 J	6.1 J	ND (340) J	9.7 J	ND (2.4) J	5.3 J	25,000 J	460 J	83	120	120
	01/25/17	2 - 3	N	51	7 J	ND (0.42)	0.77 J	ND (0.53)	ND (2)	0.78 J	1.2 J	ND (0.16)	ND (0.46)	ND (0.43)	ND (10)	ND (1.1)	ND (0.19)	ND (0.23)	410	11 J	2	2.1	2.1
	01/25/17	5 - 6	N	2,200	230	16	24	20	70	13	36	3.3 J	16	5.5 J	ND (290)	7.6 J	ND (2)	4.7 J	21,000	340	60	82	82
PA-12	01/27/16	0 - 1	N	20,000 J	1,500 J	95 J	45 J	160 J	410 J	59 J	94 J	60 J	22 J	24 J	ND (1,900) J	42 J	ND (3.3) J	9.5 J	290,000 J	6,000 J	280	520	520
	01/25/17	2 - 3	N	65	7.5 J	ND (0.96)	ND (0.57)	ND (0.37)	1.8 J	ND (0.49)	ND (1.1)	ND (0.26)	ND (0.24)	ND (0.3)	ND (5.3)	ND (0.3)	ND (0.1)	ND (0.14)	620	43	1	1.7	1.7
	01/25/17	5 - 6	N	210	19	1.8 J	1.7 J	ND (3.1)	6.9 J	2.9 J	ND (0.43)	ND (0.5)	ND (0.36)	10 J	ND (82)	ND (7.9)	ND (0.39)	ND (0.45)	1,900	40	11	10	10
SD-11A	03/07/16	0 - 1	N	2,700 J	ND (2.9) J	67 J	42 J	55 J	130 J	50 J	80 J	ND (3) J	ND (130) J*	ND (2.9) J	ND (2.7) J	ND (11) J	ND (4.4) J	ND (14) J	18,000 J	1,000 J	110	140	140
	03/07/16	2 - 3	N	3,300 J	ND (3.5) J	59 J	ND (28) J	41 J	110 J	23 J	ND (44) J	ND (5.4) J	ND (51) J*	240 R	ND (4.8) J	ND (250) J	ND (4.1) J	ND (12) J	33,000 J	1,800 J	190 JR	130 JR	130 JR
	03/07/16	5 - 6	N	1,800 J	260 J	ND (20) J	16 J	ND (3.7) J	64 J	12 J	35 J	ND (4.3) J	ND (15) J*	ND (3.8) J	ND (380) J	ND (4) J	ND (1.6) J	ND (2.6) J	18,000 J	670 J	44	67	67
SD-23	03/09/16	0 - 1	N	460 J	38 J	ND (2.4) J	5.9 J	3.4 J	14 J	3.4 J	8.2 J	ND (0.26) J	ND (3) J	ND (0.68) J	ND (37) J	2.3 J	ND (0.16) J	ND (0.22) J	4,300 J	67 J	9.1	14	14
SD-27	02/15/17	2 - 3	N	12 J	1.5 J	ND (0.22)	ND (0.49)	ND (0.15)	ND (0.48)	ND (0.14)	ND (0.47)	ND (0.18)	ND (0.47)	ND (0.17)	ND (4.6)	ND (0.17)	ND (0.41)	ND (0.11)	86	ND (3.4)	0.92	0.96	0.96

Notes:

Category 1: Validated data suitable for all uses, including risk assessment and remedial action decisions.
Category 2: Validated data suitable for use in characterization of the chemicals of potential concern at the facility and to help define the nature and extent of contamination.
Category 3: Validated data suitable only for use in qualitative characterization of the nature and extent of contamination.
Results greater than or equal to the Interim Screening Level are circled.

-- not analyzed
ft bgs feet below ground surface

TABLE B-5b
Sample Results: Dioxins and Furans
AOC 11 – Topographic Low Areas
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

ng/kg	nanograms per kilogram
DTSC-SL	DTSC Screening Levels
DTSC	California Department of Toxic Substances Control
FD	Field Dupliicate
J	concentration or reporting limit estimated by laboratory or data validation
JR	estimated value, one or more input values is “R” qualified.
N	Primary Sample
NA	NA = not applicable
NE	not established
ND	not detected at the listed reporting limit
R	The result has been rejected; identification and/or quantitation could not be verified because critical QC specifications were not met (e.g., a non-detect result obtained for an archive sample following a hold time of greater than one year).
USEPA	USEPA = United States Environmental Protection Agency

1 For individual dioxins and furans, selected value is the lower of the ECV, residential DTSC-SL, or USEPA residential regional screening value, unless the background value is higher. For TEQ values, selected value is the DTSC-SL.

2 United States Environmental Protection Agency (USEPA). 2017. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. November.

3 California Department of Toxic Substances Control (DTSC). 2018. Human Health Risk Assessment (HHRA) Note Number 3. JanuaryCalifornia Department of Toxic Substances Control (DTSC). 2017. Human Health Risk Assessment (HHRA) Note 2, Soil Remedial Goals for Dioxins and Dioxin-like Compounds for Consideration at California Hazardous Waste Sites. April.

4 ARCADIS. 2008. "Technical Memorandum 3: Ecological Comparison Values for Metals and Polycyclic Aromatic Hydrocarbons in Soil." May 28. ARCADIS. 2009. "Topock Compression Station - Final Technical Memorandum 4: Ecological Comparison Values for Additional Dectected Chemicals in Soil." July 1.

5 CH2M. 2017. Revised Ambient Study of Dioxins and Furans at the Pacific Gas and Electric Company, Topock Compressor Station, Needles, California. October.

Calculations:

TEQ = Sum of Result xToxic equivalency factor (TEF), 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TEQ Avian = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TEQMammals = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

Teq Humans = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TABLE B-6a
Sample Results: Metals
AOC 14 – Railroad Debris Area
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
Category 1																					
AOC14-1	09/30/08	0 - 0.5	N	ND (2) *	4.8	190 J	ND (2) *	ND (1)	0.841	25	7.2	11	18	ND (0.1) *	ND (2) *	11	ND (1)	ND (2)	ND (4) *	30	70
	09/30/08	2 - 3	N	ND (2) *	4.8	220	ND (2) *	ND (1)	ND (0.412)	25	8.4	8.5	8.7	ND (0.1) *	ND (2) *	11	ND (1)	ND (2)	ND (4.1) *	36	47
	09/30/08	5 - 6	N	ND (2) *	2.2	180	ND (1) *	ND (1)	ND (0.412)	27	8.5	9.5	2.3	ND (0.1) *	1.6	12	ND (2) *	ND (1)	ND (2) *	34	38
	09/30/08	9 - 10	N	ND (2) *	2.3	160	ND (1) *	ND (1)	ND (0.403)	17	7.4	8.2	2.7	ND (0.099) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	31	34
	09/30/08	14 - 15	N	ND (2) *	2.7	140	ND (1) *	ND (1)	ND (0.412)	18	8.6	12	2.1	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	29	34
AOC14-2	09/30/08	0 - 0.5	N	ND (2) *	5.8	190	ND (2) *	ND (1)	0.768	28	6.8	44	18	ND (0.1) *	ND (2) *	12	ND (1)	ND (2)	ND (4.1) *	28	49
	09/30/08	2 - 3	N	ND (2.1) *	11	130	ND (11) *	ND (1.1) *	1.04	42	ND (11)	ND (21) *	7.6	ND (0.11) *	ND (11) *	12	ND (1.1)	ND (11) *	ND (21) *	25	34
	10/01/08 ⊖	3 - 3.25	N	ND (2.3) *	15	120	ND (11) *	ND (1.1) *	2.16	26	ND (11)	ND (23) *	ND (1.1)	ND (0.11) *	ND (11) *	4.5	ND (1.1)	ND (11) *	ND (23) *	13	ND (11)
	09/30/08	5 - 6	N	ND (2.1) *	8.5	150	ND (5.2) *	ND (1)	1.32	42	6.6	19	21	ND (0.11) *	ND (5.2) *	13	ND (1)	ND (5.2) *	ND (10) *	27	51
	09/30/08	9 - 10	N	ND (2) *	2.6	180	ND (1) *	ND (1)	ND (0.405)	21	8.5	16 J	1.8	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	32	40
	09/30/08	9 - 10	FD	ND (2) *	2.6	180	ND (1) *	ND (1)	ND (0.404)	21	8.4	11 J	1.9	ND (0.1) *	ND (1)	10	ND (2) *	ND (1)	ND (2) *	33	41
	09/30/08	14 - 15	N	ND (2) *	3.1	120	ND (1) *	ND (1)	ND (0.407)	15	7.2	9.1	2.1	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	28	35
AOC14-3	10/01/08	0 - 0.5	N	ND (2) J*	3.7	140	ND (1) *	ND (1)	ND (0.403)	31	7.5	12	8.4	ND (0.1) *	1.6	11	ND (1)	ND (1)	ND (2) *	30	52
	10/01/08	2 - 3	N	ND (2) *	3.3	90	ND (1) *	ND (1)	ND (0.405)	26	8.1	13	6.4	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	34	46
	10/01/08	5 - 6	N	ND (2) *	3.4	130	ND (1) *	ND (1)	0.877	32	6.6	11	9	ND (0.1) *	2.1	11	ND (1)	ND (1)	ND (2) *	26	40
	10/01/08	9 - 10	N	ND (2) *	2.1	140	ND (1) *	ND (1)	ND (0.404)	19	7.5	7.1	2	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	30	33
	10/01/08	14 - 15	N	ND (2) *	2.7	110	ND (1) *	ND (1)	ND (0.403)	17	7.6	12	2.2	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	29	32
AOC14-4	10/01/08	0 - 0.5	N	ND (2) *	4.5	99	ND (1) *	ND (1)	ND (0.402)	13	4.3	7.3	7.2	ND (0.1) *	ND (1)	7.1	ND (1)	ND (1)	ND (2) *	20	31
	10/01/08	2 - 3	N	ND (2) *	4.5	130	ND (1) *	ND (1)	ND (0.405)	16	4.4	6.2	3.5	ND (0.1) *	1.5	7.6	ND (1)	ND (1)	ND (2) *	21	23
	10/01/08	5 - 6	N	ND (2) *	4.1	110	ND (1) *	ND (1)	ND (0.403)	16	4.4	5.3	3.5	ND (0.1) *	1.5	7.3	ND (1)	ND (1)	ND (2) *	21	23
	10/01/08	9 - 10	N	ND (2) *	2.9	86	ND (1) *	ND (1)	ND (0.403)	8.2	3.4	2.9	2.8	ND (0.1) *	1.2	4.8	ND (1)	ND (1)	ND (2) *	19	16
	10/01/08	9 - 10	FD	ND (2) *	3.1	96	ND (1) *	ND (1)	ND (0.404)	8.1	3.3	2.7	2.9	ND (0.1) *	1.2	4.8	ND (1)	ND (1)	ND (2) *	18	16
	10/01/08	14 - 15	N	ND (2) *	3.4	130	ND (1) *	ND (1)	ND (0.406)	15	6.4	7.9	2.2	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	27	29
AOC14-5	10/02/08	0 - 0.5	N	ND (2) *	6.8	300	ND (2) *	ND (1)	ND (0.403)	15	6.8	9.6	5.3	ND (0.099) *	ND (2) *	10	ND (1)	ND (2)	ND (4) *	29	35
	10/02/08	2 - 3	N	ND (2) *	9	240	ND (2) *	ND (1)	ND (0.405)	17	6.1	16	16	ND (0.1) *	ND (2) *	13	ND (1)	ND (2)	ND (4) *	28	46
	10/02/08	5 - 6	N	ND (2) *	3.2	240	ND (1) *	ND (1)	ND (0.404)	15	7.3	7.9	2.7	ND (0.099) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	28	35
	10/02/08	9 - 10	N	ND (2) *	2.8	110	ND (1) *	ND (1)	ND (0.403)	15	7.6	9.5	2.3	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	30	35
	10/02/08	14 - 15	N	ND (2) *	3.2	90	ND (1) *	ND (1)	ND (0.406)	16	6.8	7.3	2.2	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	28	30
AOC14-6	10/02/08	0 - 0.5	N	ND (2) *	5	120	ND (1) *	ND (1)	ND (0.402)	11	4	6.1	7.4	ND (0.1) *	1.2	7	ND (1)	ND (1)	ND (2) *	20	35
	10/02/08	2 - 3	N	ND (2) *	6	210	ND (2) *	ND (1)	ND (0.403)	23	7.8	9.5	3.3	ND (0.1) *	2.4	11	ND (1)	ND (2)	ND (4) *	34	37
	10/02/08	5 - 6	N	ND (2) *	3.4	140	ND (1) *	ND (1)	ND (0.405)	18	7.7	9.1	2.3	ND (0.099) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	31	35
	10/02/08	9 - 10	N	ND (2) *	2.6	120	ND (1) *	ND (1)	ND (0.406)	18	8.3	9.6	2.4	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	33	39
	10/02/08	9 - 10	FD	ND (2) *	2.8	110	ND (1) *	ND (1)	ND (0.406)	18	8.4	9.7	2.3	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	33	39
	10/02/08	14 - 15	N	ND (2) *	3.3	110	ND (1) *	ND (1)	ND (0.402)	16	5.9	7.2	2.2	ND (0.1) *	ND (1)	9.3	ND (1)	ND (1)	ND (2) *	25	28
AOC14-7	10/02/08	0 - 0.5	N	ND (2) *	5	160	ND (1) *	ND (1)	ND (0.404)	15	4.7	7.4	6.1	ND (0.099) *	ND (1)	9.6	ND (1)	ND (1)	ND (2) *	25	31
	10/02/08	2 - 3	N	ND (2) *	5	170	ND (1) *	ND (1)	ND (0.405)	13	6.1	10	7.1	ND (0.1) *	ND (1)	9.3	ND (1)	ND (1)	ND (2) *	23	30
	10/02/08	5 - 6	N	ND (2) *	5.3	210	ND (2) *	ND (1)	ND (0.405)	18	7.5	10	4.8	ND (0.1) *	ND (2) *	12	ND (1)	ND (2)	ND (4) *	30	35
	10/02/08	9 - 10	N	ND (2) *	3.9	120	ND (1) *	ND (1)	ND (0.404)	26	10	14	2.9	ND (0.1) *	ND (1)	16	ND (1)	ND (1)	ND (2) *	38	46
	10/02/08	14 - 15	N	ND (2) *	3.7	150	ND (1) *	ND (1)	ND (0.401)	25	6.5	9.9	3.5	ND (0.1) *	2.4	11	ND (1)	ND (1)	ND (2) *	25	32

TABLE B-6a

Sample Results: Metals

AOC 14 – Railroad Debris Area

Soil Engineering Evaluation/Cost Analysis

PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
AOC14-8	10/02/08	0 - 0.5	N	ND (2) *	6.8	110	ND (2) *	ND (1)	ND (0.403)	12	4.9	7.9	6.4	ND (0.099) *	ND (2) *	9.4	ND (1)	ND (2)	ND (4) *	24	30
	10/02/08	2 - 3	N	ND (2) *	6.9	93	ND (2) *	ND (1)	ND (0.406)	15	5.5	8.8	6.8	ND (0.1) *	ND (2) *	11	ND (1)	ND (2)	ND (4) *	26	31
	10/02/08	5 - 6	N	ND (2) *	2.8	210	ND (1) *	ND (1)	ND (0.404)	18	8.6	6.6	2.4	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	35	39
	10/02/08	9 - 10	N	ND (2) *	3.3	89	ND (1) *	ND (1)	ND (0.404)	19	8.5	12	2.7	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	33	38
	10/02/08	9 - 10	FD	ND (2) *	3.3	92	ND (1) *	ND (1)	ND (0.404)	19	8.5	10	3	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	35	39
	10/02/08	14 - 15	N	ND (2.1) J*	4.7	73 J	ND (1) *	ND (1)	ND (0.413)	23 J	9.7	18	3.7	ND (0.1) *	ND (1)	16	ND (1)	ND (1)	ND (2.1) *	36 J	42 J
AOC14-9	10/01/08	0 - 0.5	N	ND (2) *	5.3	140	ND (1) *	ND (1)	ND (0.404)	13	4.8	7.6	5.4	ND (0.1) *	ND (1)	9.5	ND (1)	ND (1)	ND (2) *	23	28
	10/01/08	2 - 3	N	ND (2) *	6.3	170	ND (2) *	ND (1)	ND (0.407)	12	4.8	7.2	6	ND (0.1) *	ND (2) *	9.1	ND (1)	ND (2)	ND (4) *	23	29
	10/01/08	5 - 6	N	ND (2) *	3	61	ND (1) *	ND (1)	ND (0.4)	9	2.8	4.1	2.8	ND (0.1) *	ND (1)	5	ND (1)	ND (1)	ND (2) *	13	13
	10/01/08	9 - 10	N	ND (2) *	4.4	220	ND (1) *	ND (1)	ND (0.405)	15	5.5	7.6	3.6	ND (0.1) *	ND (1)	9.1	ND (1)	ND (1)	ND (2) *	23	29
	10/01/08	14 - 15	N	ND (2) J*	6.2	120 J	ND (2) *	ND (1)	ND (0.406)	13	5.9	8.2	5	ND (0.1) *	ND (2) *	9.4	ND (1)	ND (2)	ND (4.1) *	22	32
AOC14-10	10/01/08	0 - 0.5	N	ND (2) *	3.6	69	ND (1) *	ND (1)	ND (0.401)	10	2.4	3.5	3.5	ND (0.1) *	ND (1)	4.2	ND (1)	ND (1)	ND (2) *	13	14
	10/01/08	2 - 3	N	ND (2) *	2.9	65	ND (1) *	ND (1)	ND (0.401)	11	2.4	3.1	2.9	ND (0.1) *	ND (1)	3.9	ND (1)	ND (1)	ND (2) *	11	14
	10/01/08	5 - 6	N	ND (2) *	3.3	110	ND (1) *	ND (1)	ND (0.403)	12	2.9	4.6	3.4	ND (0.1) *	ND (1)	5.2	ND (1)	ND (1)	ND (2) *	14	17
	10/01/08	5 - 6	FD	ND (2) *	3.1	97	ND (1) *	ND (1)	ND (0.402)	12	2.6	4.1	3.1	ND (0.1) *	ND (1)	4.6	ND (1)	ND (1)	ND (2) *	13	15
	10/01/08	9 - 10	N	ND (2) *	5	81	ND (1) *	ND (1)	ND (0.409)	11	4.5	7.1	5.9	ND (0.1) *	ND (1)	8.7	ND (1)	ND (1)	2.2	21	28
	10/01/08	14 - 15	N	ND (2) *	7.1	110	ND (4) *	ND (1)	ND (0.404)	9.8	ND (4)	ND (8.1)	2.6	ND (0.1) *	ND (4) *	4.6	ND (1)	ND (4)	ND (8.1) *	13	13
AOC14-11	10/01/08	5 - 6	N	ND (2) *	5.5	140	ND (1) *	ND (1)	ND (0.406)	15	5.9	7.3	4.2	ND (0.1) *	1	9.9	ND (1)	ND (1)	ND (2) *	28	28
	10/01/08	9 - 10	N	ND (2) *	2.4	140	ND (1) *	ND (1)	ND (0.405)	18	8.4	13	2	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	34	37
	10/01/08	14 - 15	N	ND (2) *	4	80	ND (1) *	ND (1)	ND (0.41)	20	8.5	9	3	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2) *	35	39
AOC14-12	09/30/08	5 - 6	N	ND (2) *	3.2	190	ND (1) *	ND (1)	ND (0.406)	27	7.5	8.4	3.2	ND (0.1) *	2.4	9.8	1.5	ND (1)	ND (2) *	29	36
	09/30/08	9 - 10	N	ND (2) *	2.3	150	ND (1) *	ND (1)	ND (0.405)	17	7.4	7.7	3	ND (0.1) *	ND (1)	11	1.2	ND (1)	ND (2) *	29	37
	09/30/08	14 - 15	N	ND (2) *	3.2	140	ND (1) *	ND (1)	ND (0.401)	20	7.7	9.8	2.8	ND (0.1) *	1.2	13	ND (1)	ND (1)	ND (2) *	29	35
AOC14-13	09/30/08	5 - 6	N	ND (2) *	3.3	130	ND (1) *	ND (1)	ND (0.405)	22	5.8	11	3.6	ND (0.099) *	2	9	ND (1)	ND (1)	ND (2) *	21	30
	09/30/08	9 - 10	N	ND (2) *	1.9	140	ND (1) *	ND (1)	ND (0.405)	16	7.7	7.2	2.1	ND (0.1) *	ND (1)	10	1.6	ND (1)	ND (2) *	28	34
	09/30/08	14 - 15	N	ND (2) *	3.2	110	ND (1) *	ND (1)	ND (0.409)	16	7	11	2.2	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	29	33
	09/30/08	14 - 15	FD	ND (2) *	2.9	100	ND (1) *	ND (1)	ND (0.409)	16	7.5	13	2.4	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	29	33
AOC14-14E	02/18/16	0 - 1	N	ND (2) *	3.2	140	ND (1) *	ND (1)	0.27	16	7.2	11	7.2	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	27	44
	02/18/16	2 - 3	N	ND (2) *	3.3	71 J	ND (1) *	ND (1)	0.25	30	8.5	13	3	ND (0.1) *	ND (1)	17	ND (1)	ND (1)	2.1	30	42
	02/18/16	2 - 3	FD	ND (2) *	3.3	87 J	ND (1) *	ND (1)	0.35	26	8.4	10	3.5	ND (0.1) *	ND (1)	15	ND (1)	ND (1)	ND (2) *	34	43
	02/18/16	5 - 5.5	N	ND (2) *	2.6	98	ND (1) *	ND (1)	0.8	27	7.8	9.8	2.1	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	2.2	29	38
	02/18/16	6 - 7	N	ND (2.1) *	3.2	77	ND (1) *	ND (1)	ND (0.2)	19	8.3	9.9	2.1	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	33	38
	02/18/16	9 - 10	N	ND (2) *	3.4	110	ND (1) *	ND (1)	ND (0.2)	20	7.4	8	2.6	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	2.6	29	39
AOC14-14W	02/16/16	0 - 1	N	ND (2) *	2.5	150	ND (1) *	1.4	0.33	16	7.2	12	15	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	30	65
	02/16/16	2 - 3	N	ND (2) *	2	120	ND (1) *	ND (1)	ND (0.2)	13	7.1	12	3.4	ND (0.1) *	ND (1)	8.9	ND (1)	ND (1)	ND (2) *	30	32
	02/16/16	5 - 5.5	N	ND (2.1) *	5.9	160	ND (1) *	1.9	6.7	420	7.3	170	160	0.22	4.5	27	ND (1)	ND (1)	ND (2.1) *	58	310
	02/16/16	6 - 7	N	ND (2) *	3.4	160	ND (1) *	1.3	2.7	65	7.7	80	70	ND (0.1) *	2.8	16	ND (1)	ND (1)	ND (2) *	27	260
	02/16/16	9 - 10	N	ND (2) *	2.5	95	ND (1) *	ND (1)	0.66	15	7	9.7	2.6	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	29	34

TABLE B-6a
Sample Results: Metals
AOC 14 – Railroad Debris Area
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				0.285	11	410	0.672	1.1	0.83	39.8	12.7	16.8	8.39	0.0125	1.37	27.3	1.47	5.15	0.78	52.2	58
Residential Regional Screening Levels [2]:				31	0.68	15,000	160	71	0.3	120,000	23	3,100	400	11	390	1,500	390	390	0.78	390	23,000
Residential DTSC-SL [3]:				NE	0.11	NE	15	5.2	NE	36,000	NE	NE	80	1	NE	490	NE	390	NE	390	NE
Ecological Comparison Values [4]:				0.285	11.4	330	23.3	0.0151	139.6	36.3	13	20.6	0.0166	0.0125	2.25	0.607	0.177	5.15	2.32	13.9	0.164
Background [5]:				NE	11	410	0.672	1.1	0.83	39.8	12.7	16.8	8.39	NE	1.37	27.3	1.47	NE	NE	52.2	58
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
AOC14-15	02/18/16	0 - 1	N	ND (2) *	4	140	ND (1) *	ND (1)	ND (0.2)	14	7.8	11	2.2	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	29	36
	02/18/16	2 - 3	N	ND (2) *	3	190	ND (1) *	ND (1)	0.21	16	6.5	12	4.6	ND (0.1) *	ND (1)	9.9	ND (1)	ND (1)	2.3	26	40
	02/18/16	5 - 6	N	ND (2) *	2.9	170	ND (1) *	ND (1)	ND (0.2)	11	6.3	9.7	3.1	ND (0.1) *	ND (1)	8.9	ND (1)	ND (1)	2.2	24	34
	02/18/16	7 - 8	N	ND (2) *	3.9	150	ND (1) *	ND (1)	ND (0.2)	16	6.9	8.9	2.5	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	2.2	30	33
AOC14-16E	02/23/16	0 - 1	N	ND (2) *	2	120	ND (1) *	ND (1)	0.26	20	7.6	9.6	5.9	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	32	62
	02/23/16	2 - 3	N	ND (2.1) *	2.3	150	ND (1) *	ND (1)	ND (0.21)	12	7.1	9	3	ND (0.1) *	ND (1)	8.6	ND (1)	ND (1)	ND (2.1) *	31	33
	02/23/16	5 - 6	N	ND (2) *	1.7	110	ND (1) *	ND (1)	0.22	12	5.7	6.7	3	ND (0.1) *	ND (1)	7.6	ND (1)	ND (1)	ND (2) *	23	30
	02/23/16	9 - 10	N	ND (2.1) *	1.3	97	ND (1) *	ND (1)	ND (0.21)	15	7	9	1.6	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2.1) *	27	31
AOC14-16W	02/22/16	0 - 1	N	ND (2) J*	2.1	140 J	ND (1) *	ND (1)	ND (0.2)	13	6.2	7.3	2.7	0.41	ND (1)	8.4	ND (1) J	ND (1) J	ND (2) *	27 J	27
	02/22/16	2 - 3	N	3.3	19	100	ND (1) *	4.2	20	360	11	1,300	110	180	63	170	ND (1)	ND (1)	ND (2.1) *	26	110
	02/22/16	5 - 6	N	ND (2.2) *	4.3	130	ND (1.1) *	ND (1.1) *	3	50	7.7	100	28	72	14	17	ND (1.1)	ND (1.1)	ND (2.2) *	30	61
	02/22/16	7 - 8	N	ND (2) *	2.8	140	ND (1) *	ND (1)	0.96	23	7.6	35	14	17	ND (1)	11	ND (1)	ND (1)	ND (2) *	31	45
	02/22/16	9 - 10	N	ND (2) *	1.4	110	ND (1) *	ND (1)	ND (0.2)	13	7.5	8.7	2.3	ND (0.1) *	ND (1)	9	ND (1)	ND (1)	ND (2) *	32	31
	02/22/16	9 - 10	FD	ND (2) *	ND (1)	100	ND (1) *	ND (1)	ND (0.2)	13	7	7.1	1.6	ND (0.1) *	ND (1)	8.9	ND (1)	ND (1)	ND (2) *	29	30
AOC14-17E	02/24/16	9 - 10	N	ND (2) *	1.4	92	ND (1) *	ND (1)	ND (0.2)	11	6.4	7.8	2.7	ND (0.1) *	ND (1)	9.1	ND (1)	ND (1)	ND (2) *	27	31
AOC14-17W	02/24/16	0 - 1	N	ND (2) *	2.6	66	ND (1) *	ND (1)	ND (0.2)	9	3.3	4.7	3.9	ND (0.1) *	ND (1)	5	ND (1)	ND (1)	ND (2) *	17	21
	02/24/16	1 - 2	N	ND (2) *	3.4	90	ND (1) *	ND (1)	ND (0.2)	12	4.8	9.2	8.5	ND (0.1) *	ND (1)	7.9	ND (1)	ND (1)	ND (2) *	18	26
	02/24/16	2 - 3	N	ND (2) *	2.7	130	ND (1) *	ND (1)	ND (0.2)	13	6.4	7.7	3.7	ND (0.1) *	ND (1)	8	ND (1)	ND (1)	ND (2) *	27	29
	02/24/16	5 - 6	N	ND (2) *	3.1	180	ND (1) *	ND (1)	ND (0.2)	12	5	10	3.4	ND (0.1) *	ND (1)	7.3	ND (1)	ND (1)	ND (2) *	24	24
	02/24/16	9 - 10	N	ND (2) *	4.1	110	ND (1) *	ND (1)	ND (0.2)	12	6.2	8.6	2.6	ND (0.1) *	ND (1)	8	ND (1)	ND (1)	ND (2) *	33	29
AOC14-18	02/17/16	0 - 1	N	ND (2) *	4	250	ND (1) *	ND (1)	ND (0.2)	14	7.1	13	14	ND (0.1) *	ND (1)	9.6	ND (1)	ND (1)	ND (2) *	30	41
	02/17/16	2 - 3	N	ND (2.1) *	3.8	280	ND (1) *	ND (1)	ND (0.21)	13	7.8	12	3.5	ND (0.1) *	ND (1)	9.5	ND (1)	ND (1)	ND (2.1) *	30	34
	02/17/16	5 - 6	N	ND (2.1) *	4.5	86	ND (1) *	ND (1)	ND (0.21)	13	8	12	4.4	ND (0.1) *	3	12	ND (1)	ND (1)	ND (2.1) *	33	36
AOC14-19	02/17/16	2 - 3	N	19	14	410	ND (1) *	7.1 J	ND (0.21)	380 J	17	1,800	1,600 J	ND (0.1) *	16	270	ND (1) J	ND (1)	ND (2.1) *	24 J	2,000 J
	02/17/16	3 - 4	N	ND (2.1) *	2.3	190	ND (1) *	ND (1)	ND (0.21)	13	6.7	19	6.3	ND (0.1) *	ND (1)	9.7	ND (1)	ND (1)	ND (2.1) *	27	41
AOC14-20	04/26/17	0 - 0.5	N	ND (2) *	1.5	120	ND (1) *	ND (1)	ND (0.2)	14	6.7	9	5.6	ND (0.1) *	ND (1)	9	ND (1)	ND (1)	ND (2) *	25	37
	04/26/17	2 - 3	N	ND (2) *	ND (1)	140	ND (1) *	ND (1)	ND (0.2)	12	5.8	7.1	3.4	ND (0.1) *	ND (1)	7.6	ND (1)	ND (1)	ND (2) *	25	31
	04/26/17	5 - 6	N	ND (2) *	1.6	130	ND (1) *	ND (1)	ND (0.2)	14	6.8	11	2.6	ND (0.1) *	ND (1)	9	ND (1)	ND (1)	ND (2) *	26	29
	04/26/17	8 - 9	N	ND (2) *	ND (1)	68	ND (1) *	ND (1)	ND (0.2)	9.9	5.7	6.5	1.1	ND (0.1) *	ND (1)	7.1	ND (1)	ND (1)	ND (2) *	23	24
AOC14-21	04/26/17	0 - 0.5	N	ND (2) *	ND (1)	140	ND (1) *	ND (1)	ND (0.2)	15	7	10	11	ND (0.1) *	ND (1)	9	ND (1)	ND (1)	ND (2) *	26	41
	04/26/17	2 - 3	N	ND (2) *	ND (1)	130	ND (1) *	ND (1)	ND (0.2)	15	7.9	11	9.4	ND (0.1) *	ND (1)	9.7	ND (1)	ND (1)	ND (2) *	29	45
	04/26/17	2 - 3	FD	ND (2) *	1.5	130	ND (1) *	ND (1)	ND (0.2)	17	7.3	12	9.8	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	26	44
	04/26/17	5 - 6	N	ND (2) *	1.1	60	ND (1) *	ND (1)	ND (0.2)	13	5.7	40	1.4	ND (0.1) *	ND (1)	8	ND (1)	ND (1)	ND (2) *	24	39
	04/26/17	9 - 10	N	ND (2) *	1	98	ND (1) *	ND (1)	ND (0.2)	14	6.7	8.1	2	ND (0.1) *	ND (1)	9.2	ND (1)	ND (1)	ND (2) *	25	30
AOC14-SS-1	10/01/08	0 - 0.5	N	ND (2) *	5	150	ND (1) *	ND (1)	ND (0.405)	15	5.2	9.4	7.2	ND (0.1) *	ND (1)	8.8	ND (1)	ND (1)	ND (2) *	23	34
	10/01/08	2 - 3	N	ND (2) *	7.2	150	ND (2) *	ND (1)	0.456	22	5.7	15	11	0.25	ND (2) *	13	ND (1)	ND (2)	ND (4) *	23	32
	10/01/08	5 - 6	N	ND (2) *	6	240	ND (2) *	ND (1)	ND (0.406)	18	6.7	15	4.8	ND (0.1) *	ND (2) *	12	ND (1)	ND (2)	ND (4.1) *	25	35
	10/01/08	9 - 10	N	ND (2) *	2.8	120	ND (1) *	ND (1)	ND (0.402)	17	7	7.4	1.6	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	26	33
	10/01/08	14 - 15	N	ND (2) *	3.1	110	ND (1) *	ND (1)	ND (0.406)	13	6.7	9	2.6	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	27	31

TABLE B-6a
Sample Results: Metals
AOC 14 – Railroad Debris Area
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
AOC14-SS-2	10/01/08	0 - 0.5	N	ND (2) *	4.8	160	ND (1) *	ND (1)	ND (0.403)	14	4.8	8.8	4.8	ND (0.1) *	1.1	10	ND (1)	ND (1)	ND (2) *	24	27
	10/01/08	2 - 3	N	ND (2) *	7	160	ND (2) *	ND (1)	ND (0.407)	14	4.9	7.6	5.5	ND (0.1) *	ND (2) *	9.4	ND (1)	ND (2)	ND (4) *	22	29
	10/01/08	5 - 6	N	ND (2) *	7	150	ND (2) *	ND (1)	ND (0.405)	10	4.2	6.5	5.5	ND (0.1) *	ND (2) *	8.2	ND (1)	ND (2)	ND (4.1) *	19	25
	10/01/08	9 - 10	N	ND (2) *	4.6	130	ND (1) *	ND (1)	ND (0.407)	9.5	4.2	6.7	5.3	ND (0.1) *	ND (1)	8.1	ND (1)	ND (1)	ND (2) *	18	24
	10/01/08	14 - 15	N	ND (2) *	3.3	120	ND (1) *	ND (1)	ND (0.404)	17	7	9.6	3	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	27	32
	10/01/08	14 - 15	FD	ND (2) *	3	130	ND (1) *	ND (1)	ND (0.405)	18	7.3	9.6	3	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	28	33
AOC14-SS-3	10/02/08	0 - 0.5	N	ND (2) *	5.4	190	ND (1) *	ND (1)	ND (0.401)	17	7.1	11	3.8	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	30	35
	10/02/08	2 - 3	N	ND (2) *	4	180	ND (1) *	ND (1)	ND (0.402)	18	8.3	9.5	2.7	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	33	36
	10/02/08	5 - 6	N	ND (2) *	2.9	100	ND (1) *	ND (1)	ND (0.403)	12	5.4	6.7	2	ND (0.1) *	ND (1)	7.2	ND (1)	ND (1)	ND (2) *	23	29
	10/02/08	9 - 10	N	ND (2) *	3	160	ND (1) *	ND (1)	ND (0.404)	16	7	8.4	2.2	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	31	32
	10/02/08	14 - 15	N	ND (2) *	3.2	89	ND (1) *	ND (1)	ND (0.404)	17	8.9	9.5	2.4	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	34	35
AOC14-SS-4	10/02/08	0 - 0.5	N	ND (2) *	5	190	ND (1) *	ND (1)	ND (0.402)	15	6.3	8.1	5.1	ND (0.1) *	ND (1)	9.6	ND (1)	ND (1)	ND (2) *	27	31
	10/02/08	2 - 3	N	ND (2) *	5	130	ND (1) *	ND (1)	ND (0.401)	14	4.4	6.9	10	ND (0.1) *	ND (1)	7	ND (1)	ND (1)	ND (2) *	20	27
	10/02/08	5 - 6	N	ND (2) *	4.5	120	ND (1) *	ND (1)	ND (0.403)	16	4.1	6.4	11	ND (0.1) *	1.5	6.7	ND (1)	ND (1)	ND (2) *	19	27
	10/02/08	9 - 10	N	ND (2) *	3	120	ND (1) *	ND (1)	ND (0.404)	16	8	11	2.3	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	31	32
	10/02/08	14 - 15	N	ND (2) *	2.7	120	ND (1) *	ND (1)	ND (0.405)	17	8.5	11	3	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	32	37
	10/02/08	14 - 15	FD	ND (2) *	2.5	120	ND (1) *	ND (1)	ND (0.405)	17	8.6	8.5	1.6	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	32	34
S1-20	11/01/98	3	N	---	---	---	---	---	0.7	31.8	---	15.7	---	---	---	14	---	---	---	---	49.4
S2-6	11/01/98 Θ	3	N	---	---	---	---	---	12	45.5	---	1.8	---	---	---	0.57	---	---	---	---	14.5
	11/01/98	5	N	---	---	---	---	---	1.8	39.9	---	9.7	---	---	---	9.4	---	---	---	---	35.7
S2-62	11/01/98 Θ	2	N	---	---	---	---	---	1	32	---	4.1	---	---	---	1.8	---	---	---	---	8.4
	11/01/98 ß	3	N	1.1 J	2.6	72.2	ND (0.89) *	ND (0.89)	---	72.7	5.9	22.2	7.9	0.046 J	0.86 J	47	0.99 J	ND (2.2)	ND (22) *	39.2	ND (29.3)
	11/01/98	4	N	---	---	---	---	---	ND (0.5)	21.9	---	11.5	---	---	---	10.2	---	---	---	---	39.8
S2-130	11/01/98	1	N	---	---	---	---	---	ND (0.5)	22.1	---	10.6	---	---	---	10.8	---	---	---	---	34.5
S3-15	11/01/98	2	N	---	---	---	---	---	ND (0.5)	13.8	---	9.4	---	---	---	7.5	---	---	---	---	24.1
	11/01/98	4	N	---	---	---	---	---	ND (0.5)	12.1	---	11	---	---	---	9.6	---	---	---	---	29.2
S3-72	11/01/98 Θ	1	N	---	---	---	---	---	ND (0.5)	18.7	---	6.7	---	---	---	5.9	---	---	---	---	27
	11/01/98	2	N	---	---	---	---	---	ND (0.5)	11.3	---	8	---	---	---	8.6	---	---	---	---	28.9
S3-120	11/01/98	1	N	---	---	---	---	---	ND (0.5)	12.1	---	4.2	---	---	---	4.3	---	---	---	---	18
S4-4	11/01/98 Θ	4	N	---	---	---	---	---	15.4	23.4	---	3.2	---	---	---	0.43 J	---	---	---	---	1.9
	11/01/98	6	N	---	---	---	---	---	1	13.7	---	10.3	---	---	---	9.8	---	---	---	---	32.6
S4-95	11/01/98 Θ	2	N	---	---	---	---	---	ND (0.5)	10.3	---	2.5	---	---	---	4.3	---	---	---	---	4.3
	11/01/98	3	N	---	---	---	---	---	ND (0.5)	14.9	---	8.3	---	---	---	8.8	---	---	---	---	27
S4-160	11/01/98	2	N	---	---	---	---	---	0.5	25	---	11.8	---	---	---	10.9	---	---	---	---	38.2
S8-23	11/01/98 ß	3	N	0.43 J	4.3	154	0.19 J	ND (0.83)	---	28.7	8.4	14.3	12.5	0.092 J	0.42 J	21	0.59 J	ND (2.1)	ND (21) *	36.4	57
S8-30	11/01/98	3	N	---	---	---	---	---	0.5	12.8	---	10.8	---	---	---	9.4	---	---	---	---	40.9
GS-1	11/01/98 Θ	0	N	---	---	---	---	---	0.59	33.7	---	2.2	---	---	---	0.28 J	---	---	---	---	31.3
GS-2	11/01/98 Θ	0	N	---	---	---	---	---	ND (0.5)	21.9	---	8.2	---	---	---	6	---	---	---	---	32.7
RR-1	02/02/00	0	N	---	---	---	---	---	ND (0.5)	23.4	---	15.6	---	---	---	15.8	---	---	---	---	44

TABLE B-6a

Sample Results: Metals
AOC 14 – Railroad Debris Area
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
RR-2	02/02/00	0	N	---	---	---	---	---	ND (0.5)	16.1	---	13.8	---	---	---	12.3	---	---	---	---	37.5
RR-3	02/02/00	0	N	---	---	---	---	---	ND (0.5)	18.3	---	11.6	---	---	---	13	---	---	---	---	35
RR-4	02/02/00 Θ	0	N	---	---	---	---	---	0.6	19.4	---	19.2	---	---	---	0.92	---	---	---	---	27.1
RR-5	02/02/00	0	N	---	---	---	---	---	5.8	39.5	---	7.1	---	---	---	0.33	---	---	---	---	34.1
RR-6	02/02/00	0	N	---	---	---	---	---	4.8	74.9	---	7.5	---	---	---	0.39	---	---	---	---	243
RR-7	02/02/00 Θ	0	N	---	---	---	---	---	ND (0.51)	28.6	---	9.7	---	---	---	10.4	---	---	---	---	35.1
RR-8	02/02/00	0	N	---	---	---	---	---	ND (0.51)	28.9	---	9.9	---	---	---	7.4	---	---	---	---	29.8
RR-9	02/02/00 Θ	0	N	---	---	---	---	---	2.7	19.6	---	27.9	---	---	---	2.2	---	---	---	---	15.4
RR-10	02/02/00	0	N	---	---	---	---	---	ND (0.51)	18.8	---	12.9	---	---	---	11.6	---	---	---	---	36.3
RR-11	02/02/00	0	N	---	---	---	---	---	ND (0.51)	18.1	---	20.2	---	---	---	13.4	---	---	---	---	47.5
RR-12	02/02/00 Θ	0	N	---	---	---	---	---	ND (0.5)	17.5	---	3.8	---	---	---	1.5	---	---	---	---	11.3
Category 3																					
AOC14-13	10/01/08 Y	0.5 - 1.5	N	ND (2) *	18	160	ND (10) *	ND (1)	0.487	63	ND (10)	33	16	ND (0.1) *	98	57	ND (1)	ND (10) *	ND (20) *	ND (10)	39

Notes:

Category 1: Validated data suitable for all uses, including risk assessment and remedial action decisions.
Category 2: Validated data suitable for use in characterization of the chemicals of potential concern at the facility and to help define the nature and extent of contamination.
Category 3: Validated data suitable only for use in qualitative characterization of the nature and extent of contamination.
Results greater than or equal to the interim screening level are circled; however, if the interim screening level is equal to the background value, only results greater than the interim screening level are circled.

Θ	white powder sample.
ß	black sandy material
Y	debris sample
*	Reporting limits greater than or equal to the interim screening level.
---	not analyzed
ft bgs	feet below ground surface
mg/kg	milligrams per kilogram
DTSC	California Department of Toxic Substances Control
DTSC-SL	DTSC Screening Levels
FD	field duplicate
J	concentration or reporting limit estimated by laboratory or data validation
N	primary sample
ND	not detected at the listed reporting limit
NE	not established
USEPA	United States Environmental Protection Agency

1 Interim screening level is background value. If background value is not available then the interim screening value is the lower of the Ecological Comparison Value , residential DTSC-SL, or USEPA residential regional screening value.
2 United States Environmental Protection Agency (USEPA). 2017. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. November.
3 California Department of Toxic Substances Control (DTSC). 2018. Human Health Risk Assessment (HHRA) Note Number 3. January.
4 ARCADIS. 2008. "Technical Memorandum 3: Ecological Comparison Values for Metals and Polycyclic Aromatic Hydrocarbons in Soil." May 28.
5 CH2M HILL. 2009. "Final Soil Background Technical Memorandum at Pacific Gas and Electric Company Topock Compressor Station, Needles, California." May.

TABLE B-6b
Sample Results: Dioxins and Furans
AOC 14 – Railroad Debris Area
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Date	Depth (ft bgs)	Sample Type	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDF	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDF	2,3,4,6,7,8-HxCDF	2,3,4,7,8-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	OCDD	OCDF	TEQ Avian	TEQ Human	TEQ Mammals
				Dioxin/Furans (ng/kg)																			
Interim Screening Level[1] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
Residential Regional Screening Levels[2] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
Residential DTSC-SL[3] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
Ecological Comparison Values[4] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
Background[5] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
Category 1																							
AOC14-14E	02/18/16	0 - 1	N	160 J	15	ND (1.4)	ND (1.3)	2.2 J	4.1 J	ND (0.81)	ND (2.2)	ND (0.2)	ND (0.22)	ND (0.47)	ND (20)	ND (0.64)	ND (0.16)	ND (0.21)	2,200	27	2.6	4.6	4.6
	02/18/16	2 - 3	N	510	30	2.7 J	ND (1.6)	ND (0.44)	8.6 J	ND (0.43)	3.5 J	ND (0.52)	0.9 J	ND (0.3)	ND (83)	ND (0.32)	ND (0.19)	ND (0.21)	5,900	94	7.4	14	14
	02/18/16	2 - 3	FD	380	35	ND (2.9)	ND (0.72)	ND (1.3)	9.1 J	ND (1.3)	3.5 J	ND (1.5)	ND (0.58)	ND (0.39)	ND (82)	0.39 J	ND (0.12)	ND (0.18)	5,000	100	6.9	12	12
	02/18/16	5 - 5.5	N	800	140	12 J	4.2 J	ND (4)	22	ND (3.9)	9.3 J	ND (4.6)	2.1 J	ND (0.34)	ND (260)	ND (1.3)	ND (0.13)	ND (0.15)	8,300	380	21	32	32
	02/18/16	6 - 7	N	72	9.1 J	ND (0.74)	ND (0.29)	ND (0.43)	1.5 J	ND (0.42)	0.69 J	ND (0.5)	0.16 J	ND (0.63)	ND (15)	ND (0.66)	ND (0.071)	ND (0.14)	880	34	1.8	2.5	2.5
	02/18/16	9 - 10	N	240	23	ND (1.8)	ND (0.7)	ND (0.21)	4.6 J	0.58 J	1.9 J	ND (0.24)	ND (0.42)	ND (0.19)	ND (38)	ND (0.2)	ND (0.049)	ND (0.16)	3,300	64	3.5	6.6	6.6
AOC14-14W	02/16/16	0 - 1	N	84	9.3 J	0.87 J	ND (0.74)	ND (0.12)	3 J	ND (0.38)	ND (1.6)	ND (0.14)	0.51 J	ND (0.31)	ND (22)	ND (0.35)	0.18 J	ND (0.24)	880	21 J	2.5	3.5	3.5
	02/16/16	2 - 3	N	15	3 J	ND (0.22)	ND (0.37)	0.37 J	ND (0.37)	ND (0.19)	ND (0.16)	ND (0.22)	ND (0.13)	ND (0.093)	ND (12)	ND (0.19)	ND (0.031)	0.2 J	150	8.2 J	1.1	1.1	1.1
	02/16/16	5 - 5.5	N	3,700	1,700	140	130	ND (350)	260	380	220	83	ND (110) *	210	640	490	20	ND (17)	16,000	740	780	480	480
	02/16/16	6 - 7	N	490	150	8.1 J	6.2 J	16	16	16	9.6 J	4.3 J	ND (5.6) *	9.8 J	19	18	1.4 J	ND (0.22)	4,900	120	33	27	27
	02/16/16	9 - 10	N	260	12 J	1.5 J	0.59 J	ND (0.59)	2.8 J	ND (0.58)	1.2 J	ND (0.69)	ND (0.44)	ND (0.51)	ND (26)	ND (0.76)	ND (0.13)	0.44 J	3,300	62	3.4	6	6
AOC14-15	02/18/16	0 - 1	N	94	16	1.4 J	ND (0.52)	ND (0.13)	3.1 J	ND (0.5)	ND (1.1)	ND (0.35)	ND (0.34)	ND (1.7)	ND (20)	ND (0.14)	ND (0.055)	ND (0.3)	740	49	2	3	3
	02/18/16	2 - 3	N	180	28	ND (1.4)	ND (1.1)	ND (0.21)	5.1 J	ND (0.59)	2 J	ND (0.25)	ND (0.76)	ND (0.22)	ND (44)	ND (0.23)	ND (0.14)	ND (0.17)	1,500	98	3.8	6.1	6.1
	02/18/16	5 - 6	N	140	19	1.5 J	ND (0.57)	ND (0.11)	3.9 J	ND (0.37)	2.1 J	ND (0.29)	ND (0.49)	ND (0.45)	ND (26)	ND (0.33)	ND (0.15)	ND (0.4)	1,500	57	2.8	4.4	4.4
	02/18/16	7 - 8	N	16	1.8 J	ND (0.18)	ND (0.12)	ND (0.27)	0.44 J	ND (0.13)	ND (0.14)	ND (0.15)	ND (0.12)	ND (0.062)	ND (3.6)	ND (0.11)	ND (0.039)	0.11 J	140	4.5 J	0.52	0.59	0.59
AOC14-16E	02/23/16	0 - 1	N	220	ND (0.099)	1.9 J	1.1 J	ND (0.32)	5.8 J	ND (5.6)	2.4 J	ND (0.38)	0.55 J	ND (0.32)	ND (66)	ND (0.29)	ND (0.022)	ND (0.24)	2,500	53	5.3	8.2	8.2
	02/23/16	2 - 3	N	140	ND (0.15)	ND (0.76)	ND (0.42)	ND (0.36)	2.5 J	ND (0.35)	1.3 J	ND (0.42)	ND (0.12)	ND (0.21)	ND (27)	ND (0.17)	ND (0.099)	ND (0.25)	1,400	20 J	2.2	3.8	3.8
	02/23/16	5 - 6	N	26	1.6 J	ND (0.27)	ND (0.13)	0.25 J	ND (0.69)	ND (0.082)	0.44 J	ND (0.061)	ND (0.067)	ND (0.051)	ND (15)	ND (0.054)	ND (0.022)	ND (0.16)	270	5 J	1.1	1.3	1.3
	02/23/16	9 - 10	N	3.8 J	0.29 J	ND (0.12)	ND (0.047)	ND (0.053)	ND (0.03)	ND (0.053)	ND (0.074)	ND (0.037)	ND (0.02)	ND (0.068)	ND (0.71)	ND (0.053)	ND (0.013)	ND (0.087)	30	ND (0.92)	0.15	0.13	0.13
AOC14-16W	02/22/16	0 - 1	N	5.6 J	0.9 J	ND (0.11)	ND (0.06)	ND (0.044)	ND (0.13)	ND (0.043)	0.16 J	ND (0.051)	ND (0.044)	ND (0.054)	ND (1)	ND (0.056)	ND (0.024)	0.16 J	52	2.2 J	0.32	0.22	0.22
	02/22/16	2 - 3	N	230	27	ND (2.6)	ND (4.5)	ND (5)	ND (4.5)	ND (4.9)	ND (4.3)	ND (5.9)	ND (3)	ND (1.4)	ND (21)	ND (1.5)	ND (1.5)	ND (1.2)	1,800	ND (42)	6.6	8.2	8.2
	02/22/16	5 - 6	N	44	ND (8.1)	ND (0.34)	ND (0.6)	ND (0.38)	ND (0.43)	ND (0.73)	ND (0.41)	ND (0.52)	ND (0.22)	ND (0.23)	ND (5.5)	ND (0.25)	ND (0.13)	ND (0.35)	370	9.8 J	1	1.3	1.3
	02/22/16	7 - 8	N	62	19	ND (0.98)	1.3 J	ND (0.48)	2 J	ND (0.94)	ND (0.83)	ND (0.56)	ND (0.39)	ND (0.19)	ND (10)	ND (0.41)	ND (0.1)	ND (0.3)	650	17 J	1.7	2.3	2.3
	02/22/16	9 - 10	N	ND (0.45)	ND (0.062)	ND (0.074)	ND (0.066)	ND (0.08)	ND (0.067)	ND (0.078)	ND (0.064)	ND (0.094)	ND (0.058)	ND (0.05)	ND (0.3)	ND (0.052)	ND (0.061)	ND (0.098)	3.2 J	ND (0.21)	0.17	0.11	0.11
	02/22/16	9 - 10	FD	ND (0.47)	ND (0.059)	ND (0.07)	ND (0.074)	ND (0.075)	ND (0.051)	ND (0.073)	ND (0.086)	ND (0.087)	ND (0.029)	ND (0.042)	ND (0.28)	ND (0.044)	ND (0.018)	ND (0.046)	4.7 J	ND (0.18)	0.1	0.074	0.074
AOC14-17E	02/24/16	9 - 10	N	0.23 J	0.088 J	ND (0.062)	ND (0.02)	ND (0.026)	ND (0.02)	ND (0.032)	ND (0.019)	ND (0.053)	ND (0.066)	ND (0.034)	ND (0.23)	ND (0.036)	ND (0.018)	ND (0.07)	1.9 J	ND (0.15)	0.12	0.075	0.075
AOC14-17W	02/24/16	0 - 1	N	14	1.7 J	ND (0.13)	ND (0.18)	ND (0.16)	ND (0.47)	ND (0.15)	ND (0.39)	ND (0.18)	ND (0.083)	ND (0.11)	ND (1.7)	ND (0.11)	ND (0.049)	ND (0.073)	110	2.9 J	0.34	0.44	0.44
	02/24/16	1 - 2	N	35	3.2 J	ND (0.3)	ND (0.43)	ND (0.14)	ND (1)	ND (0.12)	0.78 J	ND (0.046)	ND (0.24)	ND (0.12)	ND (3.4)	ND (0.12)	ND (0.049)	ND (0.043)	270	6.3 J	0.61	0.97	0.97
	02/24/16	2 - 3	N	14	ND (1)	ND (0.16)	ND (0.15)	ND (0.063)	ND (0.39)	ND (0.062)	ND (0.42)	ND (0.11)	ND (0.065)	ND (0.083)	ND (1.3)	ND (0.088)	ND (0.087)	ND (0.11)	120	2.4 J	0.31	0.4	0.4
	02/24/16	5 - 6	N	ND (0.44)	ND (0.16)	ND (0.071)	ND (0.029)	ND (0.049)	ND (0.03)	ND (0.058)	ND (0.028)	ND (0.055)	ND (0.029)	ND (0.059)	ND (0.041)	ND (0.062)	ND (0.086)	ND (0.19)	2 J	ND (0.089)	0.2	0.096	0.096
	02/24/16	9 - 10	N	ND (1.1)	ND (0.16)	ND (0.19)	ND (0.039)	ND (0.047)	ND (0.043)	ND (0.046)	ND (0.038)	ND (0.055)	ND (0.021)	ND (0.11)	ND (0.31)	ND (0.12)	ND (0.037)	0.2 J	6.1 J	ND (0.28)	0.32	0.11	0.11

TABLE B-6b
Sample Results: Dioxins and Furans
AOC 14 – Railroad Debris Area
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Dioxin/Furans (ng/kg)																			
Interim Screening Level[1] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
Residential Regional Screening Levels[2] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
Residential DTSC-SL[3] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
Ecological Comparison Values[4] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
Background[5] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**1,2,3,4,6,7,8-HpCDD**	**1,2,3,4,6,7,8-HpCDF**	**1,2,3,4,7,8,9-HpCDF**	**1,2,3,4,7,8-HxCDD**	**1,2,3,4,7,8-HxCDF**	**1,2,3,6,7,8-HxCDD**	**1,2,3,6,7,8-HxCDF**	**1,2,3,7,8,9-HxCDD**	**1,2,3,7,8,9-HxCDF**	**1,2,3,7,8-PeCDD**	**1,2,3,7,8-PeCDF**	**2,3,4,6,7,8-HxCDF**	**2,3,4,7,8-PeCDF**	**2,3,7,8-TCDD**	**2,3,7,8-TCDF**	**OCDD**	**OCDF**	**TEQ Avian**	**TEQ Human**	**TEQ Mammals**
AOC14-19	02/17/16	2 - 3	N	610	390	23	29	110	60	110	52	ND (11)	ND (49) *	92	220	ND (190)	17	ND (5.8)	1,800	79	210	140	140
	02/17/16	3 - 4	N	15	ND (0.48)	ND (0.57)	ND (0.9)	ND (0.3)	ND (0.43)	ND (1.3)	ND (0.41)	ND (1.1)	ND (0.91)	ND (0.11)	ND (1)	ND (0.12)	ND (0.43)	ND (0.66)	43	ND (1.3)	1.3	1.2	1.2
AOC14-20	04/26/17	0 - 0.5	N	6.1 J	ND (0.79)	0.3 J	ND (0.19)	ND (0.21)	ND (0.49)	ND (0.27)	0.58 J	ND (0.22)	ND (0.089)	ND (0.2)	ND (1.1)	ND (0.2)	ND (0.042)	ND (0.045)	40	1.2 J	0.37	0.36	0.36
	04/26/17	2 - 3	N	3.6 J	ND (0.64)	ND (0.12)	ND (0.18)	ND (0.11)	ND (0.18)	ND (0.11)	ND (0.31)	ND (0.15)	ND (0.15)	ND (0.16)	ND (1.3)	ND (0.13)	ND (0.044)	ND (0.094)	22 J	1.1 J	0.33	0.29	0.29
	04/26/17	5 - 6	N	8.7 J	ND (0.73)	ND (0.14)	ND (0.14)	ND (0.18)	ND (0.073)	ND (0.18)	ND (0.28)	ND (0.076)	ND (0.1)	0.33 J	ND (1.5)	ND (0.17)	ND (0.056)	0.53 J	66	ND (1.4)	0.86	0.4	0.4
	04/26/17	8 - 9	N	ND (1.8)	ND (0.61)	ND (0.32)	ND (0.21)	ND (0.1)	ND (0.13)	ND (0.23)	ND (0.43)	ND (0.13)	ND (0.34)	ND (0.25)	ND (0.97)	ND (0.082)	ND (0.07)	ND (0.061)	15 J	ND (1.2)	0.4	0.35	0.35
AOC14-21	04/26/17	0 - 0.5	N	12 J	2.5 J	ND (0.25)	0.25 J	0.38 J	ND (0.88)	0.35 J	ND (0.61)	ND (0.11)	ND (0.45)	ND (0.19)	ND (3.1)	ND (0.26)	ND (0.1)	0.32 J	82	ND (3.7)	1.1	0.85	0.85
	04/26/17	2 - 3	N	60	8.5 J	ND (0.65)	0.63 J	ND (0.45)	2.5 J	ND (0.62)	ND (1.3)	ND (0.15)	0.57 J	0.35 J	ND (17)	ND (0.34)	ND (0.11)	ND (0.13)	620	23 J	2.1	2.9	2.9
	04/26/17	2 - 3	FD	89	8.6 J	0.69 J	0.5 J	0.48 J	2.9 J	0.75 J	1.2 J	ND (0.14)	ND (0.58)	0.47 J	ND (20)	ND (0.39)	ND (0.073)	ND (0.085)	780	23 J	2.2	3.2	3.2
	04/26/17	5 - 6	N	ND (1.3)	ND (0.25)	ND (0.094)	ND (0.12)	ND (0.067)	ND (0.14)	ND (0.17)	ND (0.14)	ND (0.1)	ND (0.15)	ND (0.053)	ND (0.43)	ND (0.053)	ND (0.064)	ND (0.047)	ND (10)	ND (0.43)	ND (0.21)	ND (0.19)	ND (0.19)
	04/26/17	9 - 10	N	4.1 J	ND (0.61)	ND (0.027)	ND (0.061)	ND (0.047)	ND (0.061)	ND (0.045)	ND (0.067)	ND (0.053)	ND (0.1)	ND (0.13)	ND (0.75)	ND (0.14)	ND (0.052)	ND (0.11)	39	1.8 J	0.27	0.22	0.22

Notes:

Category 1: Validated data suitable for all uses, including risk assessment and remedial action decisions.
Category 2: Validated data suitable for use in characterization of the chemicals of potential concern at the facility and to help define the nature and extent of contamination.
Category 3: Validated data suitable only for use in qualitative characterization of the nature and extent of contamination.
Results greater than or equal to the Interim Screening Level are circled.

--	not analyzed
ft bgs	feet below ground surface
ng/kg	nanograms per kilogram
DTSC-SL	DTSC Screening Levels
DTSC	California Department of Toxic Substances Control
FD	Field Dupliicate
J	concentration or reporting limit estimated by laboratory or data validation
JR	estimated value, one or more input values is “R” qualified.
N	Primary Sample
NA	NA = not applicable
NE	not established
ND	not detected at the listed reporting limit
R	The result has been rejected; identification and/or quantitation could not be verified because critical QC specifications were not met (e.g., a non-detect result obtained for an archive sample following a hold time of greater than one year).
USEPA	USEPA = United States Environmental Protection Agency

1 For individual dioxins and furans, selected value is the lower of the ECV, residential DTSC-SL, or USEPA residential regional screening value, unless the background value is higher. For TEQ values, selected value is the DTSC-SL.

2 United States Environmental Protection Agency (USEPA). 2017. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. November.

3 California Department of Toxic Substances Control (DTSC). 2018. Human Health Risk Assessment (HHRA) Note Number 3. JanuaryCalifornia Department of Toxic Substances Control (DTSC). 2017. Human Health Risk Assessment (HHRA) Note 2, Soil Remedial Goals for Dioxins and Dioxin-like Compounds for Consideration at California Hazardous Waste Sites. April.

4 ARCADIS. 2008. "Technical Memorandum 3: Ecological Comparison Values for Metals and Polycyclic Aromatic Hydrocarbons in Soil." May 28. ARCADIS. 2009. "Topock Compression Station - Final Technical Memorandum 4: Ecological Comparison Values for Additional Dectected Chemicals in Soil." July 1.

5 CH2M. 2017. Revised Ambient Study of Dioxins and Furans at the Pacific Gas and Electric Company, Topock Compressor Station, Needles, California. October.

TABLE B-6b
Sample Results: Dioxins and Furans
AOC 14 – Railroad Debris Area
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Calculations:
TEQ = Sum of Result xToxic equivalency factor (TEF), 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.
TEQ Avian = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.
TEQMammals = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.
Teq Humans = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TABLE B-7a

Sample Results: Metals

AOC 27 – MW-24 Bench

Soil Engineering Evaluation/Cost Analysis

PG&E Topock Compressor Station, Needles, California

Location	Date	Depth (ft bgs)	Sample Type	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium, Hexavalent	Chromium, total	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Category 1																					
24soil-01	01/31/08	2.5 - 3	N	ND (0.4) *	3.1	130	ND (0.1)	0.71	ND (0.4)	15	3.5	7.2	6.4	ND (0.1) *	0.63	6.8	6.2	ND (0.25)	ND (1) *	17	16
24soil-02	01/31/08	2.5 - 3	N	ND (0.4) *	2.9	89	ND (0.1)	0.3	ND (0.4)	15	3.4	9.1	8.7	ND (0.1) *	0.7	7.2	1.4	ND (0.25)	ND (1) *	18	17
AOC27-1	03/18/16	0 - 1	N	ND (2.1) *	3.1	130	ND (1) *	ND (1)	0.35	17	5.8	11	28	ND (0.1) *	ND (1)	9	ND (1)	ND (1)	ND (2.1) *	27	37
	03/18/16	2 - 3	N	ND (2) *	4	160	ND (1) *	ND (1)	ND (0.2)	11	6.3	12	5.4	ND (0.1) *	ND (1)	8.8	ND (1)	ND (1)	ND (2) *	28	31
	03/18/16	5 - 6	N	ND (2) *	2	90	ND (1) *	ND (1)	ND (0.2)	17	6.7	11	2.9	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	31	31
	03/18/16	9 - 10	N	ND (2) *	1.2	98	ND (1) *	ND (1)	ND (0.2)	13	7.2	8.6	1.9	ND (0.1) *	ND (1)	8.7	ND (1)	ND (1)	ND (2) *	32	29
AOC27-18	03/17/16	0 - 1	N	ND (2) *	2.6	110	ND (1) *	ND (1)	0.3	15	4.1	8.3	5.7	ND (0.1) *	ND (1)	7.3	ND (1)	ND (1)	ND (2) *	22	26
	03/17/16	2 - 3	N	ND (2.1) *	3.1	91	ND (1) *	ND (1)	0.36	22	5.4	9.7	8.4	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	24	31
	03/17/16	5 - 6	N	ND (2.1) *	2.5	100	ND (1) *	ND (1)	ND (0.21)	11	4.1	7.4	6.9	ND (0.1) *	ND (1)	7.7	ND (1)	ND (1)	ND (2.1) *	19	27
	03/17/16	9 - 10	N	ND (2.1) *	2.5	81	ND (1) *	ND (1)	1.2	22	3.2	6.8	7.1	ND (0.1) *	ND (1)	5.4	ND (1)	ND (1)	ND (2.1) *	17	47
AOC27-18E	03/17/16	4 - 5	N	ND (2) *	2.7	110	ND (1) *	1.8	ND (0.2)	11	3.9	6.6	10	ND (0.1) *	ND (1)	6.7	ND (1)	ND (1)	ND (2) *	18	250
AOC27-2	03/18/16	0 - 1	N	ND (2) *	4.2	100	ND (1) *	ND (1)	0.2	13	3.2	5.6	3.8	ND (0.1) *	ND (1)	5.2	ND (1)	ND (1)	ND (2) *	19	24
	03/18/16	2 - 3	N	ND (2) *	5.3	150	ND (1) *	ND (1)	0.28	16	3.9	8.1	5.7	ND (0.1) *	ND (1)	5.7	ND (1)	ND (1)	ND (2) *	23	24
	03/18/16	5 - 6	N	ND (2) *	3.5	160	ND (1) *	ND (1)	ND (0.2)	11	5.2	8.5	4.9	ND (0.1) *	ND (1)	7.9	ND (1)	ND (1)	ND (2) *	24	30
	03/18/16	9 - 10	N	ND (2) *	2.1	96	ND (1) *	ND (1)	ND (0.2)	14	6.6	9.3	3.3	ND (0.1) *	ND (1)	9.1	ND (1)	ND (1)	ND (2) *	32	32
AOC27-20	03/01/16	0 - 1	N	ND (2) *	1.9	84	ND (1) *	ND (1)	ND (0.2)	17	7.2	9.2	8.4	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	27	38
	03/01/16	2 - 3	N	ND (2.1) *	3.2	70 J	ND (1) *	ND (1)	ND (0.21)	19	8.8	11	4.6	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	31	42
	03/01/16	2 - 3	FD	ND (2.1) *	3.2	51 J	ND (1.1) *	ND (1.1) *	ND (0.21)	18	8.3	9.7	3.6	ND (0.11) *	ND (1.1)	14	ND (1.1)	ND (1.1)	ND (2.1) *	32	42
	03/01/16	5 - 6	N	ND (2.1) *	2.4	65	ND (1) *	ND (1)	0.29	20	7.2	27	15	0.13	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	27	74
	03/01/16	9 - 10	N	ND (2.1) *	3.5	32	ND (1) *	ND (1)	ND (0.21)	20	9.5	11	2.7	ND (0.1) *	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	38	41
AOC27-24	03/18/16	0 - 1	N	ND (2) *	3.9	180	ND (1) *	ND (1)	0.36	29	6.2	12	6.2	ND (0.1) *	ND (1)	9.2	ND (1)	ND (1)	ND (2) *	31	37
	03/18/16	2 - 3	N	ND (2) *	2.6	150	ND (1) *	ND (1)	ND (0.2)	19	6.6	9.4	3.6	ND (0.1) *	ND (1)	9.8	ND (1)	ND (1)	ND (2) *	33	33
	03/18/16	5 - 6	N	ND (2) *	2.6	120	ND (1) *	ND (1)	ND (0.2)	14	6.5	11	4.1	ND (0.1) *	ND (1)	9.2	ND (1)	ND (1)	ND (2) *	30	30
	03/18/16	9 - 10	N	ND (2) *	2	130	ND (1) *	ND (1)	ND (0.2)	20	7.5	14	3	ND (0.1) *	ND (1)	13	ND (1)	ND (1)	ND (2) *	34	34
AOC27-24SW	03/18/16	0 - 1	N	ND (2) *	3.2	150	ND (1) *	ND (1)	ND (0.2)	15	6.9	13	4.3	ND (0.1) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	31	32
	03/18/16	2 - 3	N	ND (2) *	4.4	170	ND (1) *	ND (1)	0.34	17	5.4	8.9	7	ND (0.1) *	ND (1)	8.1	ND (1)	ND (1)	ND (2) *	25	29
	03/18/16	5 - 6	N	ND (2) *	1.8	100	ND (1) *	ND (1)	ND (0.2)	20	7.6	11	2.9	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	29	33
	03/18/16	9 - 10	N	ND (2) *	1.2	97	ND (1) *	ND (1)	ND (0.2)	12	7	9.3	1.9	ND (0.1) *	ND (1)	8.4	ND (1)	ND (1)	ND (2) *	32	29
AOC27-27	03/02/16	0 - 1	N	ND (2) *	3.3	100	ND (1) *	ND (1)	ND (0.2)	22	6.4	11	5.5	0.12	ND (1)	11	ND (1)	ND (1)	ND (2) *	34	38
	03/02/16	2 - 3	N	ND (2.1) *	2.6	100	ND (1) *	ND (1)	ND (0.21)	16	7.6	8.2	3.8	0.1	ND (1)	12	ND (1)	ND (1)	ND (2.1) *	36	38
AOC27-36	03/17/16	0 - 1	N	ND (2.1) J*	4.6	150 J	ND (1) *	ND (1)	ND (0.21)	14	5.4	11	6	ND (0.1) *	ND (1)	11	ND (1) J	ND (1)	ND (2.1) *	25	59 J
	03/17/16	2 - 3	N	ND (2.1) *	4.4	210	ND (1) *	ND (1)	ND (0.21)	14	3.9	7	4.3	ND (0.11) *	ND (1)	7	ND (1)	ND (1)	ND (2.1) *	21	24
	03/17/16	5 - 6	N	ND (2.2) *	2.8	100	ND (1.1) *	ND (1.1) *	ND (0.22)	16	6.1	8.8	3.7	ND (0.11) *	ND (1.1)	9.8	ND (1.1)	ND (1.1)	ND (2.2) *	29	29
	03/17/16	9.6 - 10	N	ND (2.2) *	5.2	81	ND (1.1) *	ND (1.1) *	ND (0.22)	13	5.6	11	6.5	ND (0.11) *	ND (1.1)	11	ND (1.1)	ND (1.1)	ND (2.2) *	27	34
AOC27-4	03/17/16	0 - 1	N	ND (2) *	2.8	110 J	ND (1) *	ND (1)	0.23	16	4	7.5	7.3	ND (0.1) *	ND (1)	7.2	ND (1)	ND (1)	ND (2) *	21	31
	03/17/16	0 - 1	FD	ND (2) *	3.2	150 J	ND (1) *	ND (1)	0.28	16	4.8	8.9	6.6	ND (0.1) *	ND (1)	6.9	ND (1)	ND (1)	ND (2) *	25	31
	03/17/16	2 - 3	N	ND (2) *	4	180	ND (1) *	ND (1)	ND (0.2)	13	5.7	9.5	5.9	ND (0.1) *	ND (1)	8.1	ND (1)	ND (1)	ND (2) *	25	27
	03/17/16	5 - 6	N	ND (2) *	1.1	76	ND (1) *	ND (1)	ND (0.2)	14	7.1	8.1	2	ND (0.099) *	ND (1)	9.1	ND (1)	ND (1)	ND (2) *	36	28

TABLE B-7a
Sample Results: Metals
AOC 27 – MW-24 Bench
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Metals (mg/kg)																	
Interim Screening Level [1]:				**0.285**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**0.0125**	**1.37**	**27.3**	**1.47**	**5.15**	**0.78**	**52.2**	**58**
Residential Regional Screening Levels [2]:				**31**	**0.68**	**15,000**	**160**	**71**	**0.3**	**120,000**	**23**	**3,100**	**400**	**11**	**390**	**1,500**	**390**	**390**	**0.78**	**390**	**23,000**
Residential DTSC-SL [3]:				**NE**	**0.11**	**NE**	**15**	**5.2**	**NE**	**36,000**	**NE**	**NE**	**80**	**1**	**NE**	**490**	**NE**	**390**	**NE**	**390**	**NE**
Ecological Comparison Values [4]:				**0.285**	**11.4**	**330**	**23.3**	**0.0151**	**139.6**	**36.3**	**13**	**20.6**	**0.0166**	**0.0125**	**2.25**	**0.607**	**0.177**	**5.15**	**2.32**	**13.9**	**0.164**
Background [5]:				**NE**	**11**	**410**	**0.672**	**1.1**	**0.83**	**39.8**	**12.7**	**16.8**	**8.39**	**NE**	**1.37**	**27.3**	**1.47**	**NE**	**NE**	**52.2**	**58**
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium, Hexavalent**	**Chromium, total**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
AOC27-5	03/17/16	0 - 1	N	ND (2) *	3.4	110	ND (1) *	ND (1)	0.31	15	3.7	7.6	7	ND (0.1) *	ND (1)	7.2	ND (1)	ND (1)	ND (2) *	19	48
	03/17/16	2 - 3	N	ND (2) *	4.1	120	ND (1) *	1.5	0.48	21	4.7	14	38	ND (0.1) *	ND (1)	8.8	ND (1)	ND (1)	ND (2) *	24	500
	03/17/16	5 - 6	N	ND (2) *	1.3	82	ND (1) *	ND (1)	ND (0.2)	15	6.9	9.2	2.4	ND (0.099) *	ND (1)	10	ND (1)	ND (1)	ND (2) *	34	32
	03/17/16	9 - 10	N	ND (2) *	1.6	93	ND (1) *	ND (1)	ND (0.2)	13	6.3	8.6	2.5	ND (0.1) *	ND (1)	8.8	ND (1)	ND (1)	ND (2) *	30	33
AOC27-50	03/02/16	0 - 1	N	ND (2) *	2.1	180	ND (1) *	ND (1)	0.3	25	8.3	25	73	0.13	ND (1)	13	ND (1)	ND (1)	ND (2) *	38	250
	03/02/16	2 - 3	N	ND (2.1) J*	4.4	190	ND (1) *	1.1	1.3	50 J	7.6	100 J	190 J	0.47	4.7 J	16	ND (1) J	ND (1.7)	ND (2.1) J*	26 J	330 J
	03/02/16	5 - 6	N	ND (2.1) *	2.1	62	ND (1) *	ND (1)	ND (0.21)	18	8	7.9	2.1	0.13	ND (1)	14	ND (1)	ND (1)	ND (2.1) *	29	39
	03/02/16	9 - 10	N	ND (2.1) *	2.1	36	ND (1) *	ND (1)	ND (0.21)	18	7.7	9.1	2.1	0.12	ND (1)	13	ND (1)	ND (1)	ND (2.1) *	31	38
AOC27-51	02/17/17	0 - 0.5	N	ND (2.1) *	2.3	130	ND (1) *	2.3	ND (0.21)	20	7.7	36	19	ND (0.1) *	ND (1)	15	ND (1) J	ND (1)	ND (2.1) J*	22	1,200
	02/17/17	2 - 3	N	ND (2) *	ND (1)	68	ND (1) *	ND (1)	ND (0.2)	10	5	7.4	1.4	ND (0.1) *	ND (1)	6.9	ND (1) J	ND (1)	ND (2) J*	18	28
	02/17/17	5 - 6	N	ND (2) *	1.4	97	ND (1) *	1.2	ND (0.2)	13	6.3	8.3	ND (1)	ND (0.1) *	ND (1)	8.2	ND (1) J	ND (1)	ND (2) J*	24	30
AOC27-6	02/29/16	0 - 1	N	ND (2.1) *	5.2	200	ND (1.1) *	1.5	0.87 J	43	6.7	500	630	0.51	8.3	22	ND (1.1)	ND (1.1)	ND (2.1) *	23	700
	02/29/16	2 - 3	N	ND (2.1) *	3.4	120	ND (1) *	ND (1)	4.8	24	6.9	76	37	0.26	ND (1)	16	ND (1)	ND (1)	ND (2.1) *	26	130
	02/29/16	5 - 6	N	ND (2.1) *	2.7	70	ND (1) *	ND (1)	ND (0.21)	39	8.6	18	51	0.14	ND (1)	26	ND (1)	ND (1)	ND (2.1) *	33	92
AOC27-7	02/29/16	0 - 1	N	ND (2) *	5.7	190	ND (1) *	1.7	2.7	150	11	580	170	0.32	11	35	ND (1)	ND (1)	ND (2) *	27	420
	02/29/16	2 - 3	N	3.5	20	180	ND (1.1) *	4.5	4	290	16	1,000	570	0.95	26	97	ND (1.1)	ND (1.1)	ND (2.3) *	17	1,300
	03/01/16	5 - 6	N	ND (2) *	2.6	28	ND (1) *	ND (1)	0.5	16	7.7	9.8	2.6	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	29	38
AOC27-8	03/01/16	1 - 2	N	ND (2) *	2	130	ND (1) *	ND (1)	0.49	20	7	29	24	0.17	ND (1)	11	ND (1)	ND (1)	ND (2) *	28	93
	03/01/16	5 - 6	N	ND (2) *	2.5	39	ND (1) *	ND (1)	ND (0.2)	17	7.3	15	6.1	ND (0.1) *	ND (1)	12	ND (1)	ND (1)	ND (2) *	30	45
AOC27-9	03/08/16	0 - 1	N	ND (2) J*	2.2	140	ND (1) *	ND (1)	ND (0.2)	13	5.9	8.2	2.5	ND (0.1) *	ND (1)	9.2	ND (1) J	ND (1)	ND (2) *	25	30 J
	03/08/16	0 - 1	FD	ND (2) J*	2.9	140	ND (1) *	ND (1)	ND (0.2)	14	5.8	14	5.9	ND (0.1) *	ND (1)	9.7	ND (1) J	ND (1)	ND (2) *	25	38 J
	03/08/16	2 - 3	N	ND (2) *	2.1	120	ND (1) *	ND (1)	ND (0.2)	14	5.7	8.3	3.7	ND (0.1) *	ND (1)	9.3	ND (1)	ND (1)	ND (2) *	25	35
	03/08/16	5 - 6	N	ND (2) *	2.1	120	ND (1) *	ND (1)	ND (0.2)	15	6.7	11	2.7	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2) *	33	36
	03/08/16	9 - 10	N	ND (2) *	1.2	88	ND (1) *	ND (1)	ND (0.2)	11	5.8	7.8	1.6	ND (0.1) *	ND (1)	7.9	ND (1)	ND (1)	ND (2) *	28	28
PA-13	01/27/16	0 - 1	N	ND (2.1) *	4.8	200	ND (1) *	ND (1)	0.26	15	6.3	12	5.8	ND (0.1) *	ND (1)	11	ND (1)	ND (1)	ND (2.1) *	27	45
Category 3																					
24debris-01	01/18/08 [Ю]	Unknown	N	1.3	4.1	89	ND (0.1)	0.49	0.43	9.6	2.9	17	66	ND (0.1) *	0.42	7.3	8	ND (0.25)	ND (1) *	16	26
24debris-02	01/18/08 [Ж]	Unknown	N	3.8	0.89	43	ND (0.1)	ND (0.1)	ND (0.4)	190	0.7	3.9	830	ND (0.1) *	0.56	1.4	8.9	ND (0.25)	ND (1) *	1.9	170
24debris-03	01/18/08 [Ψ]	Unknown	N	ND (0.4) *	4.6	45	ND (0.1)	0.74	ND (0.4)	16	2.7	5.1	20	ND (0.1) *	1.5	100	6.6	ND (0.25)	ND (1) *	120	41

Notes:

Category 1: Validated data suitable for all uses, including risk assessment and remedial action decisions.
Category 2: Validated data suitable for use in characterization of the chemicals of potential concern at the facility and to help define the nature and extent of contamination.
Category 3: Validated data suitable only for use in qualitative characterization of the nature and extent of contamination.

Results greater than or equal to the interim screening level are circled; however, if the interim screening level is equal to the background value, only results greater than the interim screening level are circled.

ψ	tar sample
Ж	wood sample
Ю	debris sample
*	Reporting limits greater than or equal to the interim screening level.
---	not analyzed
ft bgs	feet below ground surface
mg/kg	milligrams per kilogram
DTSC	California Department of Toxic Substances Control
DTSC-SL	DTSC Screening Levels
FD	field duplicate
J	concentration or reporting limit estimated by laboratory or data validation
N	primary sample
ND	not detected at the listed reporting limit
NE	not established
USEPA	United States Environmental Protection Agency

[1] Interim screening level is background value. If background value is not available then the interim screening value is the lower of the Ecological Comparison Value , residential DTSC-SL, or USEPA residential regional screening value.

[2] United States Environmental Protection Agency (USEPA). 2017. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. November.

[3] California Department of Toxic Substances Control (DTSC). 2018. Human Health Risk Assessment (HHRA) Note Number 3. January.

[4] ARCADIS. 2008. "Technical Memorandum 3: Ecological Comparison Values for Metals and Polycyclic Aromatic Hydrocarbons in Soil." May 28.

[5] CH2M HILL. 2009. "Final Soil Background Technical Memorandum at Pacific Gas and Electric Company Topock Compressor Station, Needles, California." May.

TABLE B-7b

Sample Results: Dioxins and Furans

AOC 27 – MW-24 Bench

Soil Engineering Evaluation/Cost Analysis

PG&E Topock Compressor Station, Needles, California

				Dioxin/Furans (ng/kg)																			
Interim Screening Level[1] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
Residential Regional Screening Levels[2] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
Residential DTSC-SL[3] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
Ecological Comparison Values[4] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
Background[5] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
Location	**Date**	**Depth (ft bgs)**	**Sample Type**	**1,2,3,4,6,7,8-HpCDD**	**1,2,3,4,6,7,8-HpCDF**	**1,2,3,4,7,8,9-HpCDF**	**1,2,3,4,7,8-HxCDD**	**1,2,3,4,7,8-HxCDF**	**1,2,3,6,7,8-HxCDD**	**1,2,3,6,7,8-HxCDF**	**1,2,3,7,8,9-HxCDD**	**1,2,3,7,8,9-HxCDF**	**1,2,3,7,8-PeCDD**	**1,2,3,7,8-PeCDF**	**2,3,4,6,7,8-HxCDF**	**2,3,4,7,8-PeCDF**	**2,3,7,8-TCDD**	**2,3,7,8-TCDF**	**OCDD**	**OCDF**	**TEQ Avian**	**TEQ Human**	**TEQ Mammals**
Category 1																							
AOC27-1	03/18/16	2 - 3	N	ND (1.4)	ND (0.43)	ND (0.1)	ND (0.093)	ND (0.059)	ND (0.095)	ND (0.058)	ND (0.09)	ND (0.15)	ND (0.073)	ND (0.06)	ND (0.062)	ND (0.063)	ND (0.053)	ND (0.15)	11 J	ND (0.32)	0.2	0.12	0.12
AOC27-18	03/17/16	0 - 1	N	280	ND (1.3)	ND (1.5)	ND (1.7)	1.4 J	7.8 J	2.1 J	4.9 J	ND (0.68)	ND (0.53)	ND (0.47)	ND (65)	ND (0.88)	ND (0.14)	ND (0.68)	3,300	110	6	9.3	9.3
	03/17/16	2 - 3	N	290	ND (170)	ND (4.3)	ND (1.7)	ND (1.9)	11 J	ND (5.8)	ND (2.7)	ND (0.76)	ND (1)	ND (0.95)	1.9 J	ND (1)	ND (0.37)	ND (0.37)	3,300	190	3.8	7.6	7.6
	03/17/16	5 - 6	N	240	ND (100)	ND (2.7)	14	ND (1.3)	ND (1.3)	ND (13)	ND (2.1)	ND (1.5)	ND (0.63)	ND (1.1)	ND (1.3)	ND (1.2)	ND (0.26)	ND (0.41)	2,600	96	4	6.8	6.8
AOC27-18E	03/17/16	4 - 5	N	330	ND (96)	ND (5.5)	ND (1.2)	ND (1.7)	5.4 J	ND (14)	ND (1.1)	ND (2)	ND (0.83)	ND (1.5)	ND (66)	ND (1.6)	ND (0.2)	ND (0.9)	3,800	110	7.4	11	11
AOC27-2	03/18/16	0 - 1	N	16	ND (0.54)	ND (0.64)	ND (0.29)	ND (0.13)	0.56 J	ND (1.3)	ND (0.41)	ND (0.15)	ND (0.27)	ND (0.31)	ND (4.4)	ND (0.33)	ND (0.066)	ND (0.31)	160	6.2 J	0.87	0.84	0.84
	03/18/16	2 - 3	N	15	ND (0.076)	ND (0.31)	ND (0.26)	ND (0.33)	ND (0.44)	ND (0.89)	ND (0.35)	ND (0.39)	ND (0.17)	ND (0.53)	ND (5.6)	ND (0.56)	ND (0.066)	ND (0.34)	130	7.2 J	1	0.83	0.83
AOC27-20	03/01/16	0 - 1	N	470	67	ND (6.4)	4.1 J	ND (2.8)	16	5.5 J	7.3 J	ND (3.2)	ND (1.4)	ND (0.41)	ND (160)	ND (0.92)	ND (0.54)	ND (0.44)	4,200	170	13	19	19
	03/01/16	2 - 3	N	130	15	ND (3.3)	2.2 J	ND (1.1)	5.5 J	1.8 J	ND (5.2)	ND (0.41)	ND (0.4)	ND (0.35)	ND (48)	ND (0.35)	ND (0.16)	ND (0.17)	1,000	36	4	5.8	5.8
	03/01/16	5 - 6	N	200	31	ND (3.8)	ND (1.8)	ND (2.1)	8.8 J	ND (1.9)	ND (3.2)	ND (2.4)	1.6 J	ND (0.59)	ND (75)	ND (0.59)	ND (0.95)	0.54 J	1,700	84	8	10	10
AOC27-4	03/17/16	0 - 1	N	1,100	ND (0.34)	7.1 J	ND (5.4)	8.9 J	20	ND (14)	7.8 J	ND (0.31)	ND (1.4)	ND (0.4)	ND (0.3)	ND (0.43)	ND (0.16)	0.73 J	11,000	260	6.8	20	20
	03/17/16	0 - 1	FD	1,000	45	5.3 J	6 J	7.8 J	18	ND (0.81)	6.9 J	ND (0.76)	1.2 J	ND (0.55)	ND (150)	ND (0.58)	ND (0.24)	ND (0.36)	9,800	200	14	26	26
	03/17/16	2 - 3	N	77	ND (0.39)	ND (1.5)	0.73 J	ND (0.79)	2.1 J	ND (0.77)	1.3 J	ND (0.92)	ND (0.46)	ND (0.35)	ND (15)	ND (0.17)	ND (0.34)	ND (0.33)	790	31	1.9	2.8	2.8
	03/17/16	5 - 6	N	ND (6.2)	ND (0.38)	ND (0.66)	ND (0.36)	ND (0.28)	ND (0.21)	ND (0.25)	ND (0.21)	ND (0.32)	ND (0.19)	ND (0.092)	ND (0.83)	ND (0.093)	ND (0.1)	ND (0.11)	ND (88)	ND (0.29)	ND (0.37)	ND (0.34)	ND (0.34)
AOC27-5	03/17/16	2 - 3	N	740	ND (0.88)	21	ND (3.7)	ND (3.9)	ND (11)	ND (9.7)	ND (5.7)	ND (0.52)	ND (1.5)	ND (0.48)	ND (98)	ND (0.57)	ND (0.24)	ND (0.29)	10,000	200	9.3	18	18
	03/17/16	5 - 6	N	ND (2.4)	ND (0.076)	ND (0.09)	ND (0.2)	ND (0.072)	ND (0.095)	ND (0.095)	ND (0.09)	ND (0.084)	ND (0.099)	ND (0.18)	ND (0.62)	ND (0.19)	ND (0.054)	ND (0.099)	35	ND (0.73)	0.29	0.2	0.2
AOC27-50	03/02/16	0 - 1	N	96	19	ND (1.2)	3.7 J	3.2 J	9.1 J	3.6 J	7.4 J	ND (0.9)	5.8 J	ND (1.9)	4.3 J	3.1 J	ND (1.5)	1.2 J	380	12 J	13	12	12
	03/02/16	2 - 3	N	420	ND (79)	6.6 J	ND (15)	12 J	52	ND (13)	34	ND (3)	32	ND (5.7)	ND (13)	12 J	ND (9.1) *	ND (4.6)	1,100	40	59	57	57
	03/02/16	5 - 6	N	9 J	ND (1.5)	ND (0.95)	ND (0.31)	ND (0.2)	ND (0.27)	ND (0.13)	ND (0.38)	0.55 J	ND (0.17)	ND (0.14)	ND (0.34)	ND (0.14)	ND (0.091)	ND (0.31)	ND (33)	ND (0.89)	0.5	0.41	0.41
AOC27-51	02/17/17	0 - 0.5	N	71	15	ND (0.91)	2.5 J	1.6 J	6.4 J	1.7 J	5.6 J	ND (0.27)	4 J	ND (0.89)	ND (12)	1.5 J	1.3 J	0.78 J	420	34	9.6	9.2	9.2
	02/17/17	2 - 3	N	6.2 J	1.2 J	ND (0.13)	0.29 J	ND (0.072)	0.87 J	ND (0.15)	0.68 J	ND (0.083)	ND (0.51)	ND (0.14)	ND (0.8)	ND (0.14)	ND (0.099)	ND (0.067)	ND (29)	ND (1)	0.58	0.65	0.65
	02/17/17	5 - 6	N	2.2 J	ND (0.27)	ND (0.051)	ND (0.057)	ND (0.094)	ND (0.057)	ND (0.09)	ND (0.056)	ND (0.11)	ND (0.074)	ND (0.11)	ND (0.41)	ND (0.11)	ND (0.038)	ND (0.026)	ND (27)	ND (0.85)	0.17	0.15	0.15
AOC27-6	02/29/16	0 - 1	N	610	99	6.4 J	32	14	77	12 J	67	3.1 J	70	7.6 J	14	11 J	19	5.4	2,300	84	120	120	120
	02/29/16	2 - 3	N	180	24	1.6 J	7.3 J	3.6 J	17	ND (2.8)	16	ND (0.94)	17	2 J	ND (18)	3.2 J	5.7	1.5 J	860	29	32	32	32
	02/29/16	5 - 6	N	47	10 J	ND (0.19)	1.9 J	ND (0.77)	5.2 J	ND (0.92)	ND (4.7)	ND (0.57)	4.3 J	ND (0.29)	ND (5.9)	ND (0.68)	ND (0.87)	ND (0.35)	330	ND (12)	6.2	6.9	6.9
AOC27-7	02/29/16	0 - 1	N	1,500	240	17	38	27	100	26	ND (63)	ND (5.7)	45	16	26	26	6.4	17	6,500	140	110	110	110
	02/29/16	2 - 3	N	1,500	380	36	62	68	160	ND (25)	120	ND (14)	110	39	81	65	29	ND (26)	4,000	190	260	230	230
	03/01/16	5 - 6	N	45	ND (0.48)	ND (0.57)	2 J	1.1 J	4.1 J	0.88 J	ND (3.1)	ND (0.2)	2.4 J	ND (0.59)	ND (1)	0.85 J	ND (0.25)	ND (0.15)	ND (190)	ND (5.4)	4.1	4.3	4.3
AOC27-8	03/01/16	1 - 2	N	330	67	ND (3.9)	11 J	7 J	27	ND (6.6)	21	ND (1)	14	3.9 J	ND (30)	6.7 J	4 J	3.9 J	1,500	53	36	33	33
	03/01/16	5 - 6	N	31	4.7 J	ND (1.2)	1.4 J	0.72 J	ND (1.8)	ND (0.52)	ND (1.3)	ND (1.2)	1.4 J	ND (0.43)	ND (5.1)	0.51 J	ND (0.17)	ND (0.43)	ND (170)	ND (6.8)	2.9	2.8	2.8

TABLE B-7b

Sample Results: Dioxins and Furans
AOC 27 – MW-24 Bench
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

				Dioxin/Furans (ng/kg)																			
Interim Screening Level[1] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	16	50	5.58
Residential Regional Screening Levels[2] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	4.8	NE	NE	NE	4.8	NE	NE	NE	NE	4.8	NE
Residential DTSC-SL[3] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	50	NE
Ecological Comparison Values[4] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	16	NE	1.6
Background[5] :				NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.98	5.58	5.58
Location	Date	Depth (ft bgs)	Sample Type	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDF	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDF	2,3,4,6,7,8-HxCDF	2,3,4,7,8-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	OCDD	OCDF	TEQ Avian	TEQ Human	TEQ Mammals
AOC27-9	03/08/16	0 - 1	N	110	23	ND (1.8)	1.3 J	ND (0.84)	3.7 J	1.3 J	ND (2.2)	ND (0.36)	ND (0.37)	ND (0.69)	ND (36)	ND (0.69)	ND (1.2)	1.4 J	960	120	5.2	5.3	5.3
	03/08/16	2 - 3	N	60	ND (0.64)	ND (0.76)	ND (0.41)	ND (0.73)	ND (0.35)	ND (0.64)	ND (0.36)	ND (0.83)	ND (0.57)	ND (0.82)	ND (9.7)	ND (0.52)	ND (0.21)	ND (1.9)	540	23 J	2.4	2	2
	03/08/16	5 - 6	N	20	3.3 J	ND (0.94)	ND (0.7)	ND (0.27)	ND (1.1)	ND (0.32)	ND (0.79)	ND (0.34)	ND (0.32)	ND (0.36)	ND (3.6)	ND (0.33)	ND (0.2)	0.91 J	ND (150)	ND (6.4)	1.7	1	1

Notes:

Category 1: Validated data suitable for all uses, including risk assessment and remedial action decisions.
Category 2: Validated data suitable for use in characterization of the chemicals of potential concern at the facility and to help define the nature and extent of contamination.
Category 3: Validated data suitable only for use in qualitative characterization of the nature and extent of contamination.

Results greater than or equal to the Interim Screening Level are circled.

--	not analyzed
ft bgs	feet below ground surface
ng/kg	nanograms per kilogram
DTSC-SL	DTSC Screening Levels
DTSC	California Department of Toxic Substances Control
FD	Field Dupliicate
J	concentration or reporting limit estimated by laboratory or data validation
JR	estimated value, one or more input values is "R" qualified.
N	Primary Sample
NA	NA = not applicable
NE	not established
ND	not detected at the listed reporting limit
R	The result has been rejected; identification and/or quantitation could not be verified because critical QC specifications were not met (e.g., a non-detect result obtained for an archive sample following a hold time of greater than one year).
USEPA	USEPA = United States Environmental Protection Agency

1 For individual dioxins and furans, selected value is the lower of the ECV, residential DTSC-SL, or USEPA residential regional screening value, unless the background value is higher. For TEQ values, selected value is the DTSC-SL.

2 United States Environmental Protection Agency (USEPA). 2017. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. November.

3 California Department of Toxic Substances Control (DTSC). 2018. Human Health Risk Assessment (HHRA) Note Number 3. JanuaryCalifornia Department of Toxic Substances Control (DTSC). 2017. Human Health Risk Assessment (HHRA) Note 2, Soil Remedial Goals for Dioxins and Dioxin-like Compounds for Consideration at California Hazardous Waste Sites. April.

4 ARCADIS. 2008. "Technical Memorandum 3: Ecological Comparison Values for Metals and Polycyclic Aromatic Hydrocarbons in Soil." May 28. ARCADIS. 2009. "Topock Compression Station - Final Technical Memorandum 4: Ecological Comparison Values for Additional Dectected Chemicals in Soil." July 1.

5 CH2M. 2017. Revised Ambient Study of Dioxins and Furans at the Pacific Gas and Electric Company, Topock Compressor Station, Needles, California. October.

Calculations:

TEQ = Sum of Result xToxic equivalency factor (TEF), 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TEQ Avian = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

TEQMammals = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

Teq Humans = Sum of Result x TEF, 1/2 reporting limit used for nondetects. If all Dioxins and Furans are nondetect, the final qualifier code is U.

Appendix C
Soil HHERA Executive Summary

Design & Consultancy for natural and built assets

Pacific Gas and Electric Company

SOIL HHERA EXECUTIVE SUMMARY

Topock Compressor Station, Needles, CA

February 2020

EXECUTIVE SUMMARY

This appendix is the executive summary from the Soil Human Health and Ecological Risk Assessment (HHERA) Report (Arcadis 2019) for the Topock site. The executive summary is reproduced here without alteration. This information is attached to the Soil Engineering Evaluation/Cost Analysis (EE/CA) document prepared by Jacobs (2020) to provide additional information on the approach and methods used in the HHERA. Citations in this text for document sections, tables, and figures refers to the sections, tables, and figures in the HHERA document.

The relevance of this information to the suggestions and recommendations for potential remediation at the Topock site is discussed in the body of the EE/CA document.

ES.1 Introduction

This Soil Human Health and Ecological Risk Assessment (HHERA) Report describes the potential risks to human health and ecological receptors that may contact soil impacted by historical discharges and operations at the Pacific Gas and Electric Company (PG&E) Topock Compressor Station (TCS). The TCS is an active natural gas compressor station located in eastern San Bernardino County, approximately 15 miles southeast of Needles, California. The compressor station occupies approximately 15 acres of a 65-acre parcel of PG&E-owned land. The study area for investigative and remedial activities covers additional surrounding land including portions of a 100-acre parcel owned by the Fort Mojave Indian Tribe (FMIT) and land owned and/or managed by government agencies including the U.S. Bureau of Land Management (USBLM), U.S. Bureau of Reclamation (USBOR), U.S. Fish and Wildlife Service (USFWS), San Bernardino County, California Department of Transportation, and Burlington Northern Santa Fe (BNSF) Railroad. The TCS and the additional surrounding areas investigated together are referred to as the “site” in this report.

PG&E is conducting investigative and remedial activities at the site, including this HHERA, pursuant to the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). Under CERCLA, the primary purpose of a baseline risk assessment (BRA) is to provide risk managers with an understanding of the potential adverse health effects (current or future) to human and ecological receptors posed by the release of hazardous substance from the site and in the absence of any actions to control or mitigate those releases. This information may be useful in determining whether a potential current or future threat to human health or the environment exists that warrants an action. This Soil HHERA, in conjunction with the Groundwater Risk Assessment (GWRA) (Arcadis 2009c), represent a BRA. The HHERA conducted for the TCS involved two primary components:

- Human health risk assessment (HHRA), which identifies potential human receptors and exposure pathways and presents the potential risks to human health that could result from exposure to constituents of potential concern (COPCs) in soil (discussed in Section 5 of the HHERA Report).
- Ecological risk assessment (ERA), which identifies potential ecological receptors and exposure pathways and presents the potential risks to ecological receptors that could result from exposure to constituents of potential ecological concern (COPECs) in soil (discussed in Section 6 of the HHERA Report).

The HHERA findings will be helpful in making risk management decisions. In accordance with the Human Health and Ecological Risk Assessment Work Plan (RAWP; Arcadis 2008a), specific objectives of the HHERA are twofold:

1. Help determine the need for remedial action with respect to soil conditions
2. Provide a basis for determining levels of constituents that can remain in soil at the site and still adequately protect public health and the environment (U.S. Environmental Protection Agency [USEPA] 1989).

The solid waste management units (SWMUs), areas of concern (AOCs), and additional surrounding areas investigated as part of the RCRA Facility Investigation/Remedial Investigation (RFI/RI) are those associated with the historical discharge to soil by operations and activities at the site. Site areas are organized into these two categories:

- Outside the TCS Fenceline – Evaluated for both potential human health and ecological impacts.
- Inside the TCS Fenceline – Evaluated for potential human health impacts only. Because this is an active operating facility, activities, and conditions inside the fenceline do not offer a suitable or attractive habitat for ecological populations at this time. All potential exposure pathways for ecological receptors are considered incomplete inside the TCS fenceline (Eichelberger 2006).

The HHERA evaluated all constituents detected in the soil during the RFI/RI and identifies those constituents that could potentially pose an unacceptable risk to either human health or the ecological environment using the methodology presented in the approved RAWP documents (Arcadis 2008a, 2009a, 2015) and California Environmental Protection Agency (CalEPA), Department of Toxic Substances Control (DTSC)-issued Directive Letter (DTSC 2017).

ES.2 Site History and Characteristics

ES.2.1 Site Historical Operations

The TCS began operations in December 1951 to compress natural gas supplied from the southwestern United States for transport through pipelines to PG&E's service territory in central and northern California. Current operations at the TCS are very similar to the operations that have occurred since 1951. The greatest use of chemical products at the facility involves treatment of cooling water, and the greatest volume of waste produced consists of untreated wastewater (or, blowdown) from the cooling towers.

From 1951 to 1964, untreated wastewater containing hexavalent chromium (used to inhibit corrosion, minimize scale formation, and control biological growth) was discharged to Bat Cave Wash (BCW), an ephemeral drainage that extends from the Chemehuevi Mountains to the north. From 1964 to 1969, PG&E treated the wastewater by converting hexavalent chromium to trivalent chromium. Beginning in May 1970, treated wastewater was discharged to an injection well (which is named PGE-08) located on PG&E property inside the TCS, and discharges to BCW generally ceased. Use of the injection well ceased in 1973 and wastewater was discharged exclusively to the four, single-lined evaporation ponds, located about 1,600 feet west of the TCS.

In the 1980s and 1990s, PG&E ended use of hexavalent chromium, removed the wastewater treatment system, and replaced the single-lined ponds with four new, Class II (double-lined) ponds. PG&E still uses the double-lined ponds, which are on USBLM property.

PG&E conducted soil investigations at six SWMUs, 29 AOCs, and seven additional investigation areas located inside and outside the TCS fenceline. The investigation areas carried forward into this HHERA are listed in the table titled Investigation Areas Carried Forward into the HHERA.

Investigation Areas Carried Forward into the HHERA

Location	Investigation Areas Carried Forward into the HHERA
Inside the TCS	• SWMU 5 (Sludge Drying Bed) • SWMU 6 (Chromate Reduction Tank) • SWMU 8 (Process Pump Tank) • SWMU 9 (Transfer Pump) • SWMU 11 (Former Sulfuric Acid Tanks) • AOC 5 (Cooling Tower A) • AOC 6 (Cooling Tower B) • AOC 7 (Hazardous Materials Storage Area) • AOC 8 (Paint Shed) • AOC 13 (Unpaved Area Within the TCS) • AOC 15 (Auxiliary Jacket Cooling Water Pumps) • AOC 16 (Former Sandblast Shelter) • AOC 17 (Onsite Septic System) • AOC 18 (Combine Wastewater Transference Pipelines) • AOC 19 (Former Cooling Liquid Mixing Area and Former Hotwell) • AOC 20 (Industrial Floor Drains) • AOC 21 (Round Depression Near Sludge Drying Bed) • AOC 22 (Unidentified Three-Sided Structure) • AOC 23 (Former Water Conditioning Building) • AOC 24 (Stained Area and Former API Oil/Water Separator) • AOC 25 (Compressor and Generator Engine Basements) • AOC 26 (Former Scrubber Oil Sump) • AOC 32 (Oil Storage Tanks and Waste Oil Sump) • AOC 33 (Potential Former Burn Area Near AOC 17) • Unit 4.3 (Oily Water Holding Tank) • Unit 4.4 (Oil/Water Separator) • Unit 4.5 (Portable Waste Oil Holding Tank) • Portions of AOC 4 Inside the Fence Line • Perimeter Area

Location	Investigation Areas Carried Forward into the HHERA
Outside the TCS	• SWMU 1 (Former Percolation Bed) • TCS Well #4 (Capped Well) • AOC 1 (Area Around the Percolation Bed) • AOC 4 (Debris Ravine) • AOC 9 (Southeast Fence Line) • AOC 10 (East Ravine) • AOC 11 (Topographic Low Areas) • AOC 12 (Fill Areas) • AOC 14 (Railroad Debris Site) • AOC 27 (MW-24 Bench) • AOC 28 (Pipeline Drip Legs) • AOC 31 (Former Tea Pot Dome Oil Pit) • Undesignated Area 2 (UA-2) (Former 300B Pipeline Liquids Tank) • Perimeter Area • Storm Drain System

ES.2.2 Soil Investigations and AOC 4 Interim Action

Investigative and remedial activities at the TCS date back to the 1980s when a RCRA Facility Assessment was completed, identifying a series of SWMUs at the site. The RFI began in 1996, and numerous phases of data collection and evaluation have been completed. Since 2005, investigative and remedial activities have been performed pursuant to both RCRA and CERCLA. The primary reports documenting these investigations are as follows in the table titled Primary Investigation Reports.

Primary Investigation Reports

Report Name	Notes
RFI/RI Report Volume 1 Site Background and History (CH2M Hill [CH2M] 2007a)	• Completed in August 2007. • Approved by CalEPA, DTSC (2007) and U.S. Department of the Interior (DOI 2007a).
RFI/RI Report Volume 2 Hydrogeologic Characterization and Results of Groundwater and Surface Water Investigation and Addendum (CH2M 2009)	• Report completed in February 2009. • Addendum completed in June 2009. • Approved by DTSC (2009b) and DOI (2009a).
PG&E Topock Compressor Station Soil Investigation Data Package (PG&E 2018)	• PG&E TCS soil investigation data package transmittal to DOI, dated May 8, 2018.

Report Name	Notes
RFI/RI Report Volume 3 Results of Soil and Sediment Investigation (forthcoming)	• Currently being prepared by Jacobs. • Includes final characterization data to complete the RFI/RI requirements for remaining TCS operations, including the results of soil investigations and the storm drain alignment investigation. • Data provided to DOI in the TCS soil investigation data package transmittal (PG&E 2018), will be included in the Draft RFI RI Report Volume 3, and form the basis for the risk evaluations in the Soil HHERA.
Time-Critical Removal Action (TCRA) at the AOC 4 Debris Ravine Site (DOI 2009b)	• Result of DOI Action Memorandum that directed PG&E to initiate TCRA at AOC 4. • Fill material and debris were believed to be deposited and trash reportedly was burned at AOC 4. • Removed 11,799 tons of soil and debris from AOC 4. • Based on confirmation dataset and installation of erosion control measures, substantial threat of release of contaminated material from AOC 4 was stabilized and mitigated by the TCRA (Alisto Engineering Group [Alisto] et al. 2011).
Soil Background Investigations (Various reports/authors)	• Conducted to characterize the background conditions for the presence of metals, polycyclic aromatic hydrocarbon (PAHs), and dioxins/furans, and to establish background concentrations in soil. • Site-related concentrations of constituents were compared to background concentrations to assess whether the delineation of nature and extent of contamination in soils at investigation areas was adequate. • Results are provided in a series of reports (see Section 2.2.4 of the HHERA Report).

ES.2.3 Site Conditions and Characteristics

The site is located in the Mohave Valley, along the California-Arizona border in eastern San Bernardino County, California. The Chemehuevi Mountains are located to the south and the Colorado River is located to the east and north. The site occupies approximately 3 square miles of the north-sloping piedmont alluvial terrace and floodplain along the northern margin of the mountains.

ES.2.3.1 Physical and Ecological Characteristics

The tables in this section summarize the physical and ecological characteristics, and current and future land use at the site that are important for the HHERA.

Site Physical and Ecological Characteristics and Land Use

Physical/ Ecological Characteristic	Description
Geology	• Geology of the landforms is characterized by alluvial terraces and incised drainage channels. • BCW is a prominent desert wash that crosses the Study Area from south to north. • Unconsolidated alluvial and fluvial deposits are underlain by the Miocene conglomerate and pre-Tertiary metamorphic and igneous bedrock. • In the upland area, the subsurface shallow aquifer zone consists of alluvial deposits.
Hydrology and Hydrogeology	• Site is situated at the southern extent of unconsolidated alluvial aquifer material in the Mohave groundwater basin. • Colorado River runs north to south through the basin. • Groundwater occurs under unconfined to semi-confined conditions beneath most of the site. • Saturated portion of the alluvial fan and fluvial sediments are collectively referred as the alluvial aquifer. • In the floodplain area adjacent to the Colorado River, the fluvial deposits interfinger with, and are hydraulically connected to, the alluvial fan deposits. • Unconsolidated alluvial and fluvial deposits are underlain by bedrock with very low permeability; therefore, groundwater movement occurs primarily in the overlying unconsolidated deposits, and groundwater flow is generally north to northeasterly. • Due to the variable topography at the site, the depth to groundwater ranges from as shallow as 5 feet below ground surface (bgs) in floodplain wells next to the river to approximately 170 feet bgs at the upland alluvial terrace areas.
Ecological Overview	• Site is located adjacent to and includes a portion of the 37,515-acre Havasu National Wildlife Refuge (HNWR) managed by USFWS. • Area is characterized by arid conditions and high temperatures and consists of a series of terraces divided by dry desert washes (CH2M 2007a). • Site is located either within the Mojave Desert province of California, the Colorado Desert, or the boundary between these two deserts (CH2M 2007a). Upland terrestrial habitats are typical of Mojave Desert uplands dominated by creosote bush scrub, with Mojave Wash, desert riparian, and tamarisk thicket. • BCW (AOC 1/SWMU 1) is relatively barren of vegetation, consisting of sand, gravel, and cobblestone substrate (CH2M 2014); BCW is a primarily north-south-trending channel located west of the Colorado River; large volume surface flows are generally infrequent and occur only briefly in response to high intensity rainfall events, but remains dry throughout most of the year due to arid desert conditions (PG&E 2013, 2014). Dense vegetation is present in the Tamarisk Thicket area, located at the northern end of BCW. • East Ravine (AOC 10) is 1,600 foot long and runs eastward toward the Colorado River. The ravine is bisected by three constructed berms and contains three drainage

Physical/ Ecological Characteristic	Description
	depression areas that are located behind these berms. AOC 10 is relatively barren of vegetation; may periodically flood during stormwater runoff events but remains dry throughout most of the year due to arid desert conditions. Flooding events are periodic; on the frequency of one or two times a year and usually during the summer monsoon season. • Riparian corridors consisting of small patches of emergent vegetation exist along the banks of the Colorado River, with little to no submergent vegetation within the river. East of the Colorado River, the Action Area is a sand and salt cedar (Tamarisk) environment very similar to that found on the floodplain on the California side. Various wildlife and plant species are supported by the riparian habitat. Saturated sediments along the edge of the Colorado River that are ephemerally (temporarily) flooded are located at the mouth of BCW and at the mouth of East Ravine (east of AOC 10). The ephemeral flooding is due to infrequent high flow in the wash or annual variations in stage along the Colorado River, the latter of which is not associated with the potential for transport of site-related materials.
Special-Status Species	• Programmatic Biological Assessments (PBAs; CH2M 2007b and 2014) and the reinitiations (PG&E 2017a, b) were conducted to evaluate potential impacts to species and habitats; concluded “may affect but likely to not adversely affect” for all the special-status species evaluated and their critical habitat for all terrestrial species for ongoing and planned activities at the site, including federally listed species. • No state- or federal-listed threatened or endangered (T&E) plant species are potentially present in the upland or riparian areas. • In the upland areas, special-status plant species are potentially present (CH2M 2017). California Desert Native Plant Act (CDNPA) or ethnobotanical plants include blue palo verde, catclaw acacia, desert smoke tree, and the western honey mesquite. California Rare Plants include mousetail suncup and the hillside palo verde. • No federal listed T&E wildlife species were observed at the site, except for a single observation of the southwestern willow flycatcher (federally listed T&E species) in 2009 in the Tamarisk Thicket (Garcia and Associates [GANDA] 2017), which is not considered to be resident at the site. • Other federally listed species including desert tortoise, yellow-billed cuckoo, and Yuma clapper rail were not directly observed at the site (CH2M 2014, Konecny Biological Services [Konecny] 2012). • Two large home-range species have been observed: the ring-tailed cat and Nelson’s bighorn sheep. The ring-tailed cat is a California fully protected species. To be consistent with the GWRA (Arcadis 2009c) and observations made by a PG&E employee at the site Nelson’s bighorn sheep was evaluated. • Bat surveys indicated presence of the cave myotis and pallid bat (state species of concern) at BCW (Harvey 2015). Townsend big-eared bats (a state species of concern) have not been directly observed at the site (CH2M 2015, Brown and Rainey 2015).

Land Use	Description
Current – General	• Site is located in a sparsely populated, rural area. • Major gas utility and transportation corridor, BNSF Railroad (railroad-owned land), and Interstate 40 (I-40) (California Department of Transportation-owned land) are located within the site.
Current – TCS	• TCS in an active operation and occupies approximately 15 acres of a 65-acre parcel of PG&E-owned land. • The surrounding area includes land owned and/or managed by a number of government agencies, including USBLM, USBOR, USFWS, and San Bernardino County. • USBLM-managed lands within the area are owned by USBLM, San Bernardino County, and USBOR and are considered public; however, public use is not encouraged, as the Topock Maze, a culturally significant area for several Native American tribes, is located here.
Current – Tribes	• The Tribes indicated in a memorandum (FMIT 2012) and a letter (FMIT 2013) that the tribal use of the land in the area of the site including the Topock Maze is limited to: Tribal Group Activities several times a year for prayer and reflection; Tribal Education Activities for students and young people to visit the area to learn about its importance and spiritual significance; and Tribal Member Individual Visits to the Mojave Valley on a regular but infrequent basis for quiet time and reflection as part of religious practice and culture, to pay homage to the area and to honor their ancestors.
Current – Residential and Recreational	• Nearest residents are located 2,000 feet away across the river in Topock, Arizona, a seasonal community of about 20 (mostly retired senior citizens) in a small mobile home park near the Topock 66 Marina. • Few permanently occupied homes are located on the southern side of I-40, along the shoreline between the pipeline bridge and the I-40. • Moabi Regional Park is a recreational facility operated by the San Bernardino County Department of Parks and Recreation, which is located on land leased from USBLM. As a regional park, it has no permanent full-time residents.
Future	• PG&E plans to continue owning and operating the TCS and associated property as an industrial operation for the foreseeable future. The railroad and highway will also continue in their current use for the foreseeable future. Accordingly, the reasonably anticipated future use of these areas is the same as their current use, industrial operations. • The primary conservation mission of USFWS, as it applies to the HNWR, limits human use of HNWR property. Therefore, in the future, human use of HNWR property will continue to be restricted to recreational uses. • Similarly, future use of the USBLM-owned land at the site is likely to remain recreational. Nonetheless, as recommended by DOI, future uses of the USBLM-owned property could include seasonal residential use and year-round residential use for San Bernardino County staff at Park Moabi, and recreational (such as camping) use on the floodplain. • Although future residential use of the USBLM land is unlikely, DOI has specifically requested an evaluation of future residential use on USBLM property.

ES.2.3.2 Conceptual Site Model

The conceptual site model (CSM) for the site shows the relationships between a chemical source, exposure pathways, and potential receptors. The components that constitute the fate and transport portions of the CSM include potential sources, release mechanisms, and retention and transport media. These components apply to both the HHRA and ERA and are discussed in more detail in Section 2.5 of the HHERA Report.

For this site, several CSMs (Figures 2-2 through 2-7 of the HHERA Report) were prepared that illustrate the potential source-pathway-receptor relationships and provide the basis for the quantitative exposure assessment undertaken as part of the HHERA. Most sources for site-related compounds found both inside and outside the compressor station originated inside the compressor station or from associated activities, including incidental spills/releases from various processes and activities for the operating facility. Current data indicate that the primary site related constituents in soils are metals, primarily hexavalent chromium and trivalent chromium, as well as dioxins (CH2M 2007a).

Once constituents are in soil, the potential pathways through which the constituents may move from the soil to other environmental media include: transport and release through surface water runoff, leaching to groundwater, fugitive dust emissions, and volatilization of volatile organic compounds (VOCs) from soil and release into ambient/indoor air. For the HHRA, soil direct contact exposure pathways (that is, incidental ingestion, inhalation, and dermal contact) were the primary potentially complete exposure pathways evaluated. For the ERA, the primary potentially complete exposure pathways for soil are direct contact (plants and soil invertebrates) and incidental ingestion and uptake of constituents from soil into biota and subsequent ingestion of biota as part of the diet for wildlife (mammals and birds).

ES.3 Data Evaluation

During the HHERA, the data evaluation process analyzed site characteristics and analytical data to identify constituents that are potentially related to the site and for which there are data of sufficient quality to be used in a quantitative risk assessment (USEPA 1989). Data collected from 1997 through 2017 during multiple phases of site investigation were consolidated and used in the quantitative risk assessment.

The soil and soil gas data included in the HHERA are summarized in the table titled Overview of Data Included in the HHERA; Section 3 of the HHERA Report provides more details. Soil and soil gas sample locations for data evaluated in the HHERA are presented on Figures 3-1a and 3-1b for areas outside the TCS and on Figure 3-2 for the area inside the TCS.

Overview of Data Included in the HHERA

Media	Data Included in the HHERA
Soil	• Only Category 1 data are included in the datasets used in the quantitative risk assessment. Soil samples representative of soil that has been removed as part of a removal action were not included in the HHERA datasets. • Soil samples were analyzed for one or more of the following chemical analytical suites: o Metals o Contract Laboratory Program (CLP) inorganics o PAHs o Semivolatile organic compounds (SVOCs) and VOCs o Total petroleum hydrocarbons (TPHs) o General chemistry parameters o Pesticides o Polychlorinated biphenyls (PCBs) o Dioxins/furans. • Samples designated 'white powder' collected from AOC 9, AOC 10, AOC 14, and SWMU 1 are included in the datasets used in the quantitative risk assessment as a conservative measure assuming that contact would not differ significantly from exposure to surrounding soil.
Soil Gas	• Soil gas samples were collected in January 2016 and February 2017 at several locations inside the TCS fenceline at 3 or 6 feet bgs and analyzed for VOCs.

Additionally, data are available for sediment, porewater, and various debris materials. Sediment and porewater data, collected in 2003 and 2017 at the mouth of BCW and in East Ravine along the Colorado River, were not used to estimate potential risk to human and ecological receptors in the HHERA because potential receptor exposures in the sediment areas were found to be insignificant based on a transport pathway evaluation and gradient analysis conducted as described in Section 2.5 of the HHERA Report.

ES 3.1 Data Usability

Data usability criteria identified by USEPA (1992) were used to confirm that the data were suitable for risk assessment. Data validation was conducted in accordance with the Quality Assurance Project Plan QAPP (CH2M 2004), and overall, the data were determined to be of acceptable quality (except where noted with appropriate flags), and the completeness objectives were accomplished. Section 3.2 of the HHERA Report discusses the data usability criteria and application to site data.

ES 3.2 Groupings of Data

As described in the RAWP documents (Arcadis 2008a, 2009a, 2015) and based on subsequent direction from DTSC (2017), areas at the site were identified for independent evaluation in the HHERA for potential human and/or ecological exposures. Data were grouped into datasets for each potential exposure area and evaluated for the relevant human and/or ecological receptors, as described in Section 3.3. Figure 3-3 presents the potential exposure areas based on individual AOCs/investigation areas evaluated in the HHERA for relevant human receptors, ecological communities (plants and soil invertebrates), and small home range wildlife (mammals and birds). Larger areas based on combined potential exposure areas were evaluated for relevant human receptors (Figure 3-4a) and large home range wildlife (mammals and birds) (Figure 3-4b). The potential exposure areas evaluated in the HHERA include the following areas listed in the table titled Potential Exposure Areas Evaluated in the HHERA.

Potential Exposure Areas Evaluated in the HHERA

Exposure Areas Based on Individual AOCs	Sample Locations Representative of:	HHRA	ERA
BCW	BCW (AOC 1, AOC 28d, SWMU 1, TCS-4, Tamarisk Thicket)	Evaluated	Evaluated
SWMU1	SWMU 1 and TCS-4	Evaluated	Evaluated
BCWxSWMU1	BCW excluding SWMU 1 and TCS-4	Evaluated	Evaluated
AOC4	AOC 4	Evaluated	Evaluated
AOC9	AOC 9 and AOC 10a	Evaluated	Evaluated
AOC10	AOC 10 and Subareas b, c, d	Evaluated	Evaluated
AOC11	AOC 11	Evaluated	Evaluated
AOC12	AOC 12	Evaluated	Evaluated
AOC14	AOC 14	Evaluated	Evaluated
AOC27	AOC 27	Evaluated	Evaluated
AOC28	AOC 28	Evaluated	Evaluated
AOC31	AOC 31	Evaluated	Evaluated
UA-2	UA-2	Evaluated	Evaluated
TT	Tamarisk Thicket	Not Evaluated	Evaluated
NORR	AOC 1 North of the Railroad / USBLM Land	Evaluated	Not Evaluated
ICS	Inside the Compressor Station	Evaluated	Not Evaluated
Combined Exposure Areas	**Sample Locations Representative of:**	**HHRA**	**ERA**
OCS	Outside the Compressor Station: All Soil Exposure Areas Outside the TCS	Evaluated	Evaluated
OCSxBCW	Outside the Compressor Station excluding BCW	Evaluated	Not Evaluated
BCW+AOC4	BCW and AOC 4	Not Evaluated	Evaluated
OCSxBCW+AOC4	Outside the Compressor Station excluding BCW and AOC 4	Not Evaluated	Evaluated

Notes:

ICS = Inside the Compressor Station

NORR = North of the Railroad

OCS = Outside the Compressor Station

TT = Tamarisk Thicket

Data for each of these potential exposure areas were also grouped according to exposure depth intervals evaluated in the HHERA. For human health, the various potential receptors were assumed to contact soil from 0 to 10 feet bgs, with interim intervals defined for specific receptor activities (see Section 5.3 of the HHERA Report). For ecological populations, the various potential receptors were assumed to contact soil from 0 to 6 feet bgs with interim intervals defined for specific receptor activities (see Section 6.4 of the HHERA Report).

Additionally, for the two soil potential exposure areas encompassing wash areas (BCW and AOC 10), two scouring scenarios were evaluated. The 2-foot scouring scenario assumes that the top 2 feet of soil is removed during potential future scouring resulting from surface runoff following heavy rainfalls. Similarly, in the 5-foot scouring scenario, 5 feet of soil is assumed to be removed during scouring. Datasets were adjusted so that potential exposures for the HHRA were from the ‘new’ surface to a depth of 10 feet bgs, and the ERA exposures were from the ‘new’ surface to 6 feet bgs.

ES 3.3 COPC/COPEC Selection

Selecting the COPCs/COPECs to be included in the risk assessments was a sequential process where compounds detected in site media were eliminated from further consideration based on either the concentration, if a constituent is deemed to be consistent with ambient background conditions, or their status as an essential nutrient. COPCs/COPECs were selected following appropriate guidance (DTSC 1997; USEPA 1989, 1997, 2000), according to the potential exposure areas previously described.

Using the agency-approved background soils datasets for inorganics, dioxins/furans, and PAHs, various statistical comparisons and tests were conducted to assess whether concentrations of constituents detected in the soil at the various potential exposures areas and depths are elevated above background levels. The statistical comparisons and tests conducted include: comparison of maximum observed values for each potential exposure area to a background threshold value (BTV); comparison of central tendency between potential exposure area data and background data; and comparison of upper quantiles of potential exposure area data and background data. Inorganics, dioxin/furans, and PAHs determined to be elevated above background levels were included as COPCs/COPECs in the risk assessments.

For essential nutrients determined to be elevated above background levels and where toxicity values were available, they were selected as COPCs to be evaluated further in the risk assessments. All other constituents detected in soil and soil gas were included in the quantitative HHRA.

ES.4 Estimation of Exposure Point Concentrations

An exposure point concentration (EPC) is the representative concentration of a constituent in an environmental medium that is potentially contacted by the potential receptor (USEPA 2002). In the HHERA, EPCs were calculated using depth-weighted data to account for variable depth profiles at each sampling location. For a given relevant exposure depth for the risk assessment, if only a single sample is available at a given location, that value was used to represent the concentration for the entire exposure depth. For locations with samples from multiple depths, the samples were weighted to account for the different lengths of the segments in the manner described in USEPA (1996).

Three types of EPCs were calculated based on the depth-weighted soil datasets: depth-weighted maximum, depth-weighted 95UCL (95% upper confidence limit on the mean), and depth- and area-weighted 95UCL (referred to as area-weighted EPCs for simplicity). USEPA’s ProUCL v. 5.1 software was the basis for, and primary analytical tool used for, the statistical analyses conducted for soil and soil transitioning to sediments. For the depth-weighted 95UCL EPC, the ProUCL-recommended 95UCL method was selected as the representative EPC. Area-weighted EPCs were calculated using Thiessen polygons and the bias-corrected, accelerated (BCa) Bootstrap method, one of the nonparametric statistics provided in ProUCL.

If the soil dataset had fewer than four detected values (that is, concentrations reported above the detection limit) or fewer than eight total observations, the EPC defaulted to the maximum depth-weighted concentration in that dataset. In summary, the EPC for each soil dataset is either a 95UCL (UCL method recommended by ProUCL for depth-weighted EPCs, BCa Bootstrap UCL for area-weighted EPCs), or the maximum depth-weighted concentration.

For soil gas data, individual observations for each given chemical and exposure scenario, were treated as separate estimates of exposure; no 95UCL calculations were made for soil gas.

ES.5 Human Health Risk Assessment

The HHRA for soil evaluated the likelihood that constituents detected in soils at the various potential exposure areas of the site could adversely impact human health under the assumed set of current and reasonable future land-use scenarios. The results of the risk assessment also provide key information that assists risk managers with making health-protective site management and remedial decisions.

ES.5.1 Exposure Assessment

The exposure assessment estimated the intensity, frequency, and duration of potential human exposure to COPCs in environmental media at the site, such as soil, soil gas, and air. To quantify potential exposure to site constituents, in addition to EPCs for COPCs, these components are required:

1. Relevant current and future potential receptors and their associated site related activities
2. Potentially complete exposure pathways for each current and future potential receptor as they engage in site related activities
3. Quantitative exposure assumptions for pathway specific intake of soil constituents.

ES.5.1.1 Potentially Exposed Populations

The potential human receptors identified in the RAWP documents (Arcadis 2008a, 2009a, 2015) were evaluated in the HHRA as four main categories: worker, recreational user, tribal user, and hypothetical future resident. The potential soil exposure pathways evaluated for workers, recreational users, and the hypothetical future resident include ingestion and dermal contact with soil, as well as inhalation of particulates from ambient air and inhalation of VOCs that may volatilize from the soil. In addition to these potential soil exposure pathways, potential exposure to COPCs from consumption of home-produced food was also evaluated for the hypothetical future resident. The potential soil exposure pathways evaluated for tribal users include inhalation of particulates from ambient air and inhalation of VOCs that may volatilize from the soil.

Three types of workers were evaluated. The long- and short-term maintenance workers were assumed to conduct repair and maintenance activities both inside and outside the TCS fenceline. Their activities include intrusive work and they are assumed to contact surface soil (0 to 0.5 foot bgs), shallow soil (0 to 3 feet bgs) subsurface I soil (0 to 6 feet bgs) and subsurface II soil (0 to 10 feet). The commercial worker is assumed to be involved in routine administrative and other non-intrusive activities consistent with commercial/industrial activities inside the fenceline only. Potential pathways for commercial worker exposure to soil include those listed above for soil as well as potential exposure to VOCs in soil gas via inhalation of indoor air. The commercial worker was evaluated using a screening approach, as described in Section 5.3.4.5.

Four types of potential recreational users were evaluated outside the TCS: camper, hiker, hunter, and off-highway vehicle (OHV) rider (OHVs also referred to as all-terrain vehicles [ATVs]). The adult and/or youth recreators were evaluated for potential exposure to surface soil (0 to 0.5 foot bgs) and shallow soil (0 to 3 feet bgs).

Tribal use and associated potential exposure are expected to occur at areas outside the TCS. The potential indirect pathway for exposure to soil for tribal use is the inhalation of dust arising from wind erosion and of VOCs that may volatilize from the soil. The inhalation of dust was evaluated for surface soil (0 to 0.5 foot bgs) and shallow soil (0 to 3 feet bgs). and inhalation of VOCs volatized from subsurface II soil (0 to 10 feet bgs). The exposure assumptions for this exposure scenario were developed using site-specific input from the Tribes.

USBLM has specifically requested an evaluation of a hypothetical future residential user on their property (DOI 2007b), even though unrestricted residential use is highly unlikely (DOI 2014). The hypothetical future residential user is assumed to contact surface soil (0 to 0.5 foot bgs), shallow soil (0 to 3 feet bgs), subsurface I soil (0 to 6 feet bgs) and subsurface II soil (0 to 10 feet bgs) via inhalation of particulates entrained in ambient air, incidental ingestion of soil, and dermal contact with soil. In addition, they are assumed to grow and consume vegetables, fruits, and poultry from the site (see Section 5.3.4.4 of the HHERA Report for exposure assumptions).

ES.5.1.2 Exposure Areas

The following two areas represent the upper bound potential exposure areas for the site-specific human receptors evaluated for this site – area outside the compressor station including BCW (OCS); and area inside the compressor station (ICS). For the purposes of risk management, the OCS and ICS potential exposure areas were considered most relevant to typical behaviour patterns anticipated for receptors and their activities. In addition, at the direction of DTSC, potential exposure areas based on individual AOCs outside TCS fenceline were evaluated in separate appendices as listed above in Section ES.3.2.

ES.5.1.3 Exposure Point Concentrations

As described above in ES.4, EPCs were calculated on a depth-weighted and area-weighted basis. EPCs were estimated for each of the soil intervals described above for each potential exposure area and the potentially exposed populations evaluated for that area. To ensure that the implications of averaging concentrations over one depth zone versus another are clearly understood, the Soil HHRA evaluated representative exposure concentrations for soils within the following depth categories:

- Surface soil (0 to 0.5 foot bgs)
- Shallow soil (0 to 3 feet bgs)
- Subsurface I soil (0 to 6 feet bgs)
- Subsurface II soil (0 to 10 feet bgs).

For the 2-foot and 5-foot scouring scenarios for BCW and AOC 10, datasets were adjusted to the revised surface level for the intervals. For example, for the 2-foot scouring scenario, the surface soil is adjusted to evaluate data collected from 2 to 3 feet bgs, while the shallow soil uses data from 2 to 6 feet bgs.

ES.5.2 Toxicity Assessment

The toxicity assessment was completed to characterize the relationship between the magnitude of assumed exposure to a constituent and the potential for adverse effects. More specifically, the toxicity assessment identifies or derives toxicity values that can be used to estimate the likelihood of adverse effects occurring in humans at different exposure levels. Consistent with regulatory risk assessment policy, adverse health effects resulting from constituent exposures are evaluated in two categories: carcinogenic effects and noncarcinogenic effects. Toxicity values to evaluate carcinogenic effects and noncarcinogenic effects were identified from available CalEPA and USEPA toxicity information databases and were selected for use in this HHRA in the RAWP documents (Arcadis 2008a, 2009a, 2015) and in accordance with DTSC (2015, 2014, 2018) and USEPA (1989, 2003) risk assessment guidance. In addition, the adverse health effects associated with potential exposure to lead are evaluated separately, using models developed by CalEPA DTSC and USEPA.

ES.5.3 Risk Characterization

Estimating incremental lifetime cancer risks (ILCRs) and noncancer hazard indices (HIs) for potential exposures to constituents in soil and/or soil gas requires information regarding constituent concentrations in the soil and/or soil gas, the level of exposure to each constituent, and the relationship between exposure to the constituent and its toxicity. Cumulative incremental lifetime cancer risks (that is, sum of chemical-specific ILCRs) posed by a site are compared to a range of one in one million (1×10^{-6}) to one hundred in a million (1×10^{-4}). As indicated in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (which is 40 Code of Federal Regulations [CFR] Part 300), cancer risks between one in a million and one hundred in a million probability of occurrence (1×10^{-6} and 1×10^{-4}) fall within a risk management range. This is generally referred to as the acceptable risk range. Within this estimated cancer risk range, there is flexibility for risk managers in deciding what action, if any, is necessary and appropriate for the protection of human health. CalEPA DTSC point of departure for excess incremental lifetime cancer risk is 1×10^{-6}, and risk management decisions may raise this criterion depending on site specific conditions. A cumulative non-cancer HI of less than or equal to 1 implies that the predicted exposure for a given population and chemical is not expected to result in adverse noncancer health effects for multi-chemical exposures (USEPA 1989).

ES.5.3.1 Methodology

The methodology used to derive the ILCRs and noncancer HIs for the selected COPCs is based principally on guidance provided in the regulatory documents and the equations listed in Sections 5.5.1 and 5.5.2 of the HHERA Report. These calculation methods were applied to relevant receptors for all potential exposure areas outside and inside the TCS fenceline.

ES.5.3.2 Results of the Cancer Risk and Noncancer Hazard Assessment

ILCRs and HIs were estimated for each HHRA potential exposure area and its associated receptors using the methods described above. A detailed description of the calculated risks/hazards, including the tables that provide the breakdown of risk/hazard by individual chemical and exposure pathway, is provided in the exposure area-specific appendices, which are provided as Appendices BCW through ICS, and summarized in Section 5.5.3 of the HHERA Report. It should be noted that risks/hazards calculated separately for individual AOCs are conservative and likely overestimate site risks/hazards.

The potential exposure areas for which estimated HIs ≤ 1 and ILCRs were at or below the *de minimis* point of departure for risk management of 1 x 10^{-6} for cancer risk include BCWxSWMU1/TCS4, AOC 12, AOC 14, AOC 27, AOC 28, and AOC 31.

The estimated ILCRs and HIs for the hunter and tribal user were at or below *de minimis* levels for all potential exposure areas evaluated in the HHRA. In addition, the estimated ILCRs and HIs for the short-term maintenance worker were at or below *de minimis* levels for the ICS potential exposure area.

This section summarizes the results for the two most representative upper-bound potential exposure areas, which are the OCS and ICS potential exposure areas. The risks/hazards estimated for the OCS potential exposure area are believed to provide a more appropriate representation of the potential exposures for the human populations that could be present in the areas outside of TCS, which are maintenance workers, recreational users, and tribal users, than the risks/hazards estimated for individual AOCs/SWMU/UA potential exposure areas. In addition, potential risks/hazards for COPCs in soil in the NORR potential exposure area are estimated for hypothetical future residents, at the request of the agencies, although future unrestricted land use in this area is highly unlikely. The results of the HHRA for the OCS and ICS potential exposure areas support these findings.

OCS Potential Exposure Area Conclusions

The tables in this section summarize the results of the HHRA for the OCS potential exposure area.

OCS Estimated Cumulative Incremental Lifetime Cancer Risk and Hazard Index for the OCS Potential Exposure Area

Potential Receptor	Estimated Cumulative ILCR less than or equal to 1x10^{-6}	Estimated Cumulative ILCR greater than 1x10^{-6} and less than or equal to 5x10^{-6}	Estimated Cumulative ILCR greater than 5x10^{-6} and less than or equal to 1x10^{-5}	Estimated Cumulative ILCR greater than 1x10^{-5} and less than or equal to 1x10^{-4}	Estimated Cumulative ILCR greater than 1x10^{-4}	Estimated HI less than or equal to 1	Estimated HI greater than 1
Short-Term Maintenance Worker		Yes (depth- and area-weighted)				Yes (depth- and area-weighted)	
Long-Term Maintenance Worker			Yes (area-weighted)	Yes (depth-weighted)		Yes (depth- and area-weighted)	
Camper		Yes (depth- and area-weighted)				Yes (depth- and area-weighted)	
Hiker		Yes (area-weighted)	Yes (depth-weighted)			Yes (depth- and area-weighted)	
Hunter	Yes (depth- and area-weighted)					Yes (depth- and area-weighted)	

Potential Receptor	Estimated Cumulative ILCR less than or equal to $1x10^{-6}$	Estimated Cumulative ILCR greater than $1x10^{-6}$ and less than or equal to $5x10^{-6}$	Estimated Cumulative ILCR greater than $5x10^{-6}$ and less than or equal to $1x10^{-5}$	Estimated Cumulative ILCR greater than $1x10^{-5}$ and less than or equal to $1x10^{-4}$	Estimated Cumulative ILCR greater than $1x10^{-4}$	Estimated HI less than or equal to 1	Estimated HI greater than 1
OHV Rider			Yes (depth- and area-weighted)			Yes (depth- and area-weighted)	
Tribal User	Yes (depth- and area-weighted)					Yes (depth- and area-weighted)	

OCS Estimated Cumulative Incremental Lifetime Cancer Risk and Hazard Index for the NORR Potential Exposure Area

Potential Receptor	Estimated Cumulative ILCR less than or equal to $1x10^{-6}$	Estimated Cumulative ILCR greater than $1x10^{-6}$ and less than or equal to $5x10^{-6}$	Estimated Cumulative ILCR greater than $5x10^{-6}$ and less than or equal to $1x10^{-5}$	Estimated Cumulative ILCR greater than $1x10^{-5}$ and less than or equal to $1x10^{-4}$	Estimated Cumulative ILCR greater than $1x10^{-4}$	Estimated HI less than or equal to 1	Estimated HI greater than 1
Hypothetical Future Resident			Yes (area-weighted)	Yes (depth-weighted)		Yes (area-weighted)	Yes (depth-weighted)
Hypothetical Future Resident – Consumer of Home-Produced Food					Yes (depth- and area-weighted)		Yes (depth- and area-weighted)

- **Noncancer HIs.** HIs for maintenance workers, recreational users, and tribal users were all $\leq$ 1. **Based on the results of the HHRA, the levels of COPCs in OCS soil are safe and protective of potential noncancer health effects for all receptors except the hypothetical residential user in NORR potential exposure area**.
- **Lead.** The depth- and area-weighted EPCs for lead in the OCS potential exposure area are not expected to result in an increase in blood lead levels above the Office of Environmental Health Hazard Assessment's (OEHHA's) benchmark value of 1 microgram per liter (µg/dL) for child receptors or the fetus of any of the adult receptors evaluated. **Based on the results of the OCS HHRA, the levels of lead in soil are safe and protective of all potential receptors evaluated.**

- **<u>Tribal User and Hunter</u>.** Estimated lifetime cancer risks for tribal users and hunters were at or below *de minimis* levels. **Based on the results of the HHRA, levels of COPCs in OCS soils are safe and protective of tribal users and hunters**.
- **<u>Short-Term Maintenance Worker</u>.** The depth- and area-weighted estimated cumulative ILCRs for the short-term maintenance worker for the OCS potential exposure area are above 1×10^{-6}, the point of departure for risk management decisions, but below 5×10^{-6}; which is well within the risk-management range of 1×10^{-6} and 1×10^{-4}. Estimated ILCRs above 1×10^{-6} are due primarily to hexavalent chromium via the inhalation of particulate pathway. However, with health and safety work practices in place that limit the amount of exposure to soil, estimated ILCRs for the short-term maintenance worker are overestimated and actual risks are likely at or below 1×10^{-6}. **In sum, the overall weight of evidence (WOE) supports that the levels of COPCs in OCS soils are safe and protective of short-term maintenance workers.**
- **<u>Long-Term Maintenance Worker</u>.** The depth-weighted estimated cumulative ILCRs for the long-term maintenance worker for the OCS potential exposure area are above 1×10^{-6}, the point of departure for risk management decisions, and slightly above 1×10^{-5}. The area-weighted estimated cumulative ILCRs for the long-term maintenance worker for the OCS potential exposure area are at 1×10^{-5}, which is well within the risk-management range of 1×10^{-6} and 1×10^{-4}. Estimated ILCRs above 1×10^{-6} are due primarily to hexavalent chromium via the inhalation of particulate pathway. However, with health and safety work practices in place that limit the amount of exposure to soil, the estimated ILCRs for the long-term maintenance worker are overestimated and actual risks are likely below 1×10^{-5} and well within the risk management range of 1×10^{-6} and 1×10^{-4}. **In sum, the overall WOE supports that the levels of COPCs in OCS soils are safe and protective of the long-term maintenance worker.**
- **<u>Recreational User – Camper</u>.** The depth- and area-weighted estimated cumulative ILCRs for the camper for the OCS potential exposure area are slightly above 1×10^{-6}, the point of departure for risk management decisions due primarily to hexavalent chromium and dioxin toxicity equivalent (TEQ) via the soil ingestion pathway. The ILCRs are within the risk-management range of 1×10^{-6} and 1×10^{-4}. The results of the sensitivity analysis suggest that the majority of the depth- and area-weighted estimated ILCRs above 1×10^{-6} for campers exposed to soils in the OCS potential exposure area are attributed to elevated concentrations of hexavalent chromium and/or dioxin TEQ. **Based on the results of the OCS HHRA for campers, risks are within the risk management range of 1×10^{-6} and 1×10^{-4}. Some targeted form of risk management or remediation, addressing elevated levels of hexavalent chromium and dioxin TEQ in select locations, would be effective at reducing risks to levels below the CalEPA DTSC point of departure for excess ILCR of 1×10^{-6}**. No risk management or remediation would be necessary to reduce risks for the camper to levels below 1×10^{-5}.
- **<u>Recreational User – Hiker</u>.** The depth- and area-weighted estimated cumulative ILCRs for the hiker for the OCS potential exposure area are at or slightly above 5×10^{-6}; due primarily to hexavalent chromium and dioxin TEQ via the ingestion pathway. These estimated ILCRs are above 1×10^{-6}, the point of departure for risk management decisions, but within the risk-management range of 1×10^{-6} and 1×10^{-4}. The results of the sensitivity analysis suggest that the majority of the depth- and area-weighted estimated ILCRs above 1×10^{-6} for hikers exposed to soils in the OCS potential exposure area are attributed to elevated concentrations of hexavalent chromium and/or dioxin TEQ. **Based on the results of the OCS HHRA for hikers, risks are within the risk management range of 1×10^{-6} and 1×10^{-4}. Some targeted form of risk management or remediation, addressing elevated levels of hexavalent chromium and dioxin TEQ in select locations, would be effective at reducing risks to**

levels below the CalEPA DTSC point of departure for excess ILCR of 1 x 10^{-6}. No risk management or remediation would be necessary to reduce risks for the hiker to levels below 1 x 10^{-5}.

- **<u>Recreational User – OHV Rider</u>.**The depth- and area-weighted estimated cumulative ILCRs for the OHV rider for the OCS potential exposure area are at 1 x 10^{-5} and above 5 × 10^{-6}, respectively due primarily to hexavalent chromium via the inhalation particulate pathway and dioxin TEQ via the ingestion pathway. These estimated ILCRs are above 1 × 10^{-6}, the point of departure for risk management decisions, but within the risk-management range of 1 x 10^{-6} and 1 x 10^{-4}. The results of the sensitivity analysis suggest that the majority of the depth- and area-weighted estimated ILCRs above 1 x 10^{-6} for OHV riders exposed to soils in the OCS potential exposure area are attributed to elevated concentrations of hexavalent chromium and/or dioxin TEQ. **Based on the results of the OCS HHRA for OHV riders, risks are within the risk management range of 1 x 10^{-6} and 1 x 10^{-4}. Some targeted form of risk management or remediation, addressing elevated levels of hexavalent chromium and dioxin TEQ in select locations, would TEQ would be effective at reducing risks to levels below the CalEPA DTSC point of departure for excess ILCR of 1 x 10^{-6}**. No risk management or remediation would be necessary to reduce risks for the OHV rider to levels below 1 x 10^{-5}.
- **<u>Hypothetical Future Resident</u>.** The depth- and area-weighted estimated cumulative ILCRs and HIs associated with theoretical exposure to COPCs in soil and home-produced food in NORR potential exposure area for hypothetical future residents are above 1 × 10^{-6}, the point of departure for risk management decisions and an HI of 1, respectively, due to hexavalent chromium, cobalt, total PCBs, dioxin TEQ, and/or TPHd. The estimated cumulative ILCRs associated with potential exposure to COPCs in soil and home-produced food are slightly above 1 x 10^{-5} and at 1 x 10^{-3}, respectively. Note that risks/hazards estimated for NORR potential exposure area are not considered representative of the realistic or likely potential exposures for the human populations that could be present in this area or anywhere at the site. Specifically, it is highly unlikely that any area of the site will ever be used for residential purposes. However, the hypothetical future unrestrictive residential scenario was evaluated for the NORR potential exposure area at the request of the DOI. **The estimated risks and hazards presented for the hypothetical future resident in the NORR potential exposure area are provided for informational purposes only.**

In sum, **based on the results of the OCS HHRA, the levels of COPCs in OCS soils are safe and protective of short- and long-term maintenance workers, hunters, and tribal users.**

Recommendation for OCS: Some targeted form of risk management or remediation, addressing elevated levels of hexavalent chromium and dioxin, would be effective at reducing risks for the campers, hikers and OHV riders to levels below 1 x 10^{-6}, the point of departure for risk management decisions. No risk management or remediation would be necessary to reduce risks for the the campers, hikers and OHV riders to levels below 1 x 10^{-5}.The estimated risks and hazards presented for the hypothetical future resident in the NORR potential exposure area are provided for informational purposes only. However, the hypothetical future residential land use is not a reasonable anticipated future land use for the NORR area.

ICS Potential Exposure Area

The table in this section summarizes the results of the HHRA for the ICS potential exposure area.

Estimated Cumulative Incremental Lifetime Cancer Risk and Hazard Index for the ICS Potential Exposure Area

Potential Receptor	Estimated Cumulative ILCR less than or equal to $1x10^{-6}$	Estimated Cumulative ILCR greater than $1x10^{-6}$ and less than or equal to $5x10^{-6}$	Estimated Cumulative ILCR greater than $5x10^{-6}$ and less than or equal to $1x10^{-5}$	Estimated Cumulative ILCR greater than $1x10^{-5}$ and less than or equal to $1x10^{-4}$	Estimated Cumulative ILCR greater than $1x10^{-4}$	Estimated HI less than or equal to 1	Estimated HI greater than 1
Commercial Worker			Yes [1] (depth- and area-weighted)			Yes [1] (depth- and area-weighted)	
Short-Term Maintenance Worker	Yes (depth-weighted)					Yes (depth-weighted)	
Long-Term Maintenance Worker		Yes (area-weighted)	Yes (depth-weighted)			Yes (depth- and area-weighted)	

Note:

[1] Represents the estimated cumulative ILCR and HI for the commercial worker associated with COPCs in soil and soil gas.

- **<u>Noncancer HIs.</u>** The depth- and area-weighted estimated cumulative HIs for commercial worker, short-term maintenance worker, and long-term maintenance worker for ICS potential exposure area are below an HI of 1. **Based on the results of the ICS HHRA, the levels of the levels of COPCs in ICS soil are safe and protective of potential noncancer health effects for all worker receptors evaluated.**

- **<u>Lead.</u>** The depth- and area-weighted EPCs for lead in ICS potential exposure area soils are not expected to result in an increase in blood lead levels above OEHHA's benchmark value of 1 µg/dL for the fetus of any of the workers. **Based on the results of the ICS HHRA, the levels of lead in soil are safe and protective for all worker receptors evaluated.**

- **<u>Commercial Worker</u>.** The depth- and area-weighted estimated cumulative ILCRs associated with potential exposure to COPCs in soil in the ICS potential exposure area for the commercial worker are above 1×10^{-6}, the point of departure for risk management decisions, but at or below 1×10^{-5} which is well within the risk management range of 1×10^{-6} and 1×10^{-4}. However, the active TCS facility has work practices in place that limit the amount of exposure to soil. The overly conservative assumption that all areas within the ICS potential exposure area are uncovered, overestimates ILCRs for the commercial worker and reasonable upper bound values are likely below 1×10^{-5} and well within the risk management range of 1×10^{-6} and 1×10^{-4}. The estimated ILCRs and HIs associated with potential COPCs in soil gas in the ICS potential exposure area for commercial workers exposed via the inhalation of vapors in indoor air pathway is well below 1×10^{-6} and an HI of 1, respectively. **In sum, the overall WOE supports that the conditions at the facility and levels of COPCs in soils and soil gas in ICS are safe and protective of the commercial worker.**

- **Short-Term Maintenance Worker.** The depth-weighted estimated cumulative ILCRs associated with potential exposure to COPCs in soil in ICS potential exposure areas for the short-term maintenance worker are below 1 x 10^{-6}, the point of departure for risk management decisions. **Based on the results of the ICS HHRA, levels of COPCs in ICS soils are safe and protective of short-term maintenance workers.**
- **Long-Term Maintenance Worker.** The depth- and area-weighted estimated cumulative ILCRs associated with potential exposure to COPCs in soil in ICS potential exposure areas for the long-term maintenance worker are above 1 x 10^{-6}, the point of departure for risk management decisions, but at or below 1 × 10^{-5} which is well within the risk management range of 1 x 10^{-6} and 1 x 10^{-4}. However, with work practices in place that limit the amount of exposure to soil and the overly conservative assumption that all areas within the ICS potential exposure area are uncovered, estimated ILCRs for the long-term maintenance worker are overestimated and likely well below 1 x 10^{-5} and well within the risk management range of 1 × 10^{-6} and 1 × 10^{-4}. **Based on the results of the ICS HHRA, the overall WOE supports that the levels of COPCs in soils ICS are safe and protective of the long-term maintenance worker.**

ES.5.4 HHRA Uncertainty Analysis

Many of the assumptions used in this HHRA are conservative, including representativeness of the sampling data, human exposures, fate and transport modeling, and chemical toxicity. Following agency guidance, the assumptions used reflect a 90th or 95th percentile UCL value, rather than a typical or average value. By using multiple conservative exposure assumptions or toxicity estimates, the risk estimates likely develop a conservative bias that may result in significant overestimation of potential risk and hazard.

In addition, as recommended by DOI (Arcadis 2015), it is assumed that each of the recreational activities could take place at any location on federal land. In reality, specific locations may be preferred for certain activities, while other locations may be less attractive or may have limited recreational options. No physical barrier (such as fencing) is present that would stop an individual recreational user from accessing any and all areas of the AOCs outside the TCS. Therefore, potential receptor populations would more likely be exposed randomly, over the course of a lifetime, to soils present across the OCS potential exposure area, rather than have a lifetime of contact limited to a potential exposure area based on an individual AOC (as evaluated in the area-specific appendices at the request of DTSC). Therefore, risk and/or hazards presented for individual potential exposure areas are not believed to be the most representative of the estimated health risks to humans potentially contacting the soil outside the TCS and are not recommended for remedial decision making. Section 5.6 of the HHERA Report discusses the uncertainties in the HHRA.

ES.6 Ecological Risk Assessment

A Phase I Predictive ERA was completed for the site and includes ERAs for 17 individual potential ecological exposure areas, which were evaluated for the ecological communities and small home-range wildlife receptors (Figure 3-3), and large home-range wildlife receptors (Figure 3-4b) listed in the table titled Potential Ecological Exposure Areas Evaluated in the ERA.

Potential Ecological Exposure Areas Evaluated in the Ecological Risk Assessment

Potential Ecological Exposure Areas	Evaluated in the Ecological Risk Assessment
Potential Terrestrial Exposure (Soil) for Plants, Soil Invertebrates, and Small Home- Range Wildlife Receptors (mammals and birds)	• BCW • SWMU 1 • BCW excluding SWMU 1 and AOC 4 • AOC 4 • AOC 9 • AOC 10 • AOC 11 • AOC 12 • AOC 14 • AOC 27 • AOC 28 • AOC 31 • UA-2 • Tamarisk Thicket
Potential Terrestrial Exposures (Soil) for Large Home-Range Wildlife Receptors (mammals and birds)	• OCS • BCW and AOC 4 • OCS excluding BCW and AOC 4

The overall goal of the ERA is to estimate potential unacceptable risk to potential ecological receptors from exposure to COPECs in soil. The results of the risk assessment also provide key information that assists risk managers with making site management and remedial decisions protective of ecological receptors.

ES.6.1 Problem Formulation

A problem formulation step was completed to identify societal or regulatory goals and assessment endpoints to evaluate potential impact to ecological populations from site constituents. The problem formulation relies on data collected during site investigations and incorporates features of the ecological setting, evaluation of the complete pathways in the CSM, and selection of the assessment and measurement endpoints.

ES.6.1.1 Ecological Conceptual Site Model

The ecological CSM is the framework for relating potential ecological receptors to chemically affected media and evaluating the potentially complete exposure pathways.

The primary terrestrial potential exposure pathways for soil are direct contact or incidental ingestion of surface soil (0 to 0.5 foot bgs), shallow soil (0 to 3 feet bgs), and subsurface I soil (0 to 6 feet bgs)[1] and, for mammals and birds, uptake and subsequent ingestion of constituents in biota. Potential receptors evaluated include plants, soil invertebrates, birds, and mammals. Reptiles, while common in the Mojave Desert, were not evaluated quantitatively in the ERA because methods to evaluate exposure and toxicity to these receptors are generally unavailable. However, it was assumed that conservative assumptions used in the evaluation of risks for other species are protective of reptiles as well.

ES.6.1.2 Assessment and Measurement Endpoints

Assessment endpoints, which define the valued ecological resource (that is, ecological entity) and a characteristic of the resource to protect (that is, attributes), and measurement endpoints (measurable ecological characteristics that are related to the assessment endpoint) for each indicator receptor were selected in the RAWP documents (Arcadis 2008a, 2009a, 2015) and are presented in Table 6-1. The assessment endpoints included sufficient rates of survival, growth, and reproduction to sustain communities of plants and soil invertebrates and populations of mammals and birds.

ES.6.2 Exposure Assessment

The exposure assessment was completed to estimate exposure concentrations or doses based on receptor contact with COPECs in the potential exposure areas for the assumed complete and significant exposure pathways described in the CSM. The exposure assessment identified the assumptions necessary to estimate direct exposure EPCs (that is, soil concentrations) and EPCs used as the basis for estimating bioaccumulation and subsequent exposure of upper trophic-level receptors (that is, soil and biota tissue EPCs).

ES.6.2.1 Exposure Point Concentrations and Exposure Depths

The EPC is the representative concentration of a constituent in an environmental medium that is potentially contacted by the receptor (USEPA 1997). During the ERA, soil EPCs were estimated for each individual potential exposure area, as described above in Section ES.4. Biota tissue EPCs were calculated from soil EPCs using soil-to-biota uptake relationships for plants, invertebrates, and small mammals selected in the RAWP documents (Arcadis 2008a, 2009a, 2015).

As described in the CSM, potential receptor exposure to soil varies by receptor type. The ERA evaluated up to three relevant exposure depths for direct contact/incidental ingestion and biota uptake of soil for each receptor. The soil depths evaluated included surface soil (0 to 0.5 foot bgs), shallow soil (0 to 3 feet bgs), and subsurface I soil (0 to 6 feet bgs). EPCs were developed for each soil exposure interval for each potential exposure area. Ecological receptors were evaluated for potential exposure to soil, as listed in the table titled Soil Uptake Evaluations.

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[1] Subsurface soil exposure intervals are defined as subsurface I soil (0 to 6 feet bgs) and subsurface II soil (0 to 10 feet bgs). Subsurface soil II is considered in the human health risk assessment only.

Soil Uptake Evaluations

Exposure	Soil Uptake Evaluations
Assumed Direct Contact / Incidental Ingestion	• Plants – based on the highest EPCs from surface, shallow, and subsurface I soil • Soil invertebrates – based on surface soil EPCs • Granivorous, insectivorous, carnivorous birds, and invertivorous small mammals (non-burrowing) – EPCs from surface soil • Granivorous and carnivorous mammals (burrowing) – EPCs based on the highest EPCs from surface, shallow, and subsurface I soil • Herbivorous mammals (Nelson's desert bighorn sheep) – although not a burrowing receptor, soil EPCs based on the highest EPCs from surface, shallow, and subsurface I soil were conservatively selected for this special-status receptor
Assumed Biota Uptake	• Plant tissue as food – based on the highest EPCs from surface, shallow, and subsurface I soil • Soil invertebrate tissue as prey – based on surface soil EPCs • Small mammal tissue as prey – based on surface soil EPCs

Additionally, EPCs for the soil exposure intervals were estimated for scouring scenarios in BCW and AOC 10 in the table titled EPCs for Soil Exposure Intervals for Scouring Scenarios.

EPCs for Soil Exposure Intervals for Scouring Scenarios

Baseline Scenario	2-foot Scouring	5-foot Scouring
Surface soil (0 to 0.5 foot bgs)	Surface soil (2 to 3 feet bgs)	Surface soil (5 to 6 feet bgs)
Shallow soil (0 to 3 feet bgs)	Shallow soil (2 to 6 feet bgs)	Shallow soil (5 to 10 feet bgs)
Subsurface I soil (0 to 6 feet bgs)	Subsurface I soil (2 to 10 feet bgs)	Subsurface I soil (5 to 15 feet bgs)

ES.6.2.2 Exposure Concentrations and Exposure Dose Models

For ecological communities (plants and soil invertebrates), potential exposures are expressed as soil concentrations, in units of milligram per kilogram (mg/kg) or nanogram per kilogram (ng/kg).

For potential wildlife receptors (mammals and birds), route-specific and food-web or dietary exposure models were used to estimate exposure doses in milligram per kilogram body weight per day (mg/kg-bw/day). To calculate exposure doses for wildlife receptors, soil data and receptor-specific parameters were used in the dose equations.

Consistent with DTSC guidance (1996), modelled exposure doses were estimated using both the maximum and 95UCL concentrations for each COPEC in soil. In most cases, an area-weighted 95UCL was also used to refine exposure doses when data were sufficient for that calculation. Risk estimates are presented for all EPC scenarios, however, risk conclusions presented in the ERA rely predominately on the exposure doses using an area-weighted 95UCL, as they are more resistant to sampling bias potentially present using depth-weighted EPCs.

For dietary dose modeling, species-specific values used for the terrestrial receptors were selected, and include body weight, dietary composition, ingestion rate, and home range. For terrestrial birds and mammals, risks were evaluated using two site-specific use factor (SUF) scenarios: a generic SUF of 1 and a SUF based on a species- and site-specific home range (referred to as the site-specific SUF for simplicity) compared to the total area of each exposure area. For each area, COPECs with HQs greater than 1 using the depth-weighted EPCs were identified for further evaluation using refined exposure and effects assumptions, including site-specific SUFs. For ecological receptor populations exposed to COPECs in soil, risk conclusions were ultimately characterized based on HQs that were calculated using refined exposure and effects assumptions associated with a higher level of confidence in predicting risks (area-weighted EPCs, site-specific SUF, and selected TRVs) and supporting lines of evidence (LOEs). To estimate bioaccumulation in animal tissue or uptake into plants soil-to-biota uptake factors were developed as either regression equations or bioaccumulation factors (BAFs). Uptake regressions and BAFs that were selected in the RAWP (Arcadis 2008a) and technical memoranda (Arcadis 2007, 2008b, 2009b) were used to estimate concentrations of COPECs in biota and food item tissue (that is, prey) from soil.

For dioxin TEQ, the selected BAFs are based on uptake of a single congener: 2,3,7,8- tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). Because of the uncertainty associated with use of a single congener based BAF to estimate uptake for all 17 dioxin/furan congeners included in the dioxin TEQ mixture, dioxin TEQ uptake was evaluated using two congener-specific BAF approaches. Although the uptake regression for dioxin TEQ (based on 2,3,7,8-TCDD uptake) was used to estimate risk (that is, to calculate hazard quotients [HQs]) to potential ecological receptors at the site, the alternate and more robust BAFs approaches for dioxin TEQ based on congener-specific uptake are recommended for developing risk-based remediation goals (RBRGs) when considering risk management decisions.

ES.6.3 Effects Assessment

For the ERA, media-based screening levels for ecological communities of plants and soil invertebrates and dose-based toxicity reference values (TRVs) for wildlife (mammals and birds) were selected in the RAWP documents (Arcadis 2008a, 2009a, 2015) with review and/or input from the DTSC and USFWS. Screening levels and TRVs were updated with current values since the submission of the RAWP (Arcadis 2008a) and are presented in Table 6-6 of the HHERA Report.

For plants and soil invertebrates, screening levels are generic benchmarks obtained from publicly available guidance documents and other sources commonly used in ERAs.

For wildlife, range of risks were estimated using the no-observed adverse effects level (NOAEL)-based TRVs and lowest-observed adverse effects level (LOAEL)-based TRVs presented in the RAWP (Arcadis 2008a) and supporting technical memoranda (Arcadis 2007, 2008b, 2009b). These selected TRVs were primarily based on the TRVs used to develop USEPA’s Ecological Soil Screening Levels (EcoSSLs; (USEPA 2008); other sources included the Toxicological Benchmarks for Wildlife from the Oak Ridge National Laboratory (Sample et al. 1996) and the USEPA Region 6’s ERA Guidance (USEPA 1999). In addition, a second set of NOAEL- and LOAEL-TRVs based on the Navy/Biological Technical Assistance Group (BTAG) TRVs (California DTSC 2002, 2009b) were also used for COPECs, where available. Following DTSC guidance (1996, 2000), TRVs were adjusted when the differences in body weight between the site-specific potential wildlife receptor and the laboratory animals used in the studies to develop the TRVs were significant (greater than two orders of magnitude).

No avian TRVs were proposed in the RAWP documents (Arcadis 2008a, 2009a, 2015) to evaluate potential risk to birds from hexavalent chromium at the site, as published TRVs were unavailable. Avian NOAEL- and LOAEL-based TRVs for hexavalent chromium were developed for the ERA (2.5 mg/kg-bw/day and 25 mg/kg-bw/day, respectively), based on a literature search for recent studies. Uncertainty associated with these TRVs is discussed in Section 6.7.5 of the HHERA Report.

For dioxin TEQ, the selected mammalian and avian TRVs for the ERA were based on TRVs presented in the RAWP documents (Arcadis 2008a, 2009a, 2015), and are based on the lowest available TRVs. Following the approach used by USEPA in developing TRVs for the EcoSSLs (USEPA 2008), alternate and more robust dioxin TEQ TRVs were developed for mammals and birds based the geometric mean of the reproduction and growth endpoints for the NOAEL and LOAEL effect levels, respectively. Although the dioxin TEQ TRVs selected in the RAWP (Arcadis 2008a) were used to estimate risk (that is, to calculate HQs) to potential ecological receptors at the site, the alternate and more robust TRVs for dioxin TEQ based on more recent data are recommended for developing RBRGs when considering risk management decisions.

ES.6.4 Risk Characterization

The ERA risk characterization integrated the results of the exposure assessment and toxicity assessment and includes two major components: risk estimation and risk description. Following the approach described in the RAWP documents (Arcadis 2008a, 2009a, 2015), HQs were estimated for each potential receptor population in each potential exposure area using EPCs for each COPEC and appropriate soil exposure depth.

HQs only account for a single LOE. Following USEPA guidance (1998) guidance, risk estimates for each potential receptor and COPEC within a potential exposure area were interpreted based on a semi-quantitative WOE approach using multiple LOE. LOE could include but are not limited to the following: supporting statistical and site use information (such as the frequency of detection [FOD]), basis of the exposure concentrations (maximum versus 95UCL), confidence in the toxicity values, the direction of uncertainty in the risk estimates, consideration of special-status species at the site, and spatial extent of elevated concentrations. The WOE assessment, including the HQs based on the most refined exposure assumptions (area-weighted EPC and site-specific SUF) and supporting LOE, was used to evaluate the assessment endpoints, reduce uncertainty, and ultimately draw risk conclusions. These components comprise the risk description.

ES.6.4.1 Approach

Risks to potential ecological receptors from COPECs in soil were estimated for all 17 potential ecological exposure areas by calculating HQs for each receptor and COPEC. For plants and soil invertebrates, risks (HQs) were estimated by comparing the soil EPCs for each COPEC with respective screening levels and these HQs were compared to the target HQ of 1. For wildlife, HQs are an expression of the ratio of an exposure estimated dose (ADD_t) to an effects dose (that is, TRV). ADD_t for indicator species were compared to the NOAEL-based (low) and LOAEL-based (high) TRVs, and these HQs were compared to the target HQ of 1.

For wildlife, HQs represent potential risk to individual receptors and potential risk to populations must be extrapolated from these HQ values following a standard HQ equation (USEPA 1997). For wildlife, risks were estimated using a generic SUF of 1 and also using site-specific SUFs. Following the RAWP (Arcadis 2008a), area-weighted EPCs were calculated only if risks based on depth-weighted EPCs suggested potential risk to ecological receptors (that is, HQ greater than 1 for any COPEC).

The ERAs for each potential ecological exposure area are presented in detail in the exposure area-specific appendices, including risk calculations based on depth-weighted and area-weighted EPCs (when calculated) for all COPECs, and the WOE conclusions. At the conclusion of each potential exposure area ERA, risk drivers were identified based on those COPECs for which unacceptable community/population level risk (that is, HQs greater than 1 for plants and soil invertebrate communities and LOAEL-based HQs for wildlife populations [or LOAEL-based HQs greater than 10 for dioxin TEQ]) was predicted using the most refined exposure and effects assumptions (which are selected TRVs, area-weighted EPCs, and site-specific SUF) and additional supporting LOE. For T&E species and other species of concern observed onsite (ring-tail cat and bats, respectively), a qualitative assessment was completed based on surrogate and representative receptors.

ES.6.4.2 Results of the ERA

As noted above, risk conclusions are based on HQs calculated using refined exposure and effects assumptions associated with a higher level of confidence in predicting risks (area-weighted EPCs, site-specific SUF, and selected TRVs) and the supporting LOEs. The HQs, LOEs, and risk conclusions are summarized in Table 6-11 of the HHERA Report (see exposure area-specific appendices for details).

In summary, based on the WOE approach, there were no potentially unacceptable risks identified for T&E species potentially present at the site. In addition, no potentially unacceptable risk was identified for most ecological receptors, including granivorous small mammals, small home range birds, and all large home range receptors, for any of the potential exposure areas evaluated.

The potential for unacceptable risk was identified only for three ecological receptors in four potential exposure areas located along the TCS fenceline. These potential exposure areas, risk-driving COPECs, and potential receptors are presented in the table titled Potential Exposure Areas, Risk-Driving COPECs, and Potential Receptors and summarized in the following sections.

Potential Exposure Areas, Risk-Driving COPECs, and Potential Receptors

Exposure Area	Risk Driver	Plants	Invertebrates	Shrew
BCW	Dioxin TEQ	No	No	Yes
SWMU1	Hexavalent Chromium	Yes	Yes	No
SWMU1	Total Chromium	No	Yes	Yes
SWMU1	Dioxin TEQ	No	No	Yes
AOC9	Hexavalent Chromium	Yes	Yes	No
AOC9	Total Chromium	No	Yes	Yes
AOC9	Copper	Yes	Yes	Yes
AOC9	Dioxin TEQ	No	No	Yes
AOC 10	Hexavalent Chromium	Yes	Yes	No
AOC 10	Total Chromium	No	Yes	No
AOC 10	Dioxin TEQ	No	No	Yes

For ecological communities of plants and soil invertebrates, only generic risk-based screening levels were available to estimate HQs. As discussed in Section 6.7, screening levels for the risk-driving COPECs are often below BTVs and there is low confidence in their ability to predict risk at the site. The screening levels are published values based on toxicity data that have limited relevance for the site and are designed for use in conservative screening level risk assessments and for site-characterization purposes. Therefore, use of these generic screening levels can result in significant uncertainty in the risk estimates. For plants, observations of plant communities made during floristic surveys were also used as a key LOE.

BCW

For the baseline scenario, and based on a WOE approach, no potentially unacceptable risk was identified for: plants, soil invertebrates, granivorous mammals and birds, or insectivorous birds. Area-weighted HQs for plants and soil invertebrates and LOAEL-based HQs for wildlife were greater than 1 for some COPECs and receptors; however, the WOE supports the conclusion that unacceptable risk is unlikely for: antimony and thallium for plants; hexavalent chromium and total chromium for soil invertebrates; total chromium, mercury, and dioxin TEQ for cactus wren; antimony for desert shrew; and dioxin TEQ for Merriam's kangaroo rat. Potential for unacceptable risk was identified only for dioxin TEQ for invertivorous mammals (desert shrew) with risk-driving locations primarily within SWMU 1 in the BCW potential exposure area.

The risk conclusions for the 2-foot scouring scenario are similar to the baseline scenario, with the same risk drivers and associated receptors showing potentially unacceptable risk. In the 5-foot scouring scenario, the potential for unacceptable risk to desert shrew is no longer present, indicating that the concentrations of concern for dioxin TEQ are not within the surface soil interval following scouring (5 to 5.5 feet bgs) evaluated in this scenario.

As discussed previously, SWMU 1 is located within the BCW potential exposure area. The ERA conducted for the BCW excluding SWMU 1 and TCS-4 (BCWxSWMU1) potential exposure area identified no potentially unacceptable risk for any receptor or COPEC evaluated. This supports the observation that the potentially unacceptable risks identified for BCW were due to COPEC concentrations present in SWMU 1 soil.

SWMU 1

For the baseline scenario, and based on a WOE approach, no potentially unacceptable risk was identified for granivorous mammals and birds, or insectivorous birds. Unacceptable risks were driven by: hexavalent chromium for plants; hexavalent chromium and total chromium for soil invertebrates; and total chromium and dioxin TEQ for invertivorous mammals (desert shrew).

AOC 9

For the baseline scenario, and based on a WOE approach, no potentially unacceptable risk was identified for granivorous mammals and birds, or insectivorous birds. Potentially unacceptable risks were driven by: hexavalent chromium and copper for plants; hexavalent chromium, total chromium, and copper for soil invertebrates; and total chromium, copper, and dioxin TEQ for invertivorous mammals (desert shrew) at locations along the TCS fenceline.

AOC 10

For the baseline scenario, and based on a WOE approach, no potentially unacceptable risk was identified for granivorous mammals and birds, or insectivorous birds. Potentially unacceptable risks were identified for: hexavalent chromium for plants; hexavalent chromium and total chromium for soil invertebrates; and dioxin TEQ for invertivorous mammals (desert shrew). Elevated concentrations of hexavalent chromium and dioxin TEQ are present in a few locations, primarily located within the drainage depressions (which are subareas AOC10b, c, and d) behind the berms at AOC 10. The risk conclusions are similar for the 2-foot scouring scenario, although total chromium also was noted as a risk driver for the desert shrew in the 2-foot scouring scenario. For the 5-foot scouring scenario, potential for unacceptable risk was identified only for dioxin TEQ and the desert shrew.

ES.6.5 ERA Uncertainty Analysis

Sources of uncertainty that influenced the ERA risk characterization included uncertainties in the analytical results, data evaluation, problem formulation, CSM, exposure point concentrations, exposure assessment, effects assessment, and interpretation of the risk estimates. Because of these approaches and other protective assumptions made throughout the ERAs, risk estimates are expected to be overestimated rather than underestimated.

Similar to the uncertainties in the HHRA, many of these sources of uncertainty are generic in nature and inherent in the risk assessment process. Site-specific uncertainties are also discussed.

ES.7 Conclusions and Recommendations

This section summarizes the conclusions of the HHRA and ERA for COPCs/COPECs in soil at the site and provides recommendations for constituents of concern (COCs) to be addressed in the Soil Corrective Measure Study/Feasibility Study (CMS/FS). For purposes of this HHERA, COCs refers to those chemicals that most significantly contribute to estimates of unacceptable risk (also referred to as ‘risk drivers’) and that are recommended to be the focus of future remedial planning.

ES.7.1 HHRA Conclusions and Recommendations

The results of the HHRA for the OCS and ICS potential exposure areas support the following findings:

Conclusions for the HHRA

- The depth- and area-weighted EPCs for lead in all potential exposure areas evaluated are not expected to result in an increase in blood lead levels above the OEHHA benchmark value of 1 µg/dL for child receptors or the fetus of any of the adult receptors evaluated. **Based on the results of the HHRA, the levels of lead in soil are safe and protective for all potential receptors evaluated.**
- The HHRA results for the ICS potential exposure area support that the levels of COPCs in ICS soil and/or soil gas are safe and protective of commercial and short- and long-term maintenance workers for current and anticipated future operational conditions and practices.
- While **AOC-specific evaluations provide useful information regarding limited areas or areas of highest impact, they are not suitable as the sole basis for the conclusions of the HHRA** or risk management decisions going forward. Assuming lifetime soil contact is limited to these specific individual potential exposure areas is not representative of either the potential receptors evaluated, or the likely future land use for the site.
- **The OCS potential exposure area is considered the most representative baseline scenario for potential human exposures and associated risks for soil contact outside TCS.** Human populations that could be present at the site would more likely be exposed randomly, over the course of a lifetime, to soil present in all areas located outside the TCS, rather than have a lifetime of contact limited to a single AOC/SWMU/UA.

- HIs for maintenance workers, recreational users, and tribal users were all ≤ 1 for both depth- and area-weighted EPCs for the OCS potential exposure area. **Based on the results of the HHRA, the levels of COPCs in OCS soil are safe and protective of potential noncancer health effects.**
- Estimated lifetime cancer risks for tribal users and hunters were at or below *de minimis* levels for the OCS potential exposure area. **Based on the results of the HHRA, levels of COPCs in soil are safe and protective of tribal users and hunters.**
- The HHRA results of the OCS potential exposure area support that the **levels of COPCs in OCS soil are safe and protective of short- and long-term maintenance workers** for current and anticipated future operational conditions and practices.
- **For all potential human receptors evaluated, COPCs in soil driving risks or hazards above *de minimis* levels are hexavalent chromium and dioxin TEQ, located predominately in the top 3 feet of soil.** Soil risk drivers appear to be predominately located in SWMU 1/TCS 4 and AOC 9.
- **The ILCR and HI estimates for the hypothetical future resident are likely highly overestimated.** Multiple conservative factors contributing to this overestimation include: the use of maximum depth-weighted concentrations to estimate exposure to PCBs and TPH as diesel and several conservative assumptions associated with food uptake modeling for hexavalent chromium and TPH as diesel.
- **The hypothetical future resident is not representative of likely future land use on DOI land or other areas of the site.** This evaluation is included in the HHRA for informational purposes only. As stated in DOI (2015) Land Use Memo, “DOI will not utilize a future residential scenario on Federal lands within the project area when evaluating cleanup options in the Feasibility Study phase.”

Recommendations for the HHRA

- For this HHRA, the OCS potential exposure area evaluation is the most representative scenario for the basis of HHRA conclusions and recommendations for the protection and safety of potential human receptors outside the fenceline.
- Based on the estimated cumulative ILCRs calculated for the HHRA, for the protection of human health, COPCs to be carried forward for developing RBRGs for soil are hexavalent chromium and dioxin TEQ.
- RBRGs for the potential recreational users are the most appropriate benchmarks for the protection of human health and associated risk management decisions going forward.
- Risks are within the risk management range of 1×10^{-6} and 1×10^{-4}. Within this estimated cancer risk range, there is flexibility for risk managers in deciding what action, if any, is necessary and appropriate for the protection of human health. This approach to response actions at the site is consistent with the NCP (40 CFR 300). Some targeted form of risk management or remediation, addressing elevated soil levels of hexavalent chromium and dioxin TEQ would be effective at reducing risks for the potential camper, hiker, and OHV rider to levels below the CalEPA DTSC point of departure for excess ILCR of 1×10^{-6}. No risk management or remediation would be necessary to reduce risks for the potential camper, hiker and OHV rider to levels below 1×10^{-5}.

ES.7.2 ERA Conclusions and Recommendations

Potential for unacceptable risk was identified for a certain few receptors (plants, soil invertebrates, and invertivorous small mammals) based on estimated exposure to a small number of COPECs (primarily hexavalent chromium, total chromium, dioxin TEQ) in three potential exposure areas near the TCS:

SWMU1, AOC9, and AOC10. Potentially unacceptable risk to invertivorous small mammal populations from risk drivers at BCW is due to elevated concentrations within the SWMU 1 potential exposure area. Copper was also identified as a risk driving COPEC for plants, soil invertebrates, and invertivorous small mammals in the AOC 9 potential exposure area. The risk driving COPECs are associated with known historical site releases and/or activities at or adjacent to the TCS (Section 2 of the HHERA Report).

Potential for unacceptable risk was not expected (based on HQs less than 1) or considered unlikely (based on the WOE) for all other potential receptors including granivorous small mammals, small home range birds, and all large home range receptors. Additionally, unacceptable risk was not expected or was considered unlikely in all remaining potential exposure areas more distant from the TCS. Based on the conservative assumptions incorporated in ERA, these risk conclusions likely overestimate potential for unacceptable risk at the site.

Some targeted form of risk management or remediation, addressing elevated concentrations of the following risk drivers in the following potential exposure areas would be effective at reducing potential exposures and thus risks to acceptable levels:

- Dioxin TEQ in SWMU1 – Targeted soil remediation for these risk drivers would be effective at reducing potential exposures and thus risks to acceptable levels within BCW (the potential exposure area considered to be the reasonable exposure area for receptor populations [and not SWMU 1]).
- Hexavalent chromium, total chromium, copper, and dioxin TEQ in AOC 9 – Targeted soil remediation for these risk drivers at locations along the TCS fenceline would be effective at reducing potential exposures and thus risks to acceptable levels within AOC 9.
- Hexavalent chromium, total chromium, and dioxin TEQ in AOC 10 – Targeted soil remediation for these risk drivers at locations within the AOC10c subarea (which is the drainage depression behind the middle berm in East Ravine), would be effective at reducing potential exposures and thus risks to desert shrew (which is an invertivorous small mammal) to acceptable levels within AOC 10.

ES.8 Risk-Based Remedial Goals for Risk Drivers

As stated in the RAWP (Arcadis 2008a), risk management decisions to be made in the CMS/FS step of the regulatory process will be focused on COPCs/COPECs that contribute most significantly to risk and/or that exceed *de minimis* risk levels for soil for the potential receptors being evaluated (that is, COCs). RBRGs are concentrations at or below which COCs do not present potentially unacceptable risk to human health and ecological receptors. These values can be used in upcoming remedial planning including the CMS/FS to identify those COCs and areas of the site that may warrant some form of remedial or risk management action. RBRGs are proposed health protective target cleanup concentrations that can be used, in combination with other factors such as background concentrations, as a starting point for making risk management decisions. Consistent with the HHERA approach, RBRGs are applied based on the potential exposure area of interest (that is, the 95UCL for the exposure area should be less than or equal to the RBRG).

ES.8.1 Human Health RBRGs

RBRGs were calculated for hexavalent chromium and dioxin TEQ, those compounds driving cancer risk estimates to greater than *de minimis* levels for the camper, hiker, and OHV rider exposure scenarios.

ES.8.1.1 Methodology and Calculated RBRG Values

The methodology used to develop the RBRGs for the COPCs in soil at the site is based on USEPA and CalEPA guidance and the specific equations provided in the guidance documents (USEPA 1989, 1991; DTSC 1992, 2015). Exposure, transport, and toxicity assumptions remain unchanged from those described and used in the HHRA risk characterization (Section 5.0). Rearranging the equations used to estimate the ILCRs and noncancer hazards and using the CalEPA DTSC point of departure for the target ILCR of $1×10^{-6}$ (and 1×10^{-5} for dioxin TEQ) and the target noncancer HQ of 1, the concentration of each risk driver associated with the target ILCR and HQ levels was determined. Note that as indicated in the NCP (40 CFR 300), cancer risks between 1×10^{-6} and 1×10^{-4} fall within a risk management range. This is generally referred to as the acceptable risk range. Within this estimated cancer risk range, there is flexibility for risk managers in deciding what action, if any, is necessary and appropriate for the protection of human health. The CalEPA DTSC point of departure for excess incremental lifetime cancer risk is 1 x 10-6, and risk management decisions may raise the target criterion above $1×10^{-6}$ depending on site specific conditions.

RBRGs protective of potential human receptors are summarized in the table titled Risk-Based Remediation Goals Protective of Potential Human Receptors. RBRGs are a tool and not intended as a ”bright line” for remediation.

Risk-Based Remediation Goals Protective of Potential Human Receptors

Risk Drivers for Potential Recreational Users	Human Health RBRG	RBRG Basis
CrVI	3.1 mg/kg	OHV rider at 1×10^{-6} risk
CrVI	31 mg/kg	OHV rider at 1×10^{-5} risk
CrVI	310 mg/kg	OHV rider at 1×10^{-4} risk
Dioxin TEQ	100 ng/kg	Hiker at 1×10^{-6} risk
Dioxin TEQ	1,000 ng/kg	Hiker at 1×10^{-5} risk
Dioxin TEQ	10,000 ng/kg	Hiker at 1×10^{-4} risk

ES.8.1.2 Locations Driving Risk for the HHRA

The following discussion of the locations driving risk for the HHRA OCS potential exposure area is provided as an example of one method that can be used to apply the RBRGs and assist with identifying remedial design possibilities. This is not intended to substitute for actual remedial design and comprises part of the set of tools available to risk managers to make site-specific decisions regarding risk.

The lowest recreational user RBRGs for hexavalent chromium and dioxin TEQ are 3.1 mg/kg (for OHV rider at 1×10^{-6} risk level) and 0.00010 mg/kg (or 100 ng/kg; for hiker at 1×10^{-6} risk level), respectively (Table 8-1). Depth-weighted concentrations of the risk drivers, hexavalent chromium and dioxin TEQ, were ranked and the highest concentrations were iteratively removed from the baseline soil dataset. Then residual depth-weighted EPCs were calculated for the 0- to 0.5-foot bgs and 0- to 3-foot bgs exposure depths and compared with respective RBRGs. This process was repeated until the resulting residual depth-weighted 95UCL for the OCS potential exposure area was at or below the RBRG. To achieve this outcome, the following soil locations were identified as driving risks. When they were removed, the RBRG was achieved by the 95UCL for the remaining data.

- SWMU 1
  - SWMU1-25 to meet the RBRG of 100 ng/kg for dioxin TEQ based on target cancer risk of 1 x 10^{-6} for both the 0- to 0.5-foot bgs and 0- to 3-foot bgs exposure depths; no sample data needs to be removed to meet the RBRG of 1,000 ng/kg for dioxin TEQ based on target cancer risk of 1 x 10^{-5} for both the 0- to 0.5-foot bgs and 0- to 3-foot bgs exposure depths.
- AOC 9
  - AOC10-20 to meet the RBRG of 3.1 mg/kg for hexavalent chromium for both the 0- to 0.5-foot bgs and 0- to 3-foot bgs exposure depths
  - #10 to meet the RBRG of 3.1 mg/kg for hexavalent chromium for the 0- to 3-foot bgs exposure depth.
- AOC 10
  - MW-58BR_S to meet the RBRG of 3.1 mg/kg for hexavalent chromium for the 0- to 3-foot bgs exposure depth.

ES.8.2 Ecological RGRGs

The ERA identified the following risk drivers and potential exposure areas as presenting an unacceptable risk to one or more potential ecological receptors:

- BCW (baseline) –dioxin TEQ for small mammals
- AOC 9 – hexavalent chromium and copper for plants; hexavalent chromium, total chromium, and copper for invertebrates; total chromium, copper, and dioxin TEQ for small mammals
- AOC 10 – hexavalent chromium and total chromium for plants; total chromium for invertebrates; and total chromium and dioxin TEQ for small mammals.

ES.8.2.1 Methodology and Calculated RBRG Values

For potential ecological communities of plants and soil invertebrates, only generic risk-based screening levels are available, and there is low confidence in their ability to predict risk at the site. Therefore, these generic screening levels for plants and soil invertebrates are not recommended for use as RBRGs at the site. Because the key risk drivers for plants and soil invertebrates (hexavalent chromium and total chromium) tend to be co-located, risk-management or remedial actions considered for the protection of wildlife receptors potentially exposed to total chromium will also reduce risk to plants and invertebrates.

For potential wildlife receptors, RBRGs based on protection of wildlife populations (that is, based on LOAEL-based TRVs) were derived for invertivorous small mammals (desert shrew), the only potential wildlife receptor identified with the potential for unacceptable risk associated with exposure to COPECs in soil at this site. The RBRGs (Table 8-3 of the HHERA Report) for small home range invertivorous mammals (desert shrew) were derived using the dietary dose model used to estimate HQs in the predictive ERAs (Sections 6.4 and 6.6). The RBRGs were calculated using Microsoft® Excel Solver™ software that determines the soil concentration for a target HQ equal to 1.

For dioxin TEQ, a range of RBRGs were calculated using the alternate and more robust BAF and TRV approaches/values. The congener-specific BAFs (USEPA 1999, Fagervold et al. 2010) and a recommended mammalian dioxin TRV developed in HHERA Report Section 6.7.5 of 30 ng/kg-bw/day derived using the

USEPA EcoSSL approach were used to calculate the RBRGs protective of invertivorous small mammals. Ecological RBRGs are summarized in the table titled Ecological Risk-Based Remediation Goals.

Ecological Risk-Based Remediation Goals

Risk Driver for Shrew	BAF	LOAEL-Based Mammalian TRV	Ecological RBRG
Total Chromium	ERA / RAWP	ERA / RAWP	145 mg/kg
Copper	ERA / RAWP	ERA / RAWP	145 mg/kg
Dioxin TEQ	USEPA (1999)	30 ng/kg-day (geomean of rodent studies)	190 ng/kg
Dioxin TEQ	Fagervold et al. (2010)	30 ng/kg-day (geomean of rodent studies)	360 ng/kg

Note:
ng/kg-day = nanograms per kilogram per day

ES.8.2.2 Locations Driving Risk for the ERA

The following discussion of the locations driving risk for the ERA is provided as an example of one method that can be used to apply the RBRGs and assist with identifying remedial design possibilities. This is not intended to substitute for actual remedial design and comprises part of the set of tools available to the risk manager to make site-specific decisions regarding risk.

For each potential exposure area, depth-weighted concentrations of the risk-driving COPECs were ranked and the highest concentrations were iteratively removed from the baseline soil dataset. Then residual depth-weighted EPCs were calculated for the 0- to 0.5-foot bgs exposure depth and compared with respective RBRGs for the risk driving compounds. This process was repeated until the resulting residual depth-weighted 95UCL for the potential exposure area was at or below the relevant RBRG. To achieve this outcome, the following soil locations were identified as driving risks. When they were removed from the dataset, the RBRG was achieved by the 95UCL for the remaining data. Details of the exact samples and sampling locations included in each potential exposure area are presented in the Data Evaluation and COPC/COPEC Selection section (Section 2) of each exposure area-specific appendix.

To summarize, these include removal of soil the following locations:

- BCW:
    - SWMU1-25 to meet the RBRG of 190 ng/kg for dioxin TEQ at 0 to 0.5 foot bgs. No sample data were removed to meet the RBRG of 360 ng/kg for dioxin TEQ.
- AOC 9:
    - AOC10-21 to meet the RBRG of 145 mg/kg for copper at 0 to 0.5 foot bgs
    - AOC10-20 to meet the RBRG of 145 mg/kg for total chromium at 0 to 0.5 foot bgs
    - PA-20, AOC10-23, and PA-21 to meet the RBRG of 190 ng/kg for dioxin TEQ at 0 to 0.5 foot bgs; and PA-20 and AOC10-23 to meet the RBRG of 360 ng/kg for dioxin TEQ at 0 to 0.5 foot bgs.
- AOC 10:
    - AOC10c-4 to meet the RBRG of 190 ng/kg for dioxin TEQ at 0 to 0.5 foot bgs. No sample data were removed to meet the RBRG of 360 ng/kg for dioxin TEQ.

ES.9 Key Findings

Overall, the HHERA conducted herein found no potentially unacceptable risk to most human and ecological receptors potentially exposed to COPCs/COPECs in soil at the site, both within the TCS (ICS potential exposure area) and potential exposure areas outside the TCS. No unacceptable risk was identified for all relevant potential exposure areas for the following receptors:

- Potential Human Receptors:
  - Tribal users
  - Hunter
  - Workers (commercial and short- and long-term maintenance workers).
- Potential Ecological Receptors
  - Special-status species, including ring-tailed cat (California fully protected species), cave myotis (California species of concern), and pallid bats (California species of concern)
  - Large home-range receptors (desert kit fox, Nelson's desert bighorn sheep, and red-tailed hawk)
  - Herbivorous and insectivorous birds (Gambel's quail and cactus wren)
  - Herbivorous small mammals (Merriam's kangaroo rat).

For the remaining potential receptors (camper, hiker, OHV rider, and desert shrew), the potential for unacceptable risk was identified as being driven by a limited number of compounds (that is, dioxin TEQ and hexavalent chromium for human health; dioxin TEQ, total chromium, and copper for ecological receptors) in areas within SWMU 1, AOC 9, and/or AOC 10.

The RBRGs calculated for the risk drivers and relevant human and ecological receptors, were used in an example of applying the RBRGs to identify locations driving risk above acceptable levels for both human and ecological populations. That process revealed a total of nine locations in three potential exposure areas (SWMU 1, AOC 9, and AOC 10) as associated with unacceptable risk. Those locations are as follows:

- Protection of potential human recreators (four total locations for all potential exposure depth intervals [0- to 3-foot bgs depth interval]):
  - Dioxin TEQ: SWMU1-25 in OCS / SWMU1
  - Hexavalent chromium: AOC10-20, #10 in AOC 9, and MW-58BR_S in AOC 10 for the 0- to 3-foot bgs depth interval.
- Protection of desert shrew (up to seven total locations for the 0- to 0.5-foot bgs depth interval):
  - Dioxin TEQ (based on RBRG of 190 ng/kg): SWMU1-25 in BCW; PA-20, AOC10-23, and PA-21 in AOC 9; and AOC10c-4 in AOC 10
    - Based on dioxin TEQ RBRG of 360 ng/kg: PA-20 and AOC10-23 in AOC 9
  - Total chromium: AOC10-20 in AOC 9
  - Copper: AOC10-21 in AOC 9.

The overall results of the HHERA support that focusing remedial planning on limited specific locations should be effective in reducing overall risks to levels that are protective of human health and ecological receptors.

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Appendix D
Derivation of Risk-Based Remediation Goals for Risk Drivers in Soil

Pacific Gas & Electric Company

DERIVATION OF RISK-BASED REMEDIATION GOALS FOR RISK DRIVERS IN SOIL

Topock Compressor Station, Needles, CA

February 2020

This Appendix to the Soil Engineering Evaluation/Cost Analysis (EE/CA) document is an excerpt from the Soil Human Health and Ecological Risk Assessment Report (HHERA; Arcadis 2019). Specifically, the entirety of Section 8 of the Soil HHERA is presented without alteration. The information provided in this document describes the process used to develop Risk-Based Remediation Goals (RBRGs) for site specific human and ecological populations evaluated in the HHERA. Citations in this text for document sections, tables, and figures refers to the sections, tables, and figures in the HHERA document.

1 RISK-BASED REMEDIATION GOALS FOR RISK DRIVERS IN SOIL

As stated in the Human Health and Ecological Risk Assessment Work Plan (RAWP; Arcadis 2008), risk management decisions to be made in the CMS/FS step of the regulatory process will be focused on constituents of potential concern/constituents of potential ecological concern (COPCs/COPECs) that contribute most significantly to risk and/or that exceed *de minimis* risk levels for soil for the potential receptors being evaluated (i.e., the risk drivers). The overall remedial action goal is to ensure that residual concentrations of chemicals remaining at the site are protective of human health and the environment for the reasonable anticipated future land uses.

This section presents the RBRGs that can be used in the upcoming remedial planning, including the Soil Corrective Measures Study/Feasibility Study (CMS/FS) and EE/CA, to identify those areas of the site that may warrant some form of remedial or risk management action. RBRGs are concentrations that do not present unacceptable risk to human health and ecological receptors. An RBRG is a proposed health protective target cleanup concentration that can be used, in combination with other factors such as background concentrations, as a starting point for making risk management decisions. RBRGs are calculated for constituents in soil for a given potential receptor where the findings of the HHERA suggest some form of risk management or remediation may be warranted. Consistent with the HHERA approach, RBRGs are applied based on the potential exposure area of interest (i.e., the 95% upper confidence limit on the mean [95UCL] for the potential exposure area should be less than or equal to the RBRG).

The approach for the derivation of RBRGs and the calculated RBRGs for potential human and ecological receptors are discussed in the sections below. Additionally, an example is provided showing one method to identify specific soil locations that, when removed from the potential exposure area dataset, result in exposure point concentrations (EPCs) at or below RBRGs. This evaluation also constitutes a hot spot analysis in that it identifies the locations with elevated COPC/COPEC concentrations associated with unacceptable risk for an area. At these locations, deep impacts that potentially represent a threat to groundwater will be further identified in the forthcoming RCRA Facility Investigation/Remedial Investigation (RFI/RI) Report Volume 3 (currently being prepared by Jacobs).

1.1 Human Health RBRGs

Based on the results of the soil Human Health Risk Assessment (HHRA), the concentrations of COPCs in Outside the Compressor Station (OCS) exposure area soil are safe and protective of short- and long-term maintenance workers, hunters, and tribal users. Concentrations of COPCs in Inside the Compressor Station (ICS) soils are safe and protective of commercial workers and short- and long-term maintenance workers. Concentrations of COPCs in OCS soils result in calculated risks for the potential campers, hikers, and off-highway vehicle (OHV) riders that are within the risk management range of 1 x 10^{-6} and 1 x 10^{-4}. Within this estimated cancer risk range, there is flexibility for risk managers in deciding what action, if any, is necessary and appropriate for the protection of human health. However, some targeted form of risk management or remediation, addressing elevated levels of hexavalent chromium and dioxin, would be effective at reducing calculated risks for the potential campers, hikers and OHV riders to levels below California Environmental Protection Agency (CalEPA) Department of Toxic Substances Control (DTSC) point of departure for excess incremental lifetime cancer risk (ILCR) of 1 x 10^{-6}. No risk management or remediation would be necessary to reduce risks for the the potential camper, hiker, and OHV rider to levels below 1 x 10^{-5}. The result of the north of the railroad (NORR) HHRA for hypothetical future residents are presented at the request of the Department of Interior (DOI) and for informational purposes only; the hypothetical future residential land use is not a reasonable anticipated future land use for the NORR potential exposure area.

Consistent with U.S. Environmental Protection Agency (USEPA) guidance (1991), a risk-based process was used to estimate RBRGs for COPCs that drive soil risk concerns above *de minimis* risk levels. For compounds identified as carcinogens negligible or *de minimis* risk levels are defined in accordance with state and federal guidance as one in one million (1×10^{-6}). This will be the point of departure, recognizing that DTSC and USEPA ultimately have authority to allow for residual risks to be within the risk management range of 1×10^{-4} to 1×10^{-6}. RBRGs are a tool to aid in risk management decisions and are not intended to provide a bright line for remediation.

For dioxins toxicity equivalent (TEQ), DTSC's Human and Ecological Risk Office (HERO) supports the use of residential and indoor commercial worker remedial goals equal to 10 times the theoretical potential cancer risk of 1 x 10^{-6} (equal to that associated with a theoretical potential cancer risk of 1 x 10^{-5}). This regulatory approach is based on studies of bioavailability of dioxins that demonstrate exposure to soil under normal residential and indoor commercial conditions has minimal influence on the serum of exposed individuals. The 1×10^{-5} potential risk level is considered by DTSC to be a likely overestimate of the actual potential risk for exposure to soil with dioxin TEQ (DTSC 2017). For outdoor workers with direct contact with site soils such that regular incidental ingestion of soil impacted with dioxin TEQs may occur, DTSC recommends RBRGs equal to a theoretical potential cancer risk of 1×10^{-6} (DTSC 2017). Note that recreational users are assumed to have the same intake rates via ingestion, dermal contact, and inhalation exposure pathways as under a residential scenario, but exposure occurs on a less frequent basis than assumed under a residential scenario. Therefore, potential exposure to dioxin TEQ in soil for the recreational users over a lifetime would be less than for a hypothetical resident. As such, the RBRGs for recreational users equal to 10 times the theoretical potential cancer risk of 1×10^{-6} may be appropriate for the site.

For noncancer health effects, a hazard quotient (HQ) of less than or equal to 1 implies that the predicted exposure for a given population and chemical is not expected to result in adverse noncancer health effects; a hazard index (HI) of less than or equal to 1 implies the same for multi-chemical exposures (USEPA 1989).

The identification of risk drivers in the HHRA was based on the summary of results and overall conclusions of the Human Health Risk Assessment (HHRA) as presented in Section 7.1.3 and Table 5-6. RBRGs were calculated for hexavalent chromium and dioxin TEQ, the significant contributors to soil risks above *de minimis* levels[1], under the camper, hiker, and OHV rider potential exposure scenarios. The approach for the derivation of the human health RBRGs, the calculated RBRGs for recreational users, and soil locations that contribute most significantly to calculated unacceptable risks for recreational users are discussed in the sections below.

1.1.1 Methodology for Deriving Human Health RBRGs and Values

RBRGs for soil are developed by combining information regarding the level of assumed intake of the constituent, the levels of acceptable risk, and the relationship between the assumed intake of constituent and the calculated incidence of an adverse health effect as a function of human exposure to the constituent. The methodology used to develop the RBRGs for the COPCs in soil at the site is based on USEPA and DTSC guidance and the specific equations provided in the guidance documents below:

- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A) (USEPA 1989)
- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part B: Development of Risk-Based Preliminary Remediation Goals) (USEPA 1991)
- Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities (DTSC 1992)
- Preliminary Endangerment Assessment Guidance Manual (DTSC 2015).

Section 5.5 presents the estimated ILCRs and noncancer hazards posed by a representative concentration of constituent present at the site for potential recreational user scenarios. Assumptions for potential exposure, transport, and toxicity remain unchanged from those described and used in Section 5.0. Rearranging the equations used to estimate the ILCRs and noncancer hazards and using the target ILCRs at the lower and upper bounds the risk management range of 1×10^{-6} and 1×10^{-4} and the target noncancer HQ of 1, the concentration of each constituent associated with the target ILCR and HQ levels can be determined. This is the common method used to estimate RBRGs for a site, where the results of the risk assessment indicate that some form of remediation or risk management may be warranted. The soil RBRGs for the potential recreational user scenarios presented in Table 8-1 were developed using the equations below. RBRGs are rounded to two significant figures. Note that risk-based concentrations (RBCs) were developed for the list of COPCs identified in the HHERA using the same approach and equations as for the development of the human health RBRGs. The RBCs were developed for the Soil Management Plan to be used to support decisions for the handling, management, and storage of potentially contaminated and displaced soil at the site during implementation of a groundwater remedy at the site to address chromium contamination in groundwater. The RBCs are presented in Appendix RBC.

For carcinogenic effects, the following equation is used to derive the soil RBRG for assumed incidental ingestion of soil, dermal contact with soil, and inhalation of particulates and volatile organic compound (VOC) vapors in ambient outdoor air from soil:

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[1] In accordance with the RAWP (Arcadis 2008), the conclusions and recommendations for this HHRA are based on the risks estimated for the ICS and OCS potential exposure areas.

Equation 1-1

$$RBRG_{a,carcinogen} = \frac{Target\ Risk\ Level}{\left[\frac{Risk_{a,inhv}}{Conc_{a,inhv}}\right] + \left[\frac{Risk_{a,inhp}}{Conc_{a,inhp}}\right] + \left[\frac{Risk_{a,ing}}{Conc_{a,ing}}\right] + \left[\frac{Risk_{a,der}}{Conc_{a,der}}\right]}$$

Where:

$RBRG_{a,carcinogen}$ = Risk-based remediation goal for constituent a, for carcinogenic effects, (milligrams per kilogram [mg//kg])

Target Risk Level = Target cancer risk level (unitless)

$Risk_{a,inhv}$ = Calculated cancer risk for constituent a for the vapor inhalation pathway, developed as described above (unitless)

$Risk_{a,inhp}$ = Calculated cancer risk for constituent a for the particulate inhalation pathway, developed as described above (unitless)

$Risk_{a,ing}$ = Calculated cancer risk for constituent a for the soil ingestion pathway, developed as described above (unitless)

$Risk_{a,der}$ = Calculated cancer risk for constituent a for the dermal contact pathway, developed as described above (unitless)

$Conc_{a,inhv}$ = Representative exposure concentration of constituent a for the vapor inhalation pathway; mg/kg

$Conc_{a,inhp}$ = Representative exposure concentration of constituent a for the particulate inhalation pathway; mg/kg

$Conc_{a,ing}$ = Representative exposure concentration of constituent a for the soil ingestion pathway; mg/kg

$Conc_{a,der}$ = Representative exposure concentration of constituent a for the dermal contact pathway; mg/kg

For noncarcinogenic effects, the following equation was used to derive the soil RBRG for incidental ingestion of soil, dermal contact with soil, and inhalation of particulates and VOC vapors in ambient outdoor air from soil:

Equation 1-2

$$RBRG_{a,noncarcinogen} = \frac{Target\ HQ}{\left[\frac{HQ_{a,inhv}}{Conc_{a,inhv}}\right] + \left[\frac{HQ_{a,inhp}}{Conc_{a,inhp}}\right] + \left[\frac{HQ_{a,ing}}{Conc_{a,ing}}\right] + \left[\frac{HQ_{a,der}}{Conc_{a,der}}\right]}$$

Where:

$RBRG_{a,noncarcinogen}$ = Risk-based remediation goal for constituent a, for noncarcinogenic effects, (mg/kg)

Target HQ = Target hazard quotient level (unitless)

$HQ_{a,inhv}$ = Calculated hazard quotient for constituent a for the vapor inhalation pathway, developed as described above (unitless)

$HQ_{a,inhp}$ = Calculated hazard quotient for constituent a for the particulate inhalation pathway, developed as described above (unitless)

$HQ_{a,ing}$ = Calculated hazard quotient for constituent a for the soil ingestion pathway, developed as described above (unitless)

$HQ_{a,der}$ = Calculated hazard quotient for constituent a for the dermal contact pathway, developed as described above (unitless)

$Conc_{a,inhv}$ = Representative exposure concentration of constituent a for the vapor inhalation pathway; mg/kg

$Conc_{a,inhp}$ = Representative exposure concentration of constituent a for particulate inhalation pathway; mg/kg

$Conc_{a,ing}$ = Representative exposure concentration of constituent a for soil ingestion pathway; mg/kg

$Conc_{a,der}$ = Representative exposure concentration of constituent a for dermal contact pathway; mg/kg

The RBRGs for hexavalent chromium and dioxin TEQ for the potential camper, hiker, and OHV rider are presented in Table 8-1 and the lowest recreational user RBRGs for hexavalent chromium (CrVI) and dioxin TEQ are summarized in the table titled Lowest Recreational User Risk-Based Remediation Goals for Hexavalent Chromium.

Lowest Recreational User Risk-Based Remediation Goals for Hexavalent Chromium

Risk Drivers for Potential Recreational Users	Human Health RBRG	RBRG Basis
CrVI	3.1 mg/kg	OHV rider at 1 x 10^{-6} risk
CrVI	31 mg/kg	OHV rider at 1 x 10^{-5} risk
CrVI	310 mg/kg	OHV rider at 1 x 10^{-4} risk
Dioxin TEQ	100 ng/kg	Hiker at 1 x 10^{-6} risk
Dioxin TEQ	1,000 ng/kg	Hiker at 1 x 10^{-5} risk
Dioxin TEQ	10,000 ng/kg	Hiker at 1 x 10^{-4} risk

Notes:

mg/kg = milligrams per kilogram

ng/kg = nanograms per kilogram

The RBRGs calculated for hexavalent chromium (3.1 mg/kg) and dioxin TEQ (ranging from 100 to 1,000 ng/kg) were used to identify soil locations associated with calculated levels of risk above the CalEPA DTSC point of departure for excess ILCR of 1 x 10-6 , as described in following section. RBRGs are a tool and not intended as a ”bright line” for remediation.

1.1.2 Soil Locations Contributing to Calculated Risks Above De Minimis Levels for Potential Human Receptors

This section discusses the locations that drive risk for the HHRA for the OCS potential exposure area and is provided as an example of one method that can be used to apply the RBRGs and assist with identifying remedial design possibilities. This is not intended to substitute for actual remedial design and comprises part of the set of tools available to risk managers to make site-specific decisions regarding risk.

As previously stated in Section 8.1, based on the results of the HHRA, some targeted form of risk management or remediation, addressing elevated levels of the calculated risk drivers, hexavalent chromium and dioxin TEQ, would be effective at reducing calculated risks for potential campers, hikers, and OHV riders to levels below 1×10^{-6}. As indicated in Table 8-1, the lowest recreational user RBRGs for hexavalent chromium and dioxin TEQ are 3.1 mg/kg (for OHV rider at 1×10^{-6} risk level) and 0.00010 mg/kg (or 100 ng/kg; for hiker at 1×10^{-6} risk level), respectively.

To further refine the locations that could be considered for targeted risk management in the OCS potential exposure area, depth-weighted concentrations of the risk drivers, hexavalent chromium and dioxin TEQ, were ranked and the highest concentrations were iteratively removed from the baseline soil dataset. Using the remaining data, depth-weighted EPCs were calculated for the 0 to 0.5 foot below ground surface (bgs) and 0 to 3 foot bgs exposure depths and compared to the respective RBRGs. Table 8-2 identifies soil locations at three investigation areas (Solid Waste Management Unit [SWMU] 1, Area of Concern [AOC] 9, and AOC 10) within the OCS potential exposure area where the depth-weighted concentrations of hexavalent chromium and/or dioxin TEQ in the top 0 to 3 feet bgs of soil exceed the RBRGs. If removed from the OCS potential exposure area baseline dataset (i.e., mimicking a hypothetical remediation), the resulting residual depth-weighted 95UCL for the OCS potential exposure area is at or below the RBRG. These locations were identified based on depth-weighted EPCs for simplicity and as a conservative approach to identifying the areas/locations that if removed, would result in residual concentrations of Cr VI and dioxin TEQ in soil that are calculated to be protective of the potential camper, hiker, and OHV rider. As mentioned above, this is just one example of the application of RBRGs, and the specific locations identified in Table 8-2 are not intended to be used either for remedial design without further consideration or as a post remediation risk evaluation. Confirmation sampling and a post-remediation risk assessment may be necessary to demonstrate that residual contamination is not of concern if removal of soil is implemented as a remedial and risk management decision at the site.

To summarize, this example included removal of soil data for the following locations:

- **SWMU 1**
  - SWMU1-25 to meet the RBRG of 100 ng/kg for dioxin TEQ based on target cancer risk of 1×10^{-6} for both the 0- to 0.5-foot bgs and 0- to 3-foot bgs exposure depths; no sample data need to be removed to meet the RBRG of 1,000 ng/kg for dioxin TEQ based on target cancer risk of 1×10^{-5} for both the 0- to 0.5-foot bgs and 0- to 3-foot bgs exposure depths.
- **AOC 9**
  - AOC10-20 to meet the RBRG of 3.1 mg/kg for hexavalent chromium for both the 0- to 0.5-foot bgs and 0- to 3-foot bgs exposure depths

  - #10 to meet the RBRG of 3.1 mg/kg for hexavalent chromium for the 0- to 3-foot bgs exposure depth.
- **AOC 10**
  - MW-58BR_S to meet the RBRG of 3.1 mg/kg for hexavalent chromium for the 0 to 3 foot bgs exposure depth.

1.2 Ecological RBRGs

Ecological RBRGs are calculated health protective concentrations below which no potentially unacceptable calculated risk to potential ecological receptor populations is expected. RBRGs protective of potential ecological receptors are developed for risk drivers; that is, those COPECs, and potential exposure areas for which potential unacceptable risk to receptor populations was concluded in the Ecological Risk Assessment (ERA) (Section 7.2.5). For COPECs with HQs greater than 1 using the most refined exposure and effects assumptions (i.e., area-weighted EPCs, selected screening levels/toxicity reference values (TRVs), and site-specific site use factors (SUFs), a weight of evidence (WOE) assessment was used to draw risk conclusions and identify potential risk drivers for each potential exposure area. The various lines of evidence (LOEs) considered in the WOE assessment and risk conclusions are presented in Table 6-11.

The ERA calculated the following risk drivers and potential exposure areas as presenting potentially unacceptable risk to one or more ecological receptors:

- Bat Cave Wash (BCW) – dioxin TEQ for small invertivorous mammals (desert shrew)
- AOC 9 – hexavalent chromium and copper for plants; hexavalent chromium, total chromium, and copper for invertebrates; total chromium, copper, and dioxin TEQ for small invertivorous mammals
- AOC 10 – hexavalent chromium and total chromium for plants; total chromium for invertebrates (baseline and 2-foot scouring scenarios only); and total chromium and dioxin TEQ for small invertivorous mammals.

For potential ecological communities of plants and soil invertebrates, only generic risk-based screening levels (Table 6-6) are available as RBRGs. As discussed in Section 6.7.5, screening levels for the risk-driving COPECs are often below background threshold values (BTVs) and there is low confidence in their ability to predict risk at the site. The screening levels are published values based on toxicity data (typically using agriculturally important produce or crop species and conducted in laboratory settings) that have limited relevance for the Topock site. The screening levels are designed for use in conservative screening level risk assessments and for site-characterization purposes (as was done for determining nature and extent for the RFI/RI).

Surveys were conducted for special-status species only, not for general populations. The results of these special-status species surveys are summarized in Section 2.4.5 and in the individual potential exposure area appendices.

Vegetation communities observed at the site during the floristic surveys conducted in 2013 (GANDA and CH2M 2013) and 2017 (CH2M 2017) is typical of Mojave Desert plant communities (summarized in Section 2.4.2). More than 100 different vascular plant species have been observed at the site and documented in these survey reports (GANDA and CH2M 2013; CH2M 2017). The floristic surveys report a diverse assemblage of plants species found in typical abundance, density, cover, and vigor of plant communities in undisturbed desert habitat. These observations are not consistent with impairment of the plant community at the site. The floristic surveys provide site-specific observations that support the health of plant communities at the site and is considered a stronger LOE than the exceedances of low-confidence generic plant screening values, which are widely acknowledged to have low ability to predict toxicity in plants. Therefore, these generic screening levels for plants and soil invertebrates are not recommended for use as RBRGs at the site. Because the key risk drivers for plants and soil invertebrates (hexavalent chromium and total chromium) tend to be co-located, risk-management or remedial actions considered for the protection of wildlife receptors (i.e., mammals and birds) potentially exposed to total chromium will also reduce risk to plants and invertebrates.

The methodology for the derivation of ecological RBRGs, the calculated RBRGs for potential ecological receptors, and soil locations associated with calculated unacceptable risk to potential ecological receptors are discussed in the sections below.

1.2.1 Methodology for Deriving Ecological RBRGs and Values

Ecological RBRGs based on protection of wildlife populations (i.e., based on lowest observed adverse effects level (LOAEL)-based TRVs) were derived for invertivorous small mammals (desert shrew), the only wildlife receptor identified with the potential for unacceptable risk associated with assumed exposure to COPECs in soil at this site. Based on the conclusion of no unacceptable risk for T&E species potentially present at the site, RBRGs based on the protection of individual potential receptors (i.e., based on the no observed adverse effect level (NOAEL)-based TRVs) were not warranted.

The RBRGs (Table 8-3) for small home-range invertivorous mammals (desert shrew) were derived following USEPA guidance (1997, 2008) and using the dietary dose model integrating exposure assumptions and LOAEL-based TRVs used to estimate HQs in the predictive ERAs, as described in Sections 6.2 and 6.3, respectively. Note that RBCs were developed for the list of COPECs identified in the HHERA using the same approach and equations as for the development of the ecological RBRGs. The RBCs were developed for the Soil Management Plan to be used to support decisions for the handling, management, and storage of potentially contaminated and displaced soil at the site during implementation of a groundwater remedy at the site to address chromium contamination in groundwater. The RBCs are presented in Appendix RBC.

Ecological RBRGs were developed by re-arranging the standard USEPA (1997) HQ model (i.e., Equation 6-7 presented in Section 6.4) to solve for a target HQ of 1:

Equation 1-3

$$RBRG = C_{soil} = \frac{HQ \times TRV \times BW}{(SIR + [FIR \times BAF]) \times SUF}$$

Where:

HQ = hazard quotient (unitless) = 1

TRV = toxicity reference value (milligrams per kilogram of body weight per day [mg/kg-bw/day])

C_{soil} = concentration of constituent in soil (milligrams per kilogram of soil mg/kg soil) = RBRG

SIR = soil ingestion rate (kilograms of soil per day [kg soil/day])

FIR = food or biota ingestion rate (kilograms of tissue per day [kg tissue/day])

SUF = site-use factor (unitless) = 1 (home range for shrews are less than the size of all the exposure areas)

BW = body weight of receptor (kilograms of body weight [kg bw])

BAF = bioaccumulation factor or regression for media-to-biota uptake (kilograms of soil per kilograms of tissue [kg soil/kg tissue])

Incorporating uptake regressions in lieu of a simple BAF in the dose equation significantly complicates the overall dose calculation and, therefore, the Ecological RBRGs were calculated using Microsoft® Excel Solver™ software that determines the soil concentration for a target HQ equal to 1.

For dioxin TEQ, as discussed in detail in Section 6.7.6, the uncertainties associated with the calculated baseline risk estimates for the desert shrew are mainly driven by use of conservative uptake and toxicity assumptions. For desert shrew, these uncertainties together can overestimate risk by at least 10 times. Therefore, for remediation and risk-management considerations, alternate and more robust uptake models and TRVs were developed for dioxin TEQ. These alternate values are based on more defensible science (e.g., congener-specific uptake approach for dioxin TEQ BAFs) and/or more recent and comprehensive literature search and data. The alternate BAF and TRV approaches used to develop dioxin TEQ RBRGs for desert shrew have been used at various dioxin impacted sites (e.g., Tittabawasee River, MI; Rolling Knolls, NJ; Centredale Manor, RI; San Jacinto River, TX; and St. Helens, OR).

For dioxin TEQ, a range of RBRGs was calculated using the alternate and more robust approaches/values. The congener-specific BAFs (USEPA 1999; Fagervold et al. 2010) and a recommended mammalian dioxin TEQ LOAEL-based TRV of 30 ng/kg-bw/day were used to calculate the RBRGs protective of invertivorous small mammals. As noted in Section 6.7.4, the congener-specific BAF approach is based on current scientific understanding of uptake for dioxin TEQ mixtures and is more scientifically defensible than assuming all congener uptake is the same as 2,3,7,8-TCDD. The recommended TRV is based on the geometric mean of reproduction and growth LOAELs for rodents. This approach, used by USEPA (2008) for development of the Ecological Soil Screening Levels (EcoSSLs), is widely accepted as it accounts for a range of values and reduces the uncertainty associated with using toxicity data from a single study. The dioxin LOAEL-based TRV of 10 ng/kg-bw/day used in the ERA (cited in Sample et al. [1996] and based on a study by Murray et al. [1979]) is included in the toxicity dataset used to derive the alternate TRV of 30 ng/kg-bw/day (Section 6.7.5). Ecological RBRGs are summarized in the table titled Ecological Risk-Based Remediation Goals and details of the RBRG calculations are presented in Table 8-3.

Ecological Risk-Based Remediation Goals

Risk Driver for Shrew	BAF	LOAEL-based Mammalian TRV	Ecological RBRG
Total Chromium	ERA / RAWP	ERA / RAWP	145 mg/kg
Copper	ERA / RAWP	ERA / RAWP	145 mg/kg
Dioxin TEQ	USEPA 1999	30 ng/kg-day (geomean of rodent studies)	190 ng/kg
Dioxin TEQ	Fagervold et al. 2010	30 ng/kg-day (geomean of rodent studies)	360 ng/kg

Note:
ng/kg-day = nanograms per kilogram per day

A dioxin TEQ RBRG based on the 2,3,7,8- tetrachlorodibenzo-p-dioxin (TCDD) uptake regression and the TRV used in the ERA (10 ng/kg; lowest available LOAEL-based TRV) was not calculated. The BAF approach based on the 2,3,7,8-TCDD regression is not supported by available science related to the uptake and toxicity of dioxin/furans (i.e., dioxin TEQ mixtures), and the TRV does not account for variability in species sensitivity to dioxin TEQ. The RBRGs calculated for total chromium (145 mg/kg), copper (145 mg/kg), and dioxin TEQ (ranging from 190 to 360 ng/kg) were used to identify soil locations associated with potentially unacceptable risk, as described in the following section.

1.2.2 Soil Locations Associated with Calculated Levels of Unacceptable Risk to Potential Ecological Receptors

This section discusses the locations that drive risk for the ERA and is provided as an example of one method that can be used to apply the RBRGs and assist with identifying remedial design possibilities. This is not intended to substitute for actual remedial design and comprises part of the set of tools available to the risk manager to make site-specific decisions regarding risk.

As previously discussed above in Section 7.2, based on the conclusions of the ERA, some targeted form of risk management or remediation, addressing elevated concentrations of total chromium, copper, and dioxin TEQ in the SWMU 1 within BCW, AOC 9, and AOC 10 would be effective at reducing calculated risks for potential ecological receptors[2] to acceptable risk levels. The Ecological RBRGs based on invertivorous small mammals (desert shrew) include 145 mg/kg for total chromium; 145 mg/kg for copper; and 190 to 360 ng/kg for dioxin TEQ (based on the range of alternate RBRGs).

For each potential exposure area, depth-weighted concentrations of the risk-driving COPECs were ranked and the highest concentrations were iteratively removed from the baseline soil dataset. Using the

[2] As elevated concentrations of hexavalent chromium and total chromium tend to be co-located, remediation for other risk drivers (e.g., total chromium) and potential receptors (human health and wildlife) will reduce exposure and risk for plants and soil invertebrates as well.

remaining data, depth-weighted EPCs were calculated and compared to the respective RBRGs. Table 8-4 identifies soil locations at the three potential exposure areas (BCW, AOC 9, and AOC 10) where depth-weighted concentrations of total chromium, copper, and/or dioxin TEQ in the top 0 to 0.5 foot bgs of soil exceed the RBRGs and, if removed from the potential exposure area baseline dataset (i.e., mimicking a hypothetical remediation), the resulting residual depth-weighted 95UCL for the potential exposure area is below the RBRG. These locations were identified based on depth-weighted EPCs for simplicity and as a conservative approach to identifying the areas/locations that, if removed, would result in residual soil concentrations of total chromium, copper, and dioxin TEQ that are protective of potential ecological receptors. As mentioned above, this is just one example of the application of RBRGs and the specific locations identified in Table 8-4 are not intended to be used either for remedial design without further consideration or as a post remediation risk evaluation. Confirmation sampling and a post-remediation risk assessment may be necessary to demonstrate that residual contamination is not of concern if excavation and removal of soil is implemented as a remedial and risk management decision at the site.

To summarize, this example included removal of soil data for the following locations:

- **BCW**
  - SWMU1-25 at 0 to 0.5 foot bgs to meet the RBRG of 190 ng/kg for dioxin TEQ; No sample data needs to be removed to meet the RBRG of 360 ng/kg for dioxin TEQ.
- **AOC 9**
  - AOC10-21 at 0 to 0.5 foot bgs to meet the RBRG of 145 mg/kg for copper.
  - AOC10-20 at 0 to 0.5 foot bgs to meet the RBRG of 145 mg/kg for total chromium.
  - PA-20, AOC10-23, and PA-21 at 0 to 0.5 foot bgs to meet the RBRG of 190 ng/kg for dioxin TEQ; and locations PA-20 and AOC10-23 at 0 to 0.5 foot bgs to meet the RBRG of 360 ng/kg for dioxin TEQ.
- **AOC 10**
  - AOC10c-4 at 0 to 0.5 foot bgs to meet the RBRG of 190 ng/kg for dioxin TEQ; no sample data need to be removed to meet the RBRG of 360 ng/kg for dioxin TEQ.

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Appendix E
Removal Action Objective 2 Data Screening

TABLE E-1
Constituent Concentrations
Solid Waste Management Unit (SWMU) 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
MW-09		06/30/97	1	N	ND (0.05)	15	7.2	---	---	---	19.7	---
		06/30/97	3.5	N	0.06	4.1	3.1	---	---	---	11.8	---
		06/30/97	3.5	FD	0.21	7.6	3.5	---	---	---	12.6	---
		06/30/97	6	N	ND (0.05)	11.8	6.4	---	---	---	21	---
		07/01/97	10	N	ND (0.05)	42.2	6.8	2.7	---	ND (0.2)	29	---
		06/30/97	20	N	ND (0.05)	9	7.1	---	---	---	21.7	---
		07/01/97	30	N	ND (0.05)	16.3	12.4	3.9	---	ND (0.2)	29.4	---
		06/30/97	40	N	ND (0.05)	9.7	7.5	---	---	---	22.5	---
		07/01/97	50	N	ND (0.05)	11.7	14.7	3.2	---	ND (0.2)	23.3	---
		06/30/97	60	N	ND (0.05)	28.8	17.4	---	---	---	34.4	---
		06/30/97	70	N	ND (0.05)	8.9	10	---	---	---	19	---
		07/01/97	87	N	ND (0.05)	9.8	10.2	8.4	---	ND (0.2)	126	---
		07/01/97	87	FD	0.06	11.9	11.4	---	---	---	121	---
SWMU1-1	SWMU1 PAA #1	10/16/08	0 - 0.5	N	0.524	44	12	4.2	ND (0.12)	ND (1.2)	41	---
		10/16/08	2 - 3	N	0.462	67	9.4	3	ND (0.1)	ND (1)	37	---
		10/16/08	5 - 6	N	14.1	3,200	9.5	4.5	ND (0.1)	7.8	76	---
		10/16/08	9 - 10	N	0.907	55	8.6	1.7	ND (0.1)	ND (1)	89	---
SWMU1-2	SWMU1 PAA #1	10/15/08	0 - 0.5	N	ND (0.401)	26	22	6.5	ND (0.1)	ND (1)	37	---
		10/15/08	2 - 3	N	ND (0.404)	36	10	3.7	ND (0.1)	ND (1)	38	---
		10/15/08	5 - 6	N	ND (0.404)	44	12	6.1	ND (0.1)	3	38	---
		10/15/08	9 - 10	N	22.8	2,000	15	4	ND (0.1)	2.8	100	---

TABLE E-1
Constituent Concentrations
Solid Waste Management Unit (SWMU) 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	**Potential Action Area**	**Date**	**Depth (ft bgs)**	**Sample Type**	**Chromium, Hexavalent**	**Chromium, total**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Zinc**	**a TEQ Human b TEQ Mammal**
SWMU1-3	SWMU1 PAA #1	10/06/08	0 - 0.5	N	ND (0.405)	28	11	3.9	ND (0.1)	ND (1)	33	---
		10/06/08	2 - 3	N	ND (0.413)	41	9.4	2.3	ND (0.1)	1.5	38	---
		10/06/08	2 - 3	FD	ND (0.41)	38	9	2.9	ND (0.1)	1.4	37	---
		10/06/08	5 - 6	N	22.7	1,300	11	3.8	ND (0.1)	4.2	78	---
		10/06/08	9 - 10	N	1.55 J	96	11	2.7	ND (0.11)	ND (1)	140	---
		10/06/08	19 - 20	N	ND (0.416)	20	10	2.9	ND (0.1)	ND (2.1)	39	---
		10/06/08	29 - 30	N	ND (0.424)	21	15	2.4	ND (0.1)	ND (5.3)	38	---
		10/06/08	39 - 40	N	ND (0.424)	22	8.5	2.7	ND (0.1)	ND (2.1)	35	---
		10/06/08	49 - 50	N	ND (0.405)	25	12	3.2	ND (0.11)	ND (2.1)	39	---
		10/06/08	59 - 60	N	ND (0.418)	38	14	3	ND (0.1)	2.1	36	---
		10/07/08	69 - 70	N	ND (0.42)	29	14	2.6	ND (0.1)	ND (2.1)	38	---
		10/07/08	79 - 80	N	ND (0.427)	20	13	3.1	ND (0.11)	ND (2.2)	39	---
		10/07/08	79 - 80	FD	ND (0.441)	21	15	2.6	ND (0.11)	1.3	34	---
SWMU1-4		10/15/08	0 - 0.5	N	ND (0.401)	17	6.8	2.6	ND (0.1)	ND (1)	26	---
		10/15/08	2 - 3	N	4.95	870	11	3.6	ND (0.1)	1.7	72	---
		10/15/08	5 - 6	N	1.39	100	10	1.8	ND (0.1)	ND (1)	170	---
		10/15/08	7 - 8	N	ND (0.415)	40	7.6	1.6	ND (0.1)	ND (1)	120	---
		10/15/08	9 - 10	N	ND (0.414)	23	7.9	1.7	ND (0.1)	ND (1)	110	---
		10/15/08	13 - 14	N	ND (0.413)	18	7.1	1.7	ND (0.1)	ND (1)	67	---
SWMU1-5	SWMU1 PAA #1	10/15/08	9 - 10	N	0.874	47	8.3	2.1	ND (0.1)	ND (1)	100	---
		10/15/08	13 - 14	N	ND (0.42)	21	7.9	2.8	ND (0.1)	ND (2.1)	42	---
		10/15/08	13 - 14	FD	ND (0.423)	21	8	2.9	ND (0.1)	ND (2.1)	44	---
		10/15/08	15 - 16	N	ND (0.414)	21	9.1	2.8	ND (0.1)	ND (2.1)	34	---
		10/15/08	19 - 20	N	ND (0.423)	19	11	3.1	ND (0.11)	1.5	37	---
SWMU1-6		10/15/08	0 - 0.5	N	1.32	220	11	3.3	ND (0.1)	1.2	42	---
		10/15/08	2 - 3	N	2.15	270	12	2.6	ND (0.1)	1.9	46	---
		10/15/08	5 - 6	N	ND (0.405)	32	10	2.6	ND (0.1)	ND (1)	29	---
		10/15/08	9 - 10	N	0.531	33	8.6	1.7	ND (0.1)	ND (1)	88	---

TABLE E-1
Constituent Concentrations
Solid Waste Management Unit (SWMU) 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human / b TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
SWMU1-7	SWMU1 PAA #1	10/15/08	0 - 0.5	N	ND (0.403)	27	13	6.6	ND (0.1)	ND (1)	38	---
		10/15/08	2 - 3	N	6.45	630	14	3.6	ND (0.1)	1.7	130	---
		10/15/08	5 - 6	N	5.3	330	20	2.8	ND (0.1)	ND (1)	190	---
		10/15/08	9 - 10	N	0.517	51	9.2	1.9	ND (0.1)	ND (1)	150	---
		10/15/08	9 - 10	FD	0.554	47	8.3	1.6	ND (0.1)	ND (1)	150	---
SWMU1-8	SWMU1 PAA #1	10/15/08	0 - 0.5	N	0.618	120	9.1	4.7	ND (0.1)	ND (1)	36	---
		10/15/08	2 - 3	N	22.3	970	11	3.5	ND (0.1)	2.2	160	---
		10/15/08	5 - 6	N	9.25	1,600	22	3.3	ND (0.1)	3.2	120	---
		10/15/08	9 - 10	N	ND (0.433)	15	7.1	2.8	ND (0.11)	ND (1.1)	32	---
SWMU1-9		10/14/08	0 - 0.5	N	0.697	87	10	2.9	ND (0.11)	1.4	37	---
		10/14/08	2 - 3	N	ND (0.42)	13	5.9	5	ND (0.11)	ND (1)	26	---
		10/14/08	5 - 6	N	ND (0.417)	26	8.1	3.1	ND (0.1)	ND (2.1)	39	---
		10/14/08	9 - 10	N	ND (0.425)	22	11	3.2	ND (0.1)	ND (1.1)	38	---
SWMU1-10		10/14/08	0 - 0.5	N	ND (0.401)	19	11	2.6	ND (0.1)	ND (1)	32	---
		10/14/08	2 - 3	N	ND (0.403)	26	13	2.2	ND (0.1)	1.8	33	---
		10/14/08	5 - 6	N	ND (0.413)	21	8.4	2.9	ND (0.1)	ND (1)	42	---
		10/14/08	5 - 6	FD	ND (0.413)	22	10	2.9	ND (0.1)	ND (1)	41	---
		10/14/08	9 - 10	N	ND (0.431)	25	15	3.6	ND (0.11)	ND (1.1)	44	---
SWMU1-11	SWMU1 PAA #1	10/15/08	0 - 0.5	N	1.81	200	11	3.8	ND (0.11)	1.2	65	---
		10/15/08	2 - 3	N	8.82	840	11	4.3	ND (0.11)	4	120	---
		10/15/08	5 - 6	N	ND (0.431)	34	12	3.2	ND (0.11)	ND (2.1)	96	---
		10/15/08	9 - 10	N	ND (0.432)	22	10	3.4	ND (0.11)	ND (1.1)	43	---
SWMU1-12		10/14/08	0 - 0.5	N	ND (0.403)	19	8.5	2.7	ND (0.1)	ND (1)	31	---
		10/14/08	2 - 3	N	ND (0.406)	24	11	2.3	ND (0.1)	ND (2)	37	---
		10/14/08	5 - 6	N	ND (0.412)	20	13	2.7	ND (0.1)	ND (2)	40	---
		10/14/08	9 - 10	N	ND (0.419)	21	11	3.1	ND (0.1)	ND (5.2)	41	---

TABLE E-1
Constituent Concentrations
Solid Waste Management Unit (SWMU) 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
SWMU1-13		10/14/08	0 - 0.5	N	ND (0.407)	23	14	5.3	ND (0.1)	ND (1)	35	---
		10/14/08	2 - 3	N	ND (0.409)	28	11	3.5	ND (0.1)	ND (5.1)	39	---
		10/14/08	2 - 3	FD	ND (0.411)	27	11	3.5	ND (0.1)	ND (5.1)	39	---
		10/14/08	5 - 6	N	ND (0.416)	34	13	2.8	ND (0.1)	ND (2.1)	44	---
		10/14/08	9 - 10	N	ND (0.426)	30	16	3.5	ND (0.1)	ND (1)	45	---
SWMU1-14		10/14/08	0 - 0.5	N	ND (0.404)	20	8.2	2.6	ND (0.1)	ND (1)	33	---
		10/14/08	2 - 3	N	ND (0.408)	19	14	2.3	ND (0.1)	ND (1)	33	---
		10/14/08	5 - 6	N	ND (0.413)	28	17	3.4	ND (0.1)	ND (2)	42	---
		10/14/08	9 - 10	N	ND (0.415)	52	35	3.9	ND (0.1)	ND (1)	45	---
SWMU1-15		09/22/08	0 - 0.5	N	1.14	25	12	4.1	ND (0.1)	1.9	36	---
		09/22/08	2 - 3	N	ND (0.422)	23	11	3	ND (0.11)	1.2	34	---
		09/22/08	5 - 6	N	ND (0.424)	41	18	4.5	ND (0.11)	ND (2.1)	46	---
		09/22/08	9 - 10	N	ND (0.419)	58	24	4.4	ND (0.11)	ND (2.1)	50	---
		09/22/08	9 - 10	FD	ND (0.42)	60	23	4.5	ND (0.1)	ND (2.1)	50	---
		09/22/08	19 - 20	N	ND (0.425)	51	41	4.5	ND (0.11)	ND (2.1)	50	---
		09/22/08	29 - 30	N	ND (0.433)	54	23	5.4	ND (0.11)	ND (5.3)	54	---
		09/22/08	39 - 40	N	ND (0.422)	40	23	3	ND (0.1)	ND (1)	47	---
		09/22/08	49 - 50	N	ND (0.439)	55	25	5.4	ND (0.11)	ND (2.2)	59	---
		09/22/08	59 - 60	N	ND (0.449)	47	23	3	ND (0.1)	ND (5.3)	49	---
		09/22/08	59 - 60	FD	ND (0.411)	44	24	4.3	ND (0.1)	ND (2.1)	47	---
		09/22/08	69 - 70	N	ND (0.43)	39	25	3.8	ND (0.11)	ND (1.1)	53	---
		09/22/08	79 - 80	N	ND (0.43)	28	20	3.2	ND (0.11)	ND (1.1)	60	---
		09/23/08	89 - 90	N	ND (0.4)	6.5	ND (4)	ND (2)	ND (0.1)	ND (2)	21	---
SWMU1-16		09/21/08	0 - 0.5	N	ND (0.405)	10	5.2	2.3	ND (0.099)	ND (1)	21	---
		09/21/08	2 - 3	N	ND (0.408)	18	8.3	2	ND (0.1)	1	34	---
		09/21/08	5 - 6	N	ND (0.406)	18	8.9	2	ND (0.1)	ND (1)	35	---

TABLE E-1
Constituent Concentrations
Solid Waste Management Unit (SWMU) 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
SWMU1-17		09/21/08	0 - 0.5	N	ND (0.403)	27	16	3.5	ND (0.1)	ND (2)	46	---
		09/21/08	2 - 3	N	ND (0.405)	29	12	3.9	ND (0.1)	ND (2)	40	---
		09/21/08	5 - 6	N	ND (0.407)	29	12	3.1	ND (0.1)	2.4	44	---
		09/21/08	9 - 10	N	ND (0.408)	43 J	26	4.4	ND (0.1)	ND (2)	41	---
		09/21/08	9 - 10	FD	ND (0.408)	53 J	24	4.7	ND (0.1)	ND (2)	46	---
SWMU1-18		01/07/16	0 - 1	N	2.6	16	7.4	2	0.28	ND (1.1)	30	140
		01/07/16	2 - 3	N	ND (0.22)	26	20	2.5	0.27	ND (1.1)	40	0.37
		01/07/16	5 - 6	N	ND (0.22)	110	8.5	2.1	0.3	ND (1.1)	130	0.2
		01/07/16	9 - 10	N	ND (0.21)	41	17	2.6	0.34	ND (1.1)	43	0.23
		01/07/16	14 - 15	N	ND (0.21)	48	19 J	2.4	0.35	ND (1.1)	41	---
		01/07/16	14 - 15	FD	ND (0.21)	50	25 J	3.5	0.29	ND (1.1)	44	---
		01/07/16	19 - 20	N	ND (0.22)	50	21	3.6	0.33	ND (1.1)	49	---
		01/07/16	29 - 30	N	ND (0.21)	29	22	2	0.29	ND (1.1)	33	---
		01/07/16	39 - 40	N	ND (0.21)	42	19	2.9	0.29	ND (1.1)	44	---
		01/08/16	49 - 50	N	ND (0.24)	33 J	19	4.2	0.27	ND (1.2)	46 J	---
		01/08/16	59 - 60	N	ND (0.26)	27	16	5.6	0.31	ND (1.3)	54	---
		01/08/16	69 - 70	N	ND (0.23)	21	13	2.5	ND (0.12)	ND (1.1)	41	---
		01/08/16	79 - 80	N	ND (0.25)	28	17	2.1	ND (0.13)	ND (1.3)	37	---

TABLE E-1

Constituent Concentrations

Solid Waste Management Unit (SWMU) 1 – Former Percolation Bed

Soil Engineering Evaluation/Cost Analysis

PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
SWMU1-19	SWMU1 PAA #1	01/09/16	0 - 1	N	1.3	1,400	10	3.5	ND (0.1)	1.1	160	3.9
		01/09/16	2 - 3	N	22	23	8.8	1.8	ND (0.11)	ND (1.1)	34	1,100
		01/09/16	5 - 6	N	4.9	680	9.9	1.8	ND (0.1)	ND (1)	87	41
		01/09/16	9 - 10	N	22	2,100	18	2.4	ND (0.1)	ND (1)	120	210
		01/09/16	14 - 15	N	6.8	240	23	1.6	ND (0.1)	ND (1)	150	63
		01/09/16	19 - 20	N	ND (0.21)	24 J	12	3.3	ND (0.11)	ND (1.1)	120	2
		01/09/16	19 - 20	FD	ND (0.21)	31 J	11	1.9	ND (0.11)	ND (1.1)	110	---
		01/09/16	29 - 30	N	ND (0.21)	19	59	1.8	ND (0.11)	ND (1.1)	35	---
		01/09/16	39 - 40	N	ND (0.21)	16	14	1.7	ND (0.1)	ND (1)	33	---
		01/09/16	49 - 50	N	ND (0.21)	32	28	2.2	ND (0.1)	ND (1.1)	40	---
		01/09/16	59 - 60	N	ND (0.21)	29	16	2.5	0.24	ND (1.1)	38	---
		01/10/16	69 - 70	N	ND (0.21)	22	17	2.6	0.23	ND (1)	38	---
		01/10/16	79 - 80	N	ND (0.21)	16	10	1.6	0.27	ND (1.1)	34	---
SWMU1-20	SWMU1 PAA #1	01/13/16	1 - 1.5	N	---	---	---	---	---	---	---	5.5
		01/13/16	2 - 3	N	---	---	---	---	---	---	---	3.7
		01/13/16	5 - 6	N	---	---	---	---	---	---	---	110
		01/13/16	9 - 10	N	---	---	---	---	---	---	---	950
		01/13/16	14 - 15	N	8.9	190	12	1.6	ND (0.1)	ND (1)	110	140
		01/13/16	14 - 15	FD	7.9	200	9.9	2.2	ND (0.1)	ND (1)	98	---
		01/13/16	19 - 20	N	ND (0.21)	23	8	1.8	ND (0.11)	ND (1)	37	0.29
		01/13/16	29 - 30	N	ND (0.21)	14	11	1.2	ND (0.1)	ND (1)	30	---
		01/14/16	39 - 40	N	ND (0.21)	18	13	1.7	ND (0.1)	ND (1)	36	---
		01/14/16	49 - 50	N	ND (0.22)	15	8	2	ND (0.11)	ND (1.1)	37	---
		01/14/16	59 - 60	N	ND (0.21)	21	38	1.2	ND (0.1)	ND (1)	32	---
		01/14/16	69 - 70	N	ND (0.2)	23	10	1.2	ND (0.1)	ND (1)	34	---
		01/14/16	79 - 80	N	ND (0.21)	27	11	1.7	ND (0.1)	ND (1)	41	---

TABLE E-1
Constituent Concentrations
Solid Waste Management Unit (SWMU) 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
SWMU1-21	SWMU1 PAA #1	01/26/16	0 - 1	N	---	---	---	---	---	---	---	190
		01/26/16	2 - 3	N	---	---	---	---	---	---	---	870
		01/26/16	5 - 6	N	---	---	---	---	---	---	---	41
		01/26/16	9 - 10	N	---	---	---	---	---	---	---	1.8
		01/26/16	14 - 15	N	0.5	19	13	1.4	ND (0.1)	ND (1)	78	0.68
		01/26/16	19 - 20	N	0.3	16	8.7	ND (1)	ND (0.1)	ND (1)	69	0.39
		01/27/16	29 - 30	N	ND (0.21)	16	11	1.3	ND (0.1)	ND (1)	34	---
		01/27/16	39 - 40	N	ND (0.21)	14	7.9	1.3	ND (0.1)	ND (1)	37	---
		01/27/16	49 - 50	N	ND (0.21)	14	9	1.5	ND (0.1)	ND (1)	33	---
		01/27/16	59 - 60	N	ND (0.21)	22	12	1.7	ND (0.1)	ND (1.1)	41	---
		01/27/16	69 - 70	N	ND (0.21)	23	10	1.5	ND (0.1)	ND (1)	40	---
		01/27/16	79 - 80	N	ND (0.22)	19	16	1.2	ND (0.11)	ND (1.1)	32	---
		01/27/16	79 - 80	FD	ND (0.22)	17	11	1.3	ND (0.11)	ND (1.1)	35	---
SWMU1-22		12/17/15	0 - 1	N	ND (0.2)	18	12	6.5	ND (0.1)	ND (1)	33	6.2
SWMU1-23		12/17/15	0 - 1	N	0.36	23	11	7.5	ND (0.1)	ND (1)	39	16
SWMU1-24	SWMU1 PAA #3	12/17/15	0 - 1	N	1.6	55	13	6.5	ND (0.1)	ND (1)	44	1,300
SWMU1-25	SWMU1 PAA #1	01/26/16	0 - 1	N	42	2,000	12	4.4	ND (0.1)	20	60	12,000
		01/26/16	2 - 3	N	9.5	450	13	1.6	ND (0.11)	ND (1.1)	200	9.9
		01/26/16	5 - 6	N	2.3	200	14	1.6	ND (0.11)	ND (1.1)	170	6.4
		01/26/16	9 - 10	N	ND (0.21)	17	11	2.1	ND (0.11)	ND (1.1)	37	2.6
SWMU1-26		01/08/17	0 - 0.5	N	---	---	---	---	---	---	---	13
		01/08/17	0 - 0.5	FD	---	---	---	---	---	---	---	26
		01/08/17	2 - 3	N	---	---	---	---	---	---	---	1.5
		01/08/17	5 - 6	N	---	---	---	---	---	---	---	31
		01/08/17	9 - 10	N	---	---	---	---	---	---	---	1
		01/08/17	14 - 15	N	---	---	---	---	---	---	---	0.22
		01/08/17	19 - 20	N	---	---	---	---	---	---	---	0.26

TABLE E-1
Constituent Concentrations
Solid Waste Management Unit (SWMU) 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
SWMU1-27		01/07/17	0 - 0.5	N	---	---	---	---	---	---	---	7.9
		01/07/17	2 - 3	N	---	---	---	---	---	---	---	1.1
		01/07/17	5 - 6	N	---	---	---	---	---	---	---	5.9
		01/07/17	9 - 10	N	---	---	---	---	---	---	---	0.24
		01/07/17	14 - 15	N	---	---	---	---	---	---	---	0.26
		01/07/17	19 - 20	N	---	---	---	---	---	---	---	ND (0.17)
SWMU1-28		02/14/17	0 - 0.5	N	ND (0.2)	15	9.1	1.6	ND (0.1)	ND (1)	31	3.8
		02/14/17	0 - 0.5	FD	ND (0.2)	16	13	1.5	ND (0.1)	ND (1)	34	3.6
		02/14/17	2 - 3	N	ND (0.2)	13	8.3	3	ND (0.1)	ND (1)	31	1.5
SWMU1-29		02/16/17	0 - 0.5	N	ND (0.2)	19	8.5	1.2	ND (0.1)	ND (1)	28 J	7.8
		02/16/17	2 - 3	N	17	1,100	8.7	2.3	ND (0.1)	1.2	41	320
		02/16/17	5 - 6	N	5.6	270	11	ND (1)	ND (0.1)	ND (1)	33	19
		02/16/17	9 - 10	N	1.4	98	13	1.1	ND (0.1)	ND (1)	140	15
SWMU1-WP-1h		10/07/08	0 - 0.5	N	ND (0.418)	25	11	3.9	ND (0.1)	ND (1)	38	---
		10/07/08	2 - 3	N	ND (0.418)	17	8.9	2.8	ND (0.1)	ND (1)	34	---
		10/07/08	5 - 6	N	ND (0.417)	15	7.1	2.5	ND (0.11)	ND (1.1)	39	---
		10/07/08	9 - 10	N	ND (0.422)	28	8.7	2.9	ND (0.1)	ND (1)	58	---
SWMU1-WP-3a		10/14/08	0 - 0.5	N	ND (0.419)	27	11	3.6	ND (0.11)	ND (1.1)	40	---
		10/14/08	2 - 3	N	ND (0.419)	20	9.4	2.3	ND (0.11)	1.1	34	---
		10/14/08	5 - 6	N	ND (0.425)	27	15	6.2	ND (0.11)	ND (2.1)	45	---
		10/14/08	7 - 8	N	ND (0.417)	23	11	3.4	ND (0.1)	ND (2.1)	39	---
		10/14/08	9 - 10	N	ND (0.415)	66	21	2.8	ND (0.1)	ND (5.1)	46	---
		10/14/08	9 - 10	FD	ND (0.414)	66	22	2.7	ND (0.1)	ND (5.1)	47	---
		10/14/08	11 - 12	N	ND (0.421)	30	27	4	ND (0.1)	ND (1)	40	---
		10/14/08	13 - 14	N	ND (0.426)	28	31	3.8	ND (0.1)	ND (1)	40	---

TABLE E-1
Constituent Concentrations
Solid Waste Management Unit (SWMU) 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	**Potential Action Area**	**Date**	**Depth (ft bgs)**	**Sample Type**	**Chromium, Hexavalent**	**Chromium, total**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Zinc**	**a TEQ Human b TEQ Mammal**
SWMU1-WP-3h	SWMU1 PAA #2	10/07/08	0 - 0.5	N	ND (0.433)	17	6.3	1.8	ND (0.11)	ND (2.1)	33	---
		10/07/08	2 - 3	N	ND (0.404)	17	8.6	2.1	ND (0.1)	ND (1)	34	---
		10/07/08	5 - 6	N	ND (0.404)	21	7.8	2.4	ND (0.1)	ND (1)	36	---
SWMU1-WP-5a		10/05/08	0 - 0.5	N	ND (0.405)	19	11	3.9	ND (0.1)	1	35	---
		10/05/08	2 - 3	N	ND (0.408)	19	9.2	2.4	ND (0.1)	ND (1)	35	---
		10/05/08	5 - 6	N	ND (0.419)	53	17	3.9	ND (0.1)	ND (2.1)	42	---
		10/05/08	5 - 6	FD	ND (0.42) J	58	19	3.5	ND (0.1)	ND (5.2)	46	---
		10/05/08	7 - 8	N	ND (0.416)	53	18	4.1	ND (0.1)	ND (2.1)	41	---
		10/05/08	9 - 10	N	ND (0.421)	43	21	4.2	ND (0.1)	ND (2.1)	47	---
		10/05/08	11 - 12	N	ND (0.416)	36	26	3.5	ND (0.1)	ND (2.1)	42	---
		10/05/08	13 - 14	N	ND (0.422)	27	13	3.5	ND (0.1)	ND (1)	52	---
SWMU1-WP-5h	SWMU1 PAA #2	10/07/08	0 - 0.5	N	ND (0.43)	14	12	2.7	ND (0.11)	ND (1.1)	31	---
		10/07/08⊖	2 - 3	N	ND (0.435)	33	12	4.9	ND (0.11)	ND (2.1)	46	---
		10/07/08	5	N	ND (0.415)	23	11	3.3	ND (0.1)	ND (1)	40	---
SWMU1-WP-6a		10/05/08	0 - 0.5	N	ND (0.405)	32	10	7.2	ND (0.1)	2.5	35	---
		10/05/08	2 - 3	N	ND (0.404)	19	10	2.3	ND (0.1)	ND (1)	35	---
		10/05/08	2 - 3	FD	ND (0.403)	19	9.2	2.2	ND (0.1)	ND (1)	33	---
		10/05/08	5 - 6	N	ND (0.413)	41	19	3.2	ND (0.1)	ND (2.1)	44	---
		10/05/08	7 - 8	N	ND (0.414)	35	18	3.5	ND (0.1)	ND (2.1)	38	---
		10/05/08	9 - 10	N	ND (0.412)	26	14	2.4	ND (0.1)	ND (5.1)	39	---
		10/05/08	11 - 12	N	ND (0.411)	51	17	3.1	ND (0.1)	3.6	35	---
		10/05/08	13 - 14	N	ND (0.41)	60	15	3.6	ND (0.1)	ND (2)	43	---
SWMU1-WP-6h		10/06/08⊖	0 - 0.5	N	4.98	130	15	5.5	ND (0.1)	ND (2)	87	---
		10/06/08	2 - 3	N	0.538	23	61	6.6	ND (0.1)	ND (1)	34	---
		10/06/08	5 - 6	N	ND (0.406)	19	10	2.4	ND (0.1)	ND (1)	36	---
		10/06/08	5 - 6	FD	ND (0.405)	20	12	2.3	ND (0.1)	ND (1)	37	---
		10/06/08	9 - 10	N	ND (0.409)	41	23	3.5	ND (0.11)	ND (1.1)	39	---

TABLE E-1
Constituent Concentrations
Solid Waste Management Unit (SWMU) 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
				Removal Action Goal (RAG) <2 ft bgs :	3.1	145	145	36	1	22	1,050	a 100
				Removal Action Goal (RAG) 2 to 10 ft bgs :	31	145	145	36	1	22	1,050	b 190
SWMU1-WP-7	SWMU1 PAA #2	10/06/08	0 - 0.5	N	0.566	2,600	11	13	ND (0.11)	7.1	88	---
		10/06/08⊖	2 - 3	N	18.2	1,200	16	5.7	ND (0.11)	3.4	56	---
		10/06/08	5 - 6	N	6.17	21	11	2.7	ND (0.1)	ND (1)	34	---
		10/06/08	9 - 10	N	ND (0.417)	23	15	2.7	ND (0.11)	ND (1)	31	---
SWMU1-WP-8	SWMU1 PAA #2	10/06/08	0 - 0.5	N	ND (0.402)	35	13	6.9	ND (0.1)	ND (2)	47	---
		10/06/08	2 - 3	N	0.541	26	10	4.1	ND (0.1)	ND (2.1)	32	---
		10/06/08	5 - 6	N	ND (0.407)	19	10	2.7	ND (0.1)	ND (1)	38	---
		10/06/08	9 - 10	N	ND (0.411)	22	9.8	2.6	ND (0.1)	ND (1)	38	---
SWMU1-WP-9		09/21/08	0 - 0.5	N	ND (0.406)	26	8.2	2.9	ND (0.1)	2.1	33	---
		09/21/08	2 - 3	N	ND (0.407)	34 J	15	2.3	ND (0.1)	1.2	34	---
		09/21/08	2 - 3	FD	ND (0.409)	20 J	10	2.7	ND (0.1)	ND (1)	34	---
		09/21/08	5 - 6	N	ND (0.416)	39	15	3.2	ND (0.1)	ND (2)	43	---
		09/21/08	7 - 8	N	ND (0.416)	28	14	3.5	ND (0.1)	ND (2.1)	45	---
		09/21/08	9 - 10	N	ND (0.411)	37	15	3.3	ND (0.1)	ND (2)	43	---
		09/21/08	11 - 12	N	ND (0.422)	68	23	4	ND (0.11)	ND (5.2)	56	---
		09/21/08	13 - 14	N	ND (0.423)	60	22	4.9	ND (0.11)	ND (2.1)	52	---
SWMU1-WP-10	SWMU1 PAA #2	10/05/08	0 - 0.5	N	6.64	540	11	8.3	ND (0.1)	ND (2.1)	56	---
		10/05/08⊖	2 - 3	N	3.85	1,400	18	10	ND (0.1)	ND (5.2)	360	---
		10/05/08	5 - 6	N	0.494 J	50	12	3.6	ND (0.11)	ND (2.1)	53	---
		10/05/08	9 - 10	N	2.31	250	11	5.4	ND (0.11)	ND (2.1)	83	---
SWMU1-WP-T3a		10/05/08	0 - 0.5	N	ND (0.41)	25	11	2.8	ND (0.1)	ND (1)	39	---
		10/05/08	2 - 3	N	ND (0.411)	18	12	2.9	ND (0.1)	ND (1)	35	---
		10/05/08	5 - 6	N	ND (0.431)	26	16	3.4	ND (0.11)	ND (1.1)	40	---
		10/05/08	5 - 6	FD	ND (0.438)	26	15	3.7	ND (0.11)	1.1	39	---
		10/05/08	7 - 8	N	ND (0.429)	38	19	4.4	ND (0.11)	ND (2.1)	44	---
		10/05/08	9 - 10	N	ND (0.406)	71	20	3.4	ND (0.1)	6.4	42	---
		10/05/08	11 - 12	N	ND (0.42)	50	17	4.5	ND (0.1)	ND (2.1)	42	---
		10/05/08	13 - 14	N	ND (0.424)	62	30	3.8	ND (0.11)	ND (5.3)	51	---

TABLE E-1
Constituent Concentrations
Solid Waste Management Unit (SWMU) 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
SSB-2	SWMU1 PAA #2	06/30/97	1	N	ND (0.05)	48.7	7.4	---	---	---	27.3	---
		06/30/97	3	N	ND (0.05)	7.6	6.8	---	---	---	20.4	---
		06/30/97	6	N	ND (0.05)	10.1	9.4	---	---	---	27	---
		06/30/97	10	N	ND (0.05)	9.7	11	3.1	---	ND (0.2)	27.3	---
SSB-3		06/30/97	1	N	ND (0.05)	8.2	4.3	---	---	---	13.7	---
		06/30/97	3	N	ND (0.05)	13.2	9.5	---	---	---	21.4	---
		06/30/97	6	N	ND (0.05)	23.5	13.7	---	---	---	27.1	---
		06/30/97	10	N	ND (0.05)	7.1	13.4	2.3	---	ND (0.2)	19.2	---
SSB-4	SWMU1 PAA #1	06/30/97	1	N	ND (0.05)	10.1	3	---	---	---	11.9	---
		06/30/97	3	N	ND (0.05)	1,520	10.3	---	---	---	141	---
		06/30/97	6	N	ND (0.05)	297	12.4	---	---	---	130	---
		06/30/97	10	N	ND (0.05)	201	11.9	2.1	---	ND (0.2)	188	---
SSB-5		06/30/97	1	N	0.06	521	13.5	---	---	---	39.6	---
		06/30/97	3	N	ND (0.05)	1,440	16	---	---	---	128	---
		06/30/97	6	N	ND (0.05)	617	14.9	---	---	---	115	---
		06/30/97	10	N	ND (0.05)	31.6	7	1.75	---	ND (0.2)	107	---
WP-1	SWMU1 PAA #2	06/30/97	0	N	47.5	2,090	3.9	---	---	---	44.5	---
WP-2	SWMU1 PAA #2	09/18/97	0	N	ND (0.5)	25.9	22.8	---	---	---	80.1	---
WP-3	SWMU1 PAA #2	09/18/97	0.5	N	11.8	1,290	13.2	---	---	---	50.3	---
		09/18/97	2	N	0.41	273	18.6	---	---	---	50	---
WP-4	SWMU1 PAA #2	09/18/97	0	N	1.14	120	10.8	---	---	---	65.6	---
WP-5	SWMU1 PAA #2	09/18/97	0	N	3.51	511	16.8	---	---	---	50.4	---
		09/18/97	1	N	6.66	711	15.4	---	---	---	61.5	---
		09/18/97	2	N	8.97	421	15.8	---	---	---	51.9	---
		09/18/97	3	N	6.1	158	10.1	---	---	---	22.9	---
		09/18/97	4	N	10.2	113	24.4	---	---	---	41.9	---

TABLE E-1
Constituent Concentrations
Solid Waste Management Unit (SWMU) 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human / b TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
WP-6	SWMU1 PAA #2	09/18/97	0	N	1.64	712	21.6	---	---	---	57.9	---
		09/18/97	1	N	9.46	1,030	18.2	---	---	---	46.5	---
		09/18/97	2	N	2.29	401	11.9	---	---	---	210	---
WP-Bank1	SWMU1 PAA #2	11/23/98	0	N	5.5	261	10.3	---	---	---	23.4	---
WP-Bank2	SWMU1 PAA #2	11/23/98	0	N	14	909	27.2	---	---	---	61.8	---
BANK-WP	SWMU1 PAA #2	11/13/98	Unknown	N	ND (0.51)	34.4	16.3	---	---	---	41.3	---
WP-Floor	SWMU1 PAA #2	11/23/98	Unknown	N	3.3	317	13.9	---	---	---	15.9 J	---
Bank - b	SWMU1 PAA #2	11/13/98	Unknown	N	0.7	20.1	15	---	---	---	38.2	---
T-1	SWMU1 PAA #2	11/13/98	Unknown	N	ND (0.53)	15.9	13.1	---	---	---	38.6	---
		11/13/98	Unknown	N	2.1	38.8	28	---	---	---	164	---
T-2	SWMU1 PAA #2	11/13/98	Unknown	N	ND (0.53)	21.2	12.4	---	---	---	44.7	---
		11/13/98	Unknown	N	0.6	44.4	14.2	---	---	---	43	---
T-3-B	SWMU1 PAA #2	11/13/98	0	N	3.1	619	19.6	---	---	---	673	---
P-1		11/13/98	Unknown	N	ND (0.52)	12	12.7	---	---	---	29.4	---
		11/13/98	Unknown	N	ND (0.53)	17.9	16.1	---	---	---	40.4	---
P-2Soil		11/13/98	- 3.5	N	ND (0.76)	33.2	6	---	---	---	6.4	---
		11/13/98	Unknown	N	ND (0.52)	15	9.7	---	---	---	36.1	---

TABLE E-1

Constituent Concentrations
Solid Waste Management Unit (SWMU) 1 – Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Notes:

Results greater than or equal to the Removal Action Goal are circled.

ϴ	white powder sample.
---	not analyzed
FD	field duplicate
ft bgs	feet below ground surface
J	concentration or reporting limit estimated by laboratory or data validation
mg/kg	milligrams per kilogram
N	primary sample
ND	not detected at the listed reporting limit
ng/kg	nanogram per kilogram
TEQ	dioxin and furans toxicity equivalent quotient

TABLE E-2
Constituent Concentrations
Area of Concern (AOC) 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
				Removal Action Goal (RAG) <2 ft bgs :	3.1	145	145	36	1	22	1,050	a 100
				Removal Action Goal (RAG) 2 to 10 ft bgs :	31	145	145	36	1	22	1,050	b 190
AOC1-BCW1		09/20/08	0 - 0.5	N	ND (0.401)	23	11	7.5	ND (0.1)	ND (1)	44	---
		09/20/08	2 - 3	N	ND (0.404)	25	15	2	ND (0.1)	ND (1)	28	---
AOC1-BCW2		10/04/08	0 - 0.5	N	ND (0.403)	21	7.6	3.7	ND (0.1)	ND (1)	40	---
		10/04/08	2 - 3	N	ND (0.407)	34	9.2	18	ND (0.1)	ND (1)	39	---
		10/04/08	5 - 6	N	ND (0.404)	35	8.8	4.4	ND (0.1)	1.5	41	---
		10/04/08	9 - 10	N	ND (0.426)	20	8.1	3.8	ND (0.1)	ND (1.1)	39	---
AOC1-BCW3		10/04/08	0 - 0.5	N	0.416	25	11	7.3	ND (0.1)	ND (1)	51	---
		10/04/08	2 - 3	N	ND (0.404)	25	9.8	4	ND (0.1)	ND (1)	38	---
		10/04/08	5 - 6	N	ND (0.415)	23	9.6	2.2	ND (0.1)	ND (2.1)	43	---
		10/04/08	9 - 10	N	ND (0.421)	21	8.5	2.2	ND (0.11)	ND (1.1)	38	---
		10/04/08	9 - 10	FD	ND (0.424)	22	8.8	2.3	ND (0.11)	ND (1.1)	41	---
AOC1-BCW4		10/04/08	0 - 0.5	N	1.3	36	13	9.4	ND (0.1)	ND (1)	61	---
		10/04/08	2 - 3	N	ND (0.407)	24	8.3	3.6	ND (0.1)	ND (1)	33	---
		10/04/08	5 - 6	N	ND (0.416)	23	8.4	2.7	ND (0.1)	ND (1)	45	---
		10/04/08	9 - 10	N	ND (0.426)	22	7.6	2.3	ND (0.11)	ND (2.1)	42	---
AOC1-BCW5		10/04/08	0 - 0.5	N	0.445	35	12	6	ND (0.099)	ND (1)	46	---
		10/04/08	2 - 3	N	ND (0.407)	31	9.6	7	ND (0.1)	ND (1)	42	---
		10/04/08	5 - 6	N	ND (0.42)	26	8.4	2.7	ND (0.1)	ND (1)	44	---
		10/04/08	9 - 10	N	ND (0.425)	22	ND (7.4)	3.2	ND (0.11)	ND (2.1)	40	---
		10/04/08	9 - 10	FD	ND (0.427)	24	ND (7.3)	3	ND (0.11)	ND (2.1)	40	---
AOC1-BCW6		08/22/08[‡]	0 - 0.5	N	2.63	71	22	23	ND (0.14)	ND (2.8)	81	64
		08/22/08[‡]	2 - 3	N	ND (0.608)	21	14	8.7	ND (0.14)	ND (2.9)	50	11
AOC1-T1a		10/16/08	0 - 0.5	N	ND (0.406)	19	11	4.9	ND (0.1)	ND (2)	38	---
		10/16/08	2 - 3	N	ND (0.404)	27	8.6	3.8	ND (0.1)	2	37	---
		10/16/08	5 - 6	N	ND (0.405)	26	9.5	3.4	ND (0.1)	2	34	---
		10/16/08	9 - 10	N	ND (0.404)	14	7.5	1.4	ND (0.1)	ND (1)	32	---

TABLE E-2
Constituent Concentrations
Area of Concern (AOC) 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
AOC1-T1b		10/16/08	0 - 0.5	N	ND (0.405)	43 J	9	3.1	ND (0.1)	ND (1)	31	---
		10/16/08	0 - 0.5	FD	ND (0.405)	33 J	10	3.2	ND (0.1)	ND (1)	32	---
		10/16/08	2 - 3	N	ND (1.94)	98	12	3.9	ND (0.1)	ND (1)	67	---
		10/16/08	5 - 6	N	0.402	28	9	3.2	ND (0.1)	1.7	31	---
		10/16/08	9 - 10	N	ND (0.402)	42	11	2.6	ND (0.1)	5	32	---
AOC1-T1c		10/16/08	0 - 0.5	N	0.601	44	13	7.5	ND (0.1)	1.9	53	---
		10/16/08	2 - 3	N	4.77 J	140	26	20 J	ND (0.1)	2.5	82 J	---
		10/16/08	2 - 3	FD	3.58 J	150	29	32 J	ND (0.1)	2.2	110 J	---
		10/16/08	5 - 6	N	0.446	46	15	5	ND (0.1)	3	44	---
		10/16/08	9 - 10	N	ND (0.418)	20	11	1.9	ND (0.1)	ND (1)	38	---
AOC1-T2a		10/05/08	0 - 0.5	N	ND (0.403)	26	10	4.8	ND (0.1)	ND (1)	38	---
		10/16/08	2 - 3	N	ND (0.407)	28	10	4	ND (0.1)	ND (2)	42	---
		10/16/08	5 - 6	N	ND (0.405)	19	8.3	2.4	ND (0.1)	1.1	35	---
		10/16/08	9 - 10	N	ND (0.416)	15	7.1	2.1	ND (0.1)	ND (1)	36	---
AOC1-T2b	AOC1 PAA #2	10/16/08	0 - 0.5	N	ND (0.408)	26	9.3	3.2	ND (0.1)	ND (1)	39	---
		10/16/08	2 - 3	N	ND (0.414)	26	10	3	ND (0.1)	2.4	33	---
		10/16/08	5 - 6	N	ND (0.407)	53	8.7	2.4	ND (0.1)	5.5	32	---
		10/16/08	9 - 10	N	ND (0.415)	18	8.5	1.8	ND (0.1)	1.3	33	---
		10/16/08	9 - 10	FD	ND (0.413)	18	9.6	1.6	ND (0.1)	1.2	35	---
AOC1-T2c		10/08/08	0 - 0.5	N	1.26	60	10	5.1	ND (0.1)	ND (1)	44	---
		10/08/08	2 - 3	N	ND (0.416)	42	11	3.3	ND (0.1)	ND (1)	33	---
		10/08/08	5 - 6	N	ND (0.412)	22	9.1	1.8	ND (0.1)	ND (1)	28	---
		10/08/08	9 - 10	N	ND (0.419)	24	9.7	2.6	ND (0.1)	ND (1)	40	---

TABLE E-2
Constituent Concentrations
Area of Concern (AOC) 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
AOC1-T2d	AOC1 PAA #2	10/07/08	0 - 0.5	N	ND (0.408)	46	10	2.9	ND (0.1)	2.9	36	---
		10/07/08	2 - 3	N	5.73	970	13	4.7	ND (0.1)	1.5	98	---
		10/07/08	5 - 6	N	4.34	370	11	3.9	ND (0.1)	1.1	130	---
		10/07/08	9 - 10	N	2.92	140	14	3.1	ND (0.1)	ND (2.1)	68	---
		10/07/08	19 - 20	N	ND (0.423)	26	9.2	3	ND (0.11)	ND (2.1)	45	---
		10/07/08	29 - 30	N	ND (0.424)	21	8.9	2.7	ND (0.1)	ND (2.1)	37	---
		10/07/08	29 - 30	FD	ND (0.423)	24	ND (11)	2.2	ND (0.11)	ND (5.3)	36	---
		10/07/08	39 - 40	N	ND (0.431)	22	11	3.6	ND (0.11)	ND (2.1)	42	---
		10/07/08	49 - 50	N	ND (0.425)	28	10	2.1	ND (0.11)	ND (1.1)	38	---
		10/08/08	59 - 60	N	ND (0.406)	39	9.8	2.2	ND (0.1)	4.7	32	---
		10/08/08	69 - 70	N	ND (0.435)	18	9.8	2.8	ND (0.11)	2.2	31	---
AOC1-T2e		10/16/08	0 - 0.5	N	ND (0.405)	34	9.3	3.4	ND (0.1)	2.2	36	---
		10/16/08	2 - 3	N	ND (0.408)	30	8.4	3.2	ND (0.1)	1.4	30	---
		10/16/08	2 - 3	FD	ND (0.408)	32	8	3.2	ND (0.1)	1.3	33	---
		10/16/08	5 - 6	N	ND (0.402)	44	8.4	2.3	ND (0.1)	5.4	32	---
		10/16/08	9 - 10	N	ND (0.415)	20	4.9	1.1	ND (0.1)	1.1	27	---
AOC1-T3a		10/05/08	0 - 0.5	N	ND (0.403)	24	11	8.4	ND (0.1)	ND (1)	47	---
		10/17/08	2 - 3	N	ND (0.407)	19	9	4.2	ND (0.1)	ND (1)	37	---
		10/17/08	5 - 6	N	ND (0.405)	23	12	14	ND (0.1)	1.7	39	---
		10/17/08	9 - 10	N	ND (0.406)	15	10	1.9	ND (0.1)	ND (1)	33	---
AOC1-T3b		10/05/08	0 - 0.5	N	ND (0.402)	23	8	3.1	ND (0.1)	ND (1)	29	---
		10/17/08	2 - 3	N	2.77	170	13	9.1	ND (0.11)	ND (1)	120	---
		10/17/08	5 - 6	N	ND (0.405)	46	8.6	2.3	ND (0.1)	4.6	34	---
		10/17/08	9 - 10	N	ND (0.41)	17	7.7	1.7	ND (0.1)	1.1	31	---
		10/17/08	9 - 10	FD	ND (0.412)	16	6.5	1.9	ND (0.1)	1.1	32	---

TABLE E-2
Constituent Concentrations
Area of Concern (AOC) 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
AOC1-T3c		10/05/08	0 - 0.5	N	0.42	27	11	7	ND (0.1)	ND (1)	46	---
		10/05/08	2 - 3	N	ND (0.41)	30	9.7	3.4	ND (0.1)	ND (1)	39	---
		10/05/08	5 - 6	N	1.65	89	12	5.8	ND (0.1)	1.4	65	---
		10/05/08	9 - 10	N	ND (0.403)	19	10	2.4	ND (0.1)	ND (1)	36	---
AOC1-T4a		10/03/08	0 - 0.5	N	ND (0.402)	28	11	5.5	ND (0.1)	ND (1)	51	---
		10/03/08	2 - 3	N	ND (0.407)	26	10	4	ND (0.1)	ND (1)	40	---
		10/03/08	5 - 6	N	ND (0.409)	25	11	3.3	ND (0.1)	ND (1)	40	---
		10/03/08	9 - 10	N	0.525	26	9.6	4.3	ND (0.1)	ND (1)	36	---
AOC1-T4b		10/02/08	0 - 0.5	N	1.26	21	7.5	2.6	ND (0.1)	ND (1)	29	---
		10/02/08	2 - 3	N	ND (0.412)	29	12	8.8 J	ND (0.1)	ND (1)	46	---
		10/02/08	2 - 3	FD	ND (0.408)	28	11	7 J	ND (0.1)	ND (1)	50	---
		10/02/08	5 - 6	N	ND (0.419)	24	9.6	3.2	ND (0.1)	ND (1)	39	---
		10/02/08	9 - 10	N	ND (0.415)	19	8.8	2.4	ND (0.1)	ND (1)	37	---
AOC1-T4c		10/04/08	0 - 0.5	N	ND (0.403)	19	22	5.9	ND (0.1)	ND (1)	33	---
		10/04/08	2 - 3	N	0.816	27	19	14	ND (0.1)	ND (1)	67	---
		10/04/08	5 - 6	N	0.868	28	21	19	ND (0.1)	1.3	71	---
		10/04/08	9 - 10	N	ND (0.413)	27	13	5.8	ND (0.1)	ND (1)	47	---
AOC1-T5a		10/04/08	0 - 0.5	N	ND (0.402)	21	13	4	ND (0.1)	ND (1)	41	---
		10/04/08	2 - 3	N	ND (0.403)	39	10	3.2	ND (0.099)	ND (1)	38	---
		10/04/08	5 - 6	N	ND (0.405)	35	24	3.4	ND (0.1)	2.2	38	---
		10/04/08	9 - 10	N	ND (0.411)	24	11	3.6	ND (0.1)	ND (1)	38	---
		10/04/08	9 - 10	FD	ND (0.409)	27	11	3.1	ND (0.1)	ND (1)	38	---
AOC1-T5b		10/04/08	0 - 0.5	N	ND (0.402)	26	11	4.9	ND (0.1)	ND (1)	33	---
		10/04/08	2 - 3	N	0.452	41	9.5	4.4	ND (0.1)	ND (1)	38	---
		10/04/08	5 - 6	N	0.596	61	9.8	4.8	ND (0.1)	ND (1)	41	---
		10/04/08	9 - 10	N	ND (0.409)	23	13	3.4	ND (0.1)	ND (1)	41	---

TABLE E-2
Constituent Concentrations
Area of Concern (AOC) 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
AOC1-T5c		10/04/08	0 - 0.5	N	ND (0.403)	15	8.8	5.8	ND (0.1)	ND (1)	37	---
		10/04/08	2 - 3	N	0.875	31	12	7.5	ND (0.1)	ND (1)	53	---
		10/04/08	5 - 6	N	0.641	36	12	11	ND (0.099)	ND (1)	49	---
		10/04/08	9 - 10	N	0.478	21	9.8	3.9	ND (0.1)	ND (1)	39	---
AOC1-T6a		09/30/08	0 - 0.5	N	ND (0.402)	20	11	5.6	ND (0.1)	ND (1)	47	---
		09/30/08	2.5 - 3	N	ND (0.408)	20	8.9	5.6	ND (0.1)	ND (1)	36	---
		09/30/08	2.5 - 3	FD	ND (0.407)	21	8.8	5.4	ND (0.1)	ND (1)	40	---
		09/30/08	5.5 - 6	N	ND (0.408)	16	7.9	3.9	ND (0.1)	ND (1)	34	---
		09/30/08	9.5 - 10	N	ND (0.41)	20	8.7	12	ND (0.1)	ND (1)	40	---
AOC1-T6b		09/30/08	0 - 0.5	N	ND (0.401)	26	9	5.5	ND (0.1)	ND (1)	41	---
		09/30/08	2.5 - 3	N	ND (0.404)	18	7.1	4.4	ND (0.1)	ND (1)	29	---
		09/30/08	5.5 - 6	N	ND (0.404)	22	10	3.2	ND (0.1)	ND (1)	36	---
		09/30/08	9.5 - 10	N	ND (0.405)	25	9.3	3.1 J	ND (0.1)	ND (1)	37	---
		09/30/08	9.5 - 10	FD	ND (0.404)	27	10	8.5 J	ND (0.1)	ND (1)	39	---
AOC1-T6c		09/30/08	0 - 0.5	N	ND (0.401)	18	8.7	3.2	ND (0.1)	ND (1)	39	---
		09/30/08	2.5 - 3	N	ND (0.407)	26	9.7	5.1	ND (0.1)	ND (1)	37	---
		09/30/08	5.5 - 6	N	ND (0.406)	21	9.4	2.9	ND (0.1)	ND (1)	37	---
AOC4-1		10/14/08	0 - 0.5	N	0.49	47	16	8.5	ND (0.1)	ND (1)	48	---
		10/14/08	0.5 - 1	N	ND (0.404)	32	13	10	ND (0.1)	ND (1)	47	---
		10/14/08	2 - 3	N	ND (0.405)	20	12	17	ND (0.1)	ND (1)	39	---

TABLE E-2
Constituent Concentrations
Area of Concern (AOC) 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	**Potential Action Area**	**Date**	**Depth (ft bgs)**	**Sample Type**	**Chromium, Hexavalent**	**Chromium, total**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Zinc**	**a TEQ Human b TEQ Mammal**
AOC1-1	AOC1 PAA #3	01/23/16	0 - 0.5	N	12	410	14	5.4	ND (0.1)	ND (1)	74	300
		01/23/16	2 - 3	N	4.1	290	14	4.5	ND (0.1)	ND (1)	74	190
		01/23/16	5 - 6	N	ND (0.2)	15	9	2.6	ND (0.1)	ND (1)	34	---
		01/23/16	9 - 10	N	ND (0.2)	17	9.6	2.1	ND (0.1)	ND (1)	35	---
		01/23/16	14 - 15	N	ND (0.2)	18	11	1.8	ND (0.1)	ND (1)	36	---
		01/23/16	14 - 15	FD	ND (0.2)	19	12	1.9	ND (0.1)	ND (1)	36	---
		01/24/16	19 - 20	N	ND (0.2)	18	9	1.3	ND (0.1)	ND (1)	39	---
		01/24/16	29 - 30	N	ND (0.21)	16	12	2.3	ND (0.1)	ND (1)	41	---
AOC1-2		01/23/16	0 - 0.5	N	ND (0.21)	20	9.1	4.2	ND (0.1)	ND (1)	38	1.9
		01/23/16	2 - 3	N	ND (0.2)	18 J	9.1	1.9	ND (0.1)	ND (1)	36	0.15
		01/23/16	5 - 6	N	ND (0.2)	19	11	1.8	ND (0.1)	ND (1)	36	---
		01/23/16	9 - 10	N	ND (0.2)	18	6.3	1	ND (0.1)	ND (1)	28	---
		01/23/16	14 - 15	N	ND (0.2)	13	8.1	1	ND (0.1)	ND (1)	34	---
		01/23/16	19 - 20	N	ND (0.2)	16 J	7.7	1.5	ND (0.1)	ND (1)	35	---
		01/23/16	20 - 30	FD	ND (0.2)	13 J	8	1.3	ND (0.1)	ND (1)	36	---
		01/23/16	29 - 30	N	ND (0.2)	15	7.6	1.2	ND (0.1)	ND (1)	31	---

TABLE E-2

Constituent Concentrations

Area of Concern (AOC) 1 – Area around Former Percolation Bed

Soil Engineering Evaluation/Cost Analysis

PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
AOC1-3	AOC1 PAA #3	01/25/16	0 - 0.5	N	14	410	13	3.7	ND (0.1)	ND (1)	90	330
		01/25/16	2 - 3	N	3.7	210	11	3.3	ND (0.1)	ND (1)	60	180
		01/25/16	5 - 6	N	ND (0.2)	24	14	1.5	ND (0.1)	ND (1)	39	0.8
		01/25/16	9 - 10	N	ND (0.2)	13	7.7	1.4	ND (0.1)	ND (1)	32	0.52
		01/25/16	14 - 15	N	ND (0.2)	17	10	1.4	ND (0.1)	ND (1)	40	---
		01/25/16	14 - 15	FD	ND (0.2)	19	9.8	1.3	ND (0.1)	ND (1)	43	---
		01/25/16	19 - 20	N	ND (0.2)	19	11	1.6	ND (0.1)	ND (1)	38	---
		01/25/16	29 - 30	N	ND (0.2)	15	11	2.2	ND (0.1)	ND (1)	34	---
		01/25/16	39 - 40	N	ND (0.22)	22	10	1.7	ND (0.11)	ND (1.1)	39	---
		01/25/16	49 - 50	N	ND (0.21)	23	14	2.3	ND (0.11)	ND (1.1)	42	---
		01/25/16	59 - 60	N	ND (0.21)	39	14	2.2	ND (0.11)	ND (1.1)	42	---
		01/26/16	69 - 70	N	ND (0.21)	20	19	1.5	ND (0.1)	ND (1)	38	---
		01/26/16	79 - 80	N	ND (0.21)	17	13	1.3	ND (0.11)	ND (1)	31	---
AOC1-4		01/23/16	0 - 0.5	N	ND (0.2)	13	7	1.9	ND (0.1)	ND (1)	35	0.92
		01/23/16	2 - 3	N	ND (0.2)	19	8.7	3	ND (0.1)	ND (1)	30	0.66
		01/23/16	5 - 6	N	ND (0.2)	14	10	2.9	ND (0.1)	ND (1)	31	---
		01/23/16	9 - 10	N	ND (0.2)	14	9.3	2.2	ND (0.1)	ND (1)	33	---
		01/23/16	14 - 15	N	ND (0.2)	35	9.1	2	ND (0.1)	ND (1)	35	---
		01/23/16	19 - 20	N	ND (0.2)	16	8.4	1.2	ND (0.1) J	ND (1)	37	---
		01/23/16	19 - 20	FD	ND (0.2)	21	11	1.3	ND (0.1)	ND (1)	43 J	---
		01/23/16	29 - 30	N	ND (0.21)	16	7.9	2.2	ND (0.1)	ND (1.1)	39	---
AOC1-5		01/09/17	0 - 0.5	N	ND (0.21)	14	7.3	1.5	ND (0.1)	ND (1)	26	2.4
		01/09/17	2 - 3	N	ND (0.21)	24	8.7	ND (1)	ND (0.1)	ND (1)	32	0.2
		01/09/17	5 - 6	N	ND (0.21)	19	7.9	2.1	ND (0.1)	ND (1)	45	8
		01/09/17	9 - 10	N	ND (0.21)	13	9.5	ND (1)	ND (0.1)	ND (1)	28	0.45
		01/09/17	14 - 15	N	ND (0.21)	18	8.3	1.9	ND (0.11)	ND (1.1)	34	0.19

TABLE E-2
Constituent Concentrations
Area of Concern (AOC) 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
				Removal Action Goal (RAG) <2 ft bgs :	3.1	145	145	36	1	22	1,050	a 100
				Removal Action Goal (RAG) 2 to 10 ft bgs :	31	145	145	36	1	22	1,050	b 190
AOC1-6		01/09/17	0 - 0.5	N	0.22	23	11	2.9	ND (0.1)	ND (1)	34	14
		01/09/17	2 - 3	N	ND (0.21)	17	6.7	1.2	ND (0.1)	ND (1)	27	2.7
		01/09/17	5 - 6	N	ND (0.21)	14	8.8	ND (1)	ND (0.1)	ND (1)	30	0.3
		01/09/17	9 - 10	N	ND (0.21)	21	8.3	1.5	ND (0.1)	ND (1)	35	ND (0.16)
		01/09/17	14 - 15	N	ND (0.21)	23	7.3	1.6	ND (0.1)	ND (1)	38	0.24
AOC16-5		02/20/17	0 - 0.5	N	0.56	28 J	18 J	29 J	---	ND (1)	46 J	36
		02/20/17	0 - 0.5	FD	0.61	22 J	11 J	3.9 J	0.12	ND (1)	36 J	23
		02/20/17	2 - 3	N	ND (0.21)	13	28	1.3	ND (0.1)	ND (1)	25	ND (0.44)
AOC1-7		01/09/17	0 - 0.5	N	ND (0.21)	14	9.4	1.6	ND (0.1)	ND (1)	28 J	12
		01/09/17	2 - 3	N	ND (0.21)	20	9	1.9	ND (0.1)	ND (1)	35	5.8
		01/09/17	2 - 3	FD	ND (0.21)	18	7.1	1.4	ND (0.1)	ND (1)	33	3.8
		01/09/17	5 - 6	N	ND (0.21)	18	6.3	1.1	ND (0.1)	ND (1)	35	0.49
		01/09/17	9 - 10	N	ND (0.21)	25	8.8	1.6	ND (0.1)	ND (1)	42	0.15
		01/09/17	14 - 15	N	ND (0.21)	22	9.2	1.3	ND (0.1)	ND (1)	38	0.15
AOC1-8		01/05/17	0 - 0.5	N	ND (0.21)	26	12	4.1	ND (0.11)	ND (1.1)	41	5.8
		01/05/17	2 - 3	N	0.24	16	10	12	ND (0.12)	ND (1.2)	40	9
AOC1-BCW10		02/04/16	0 - 0.5	N	ND (0.21)	52	16	11	ND (0.1)	ND (1)	65	110
		02/04/16	2 - 3	N	0.42	66	15	11	ND (0.1)	ND (1)	63	18
		02/04/16	5 - 6	N	ND (0.2)	17	9.5	1.1	ND (0.1)	ND (1)	35	0.79
		02/04/16	9 - 10	N	ND (0.21)	25 J	7.9	1.8	ND (0.11)	ND (1)	49	0.15
		02/04/16	9 - 10	FD	ND (0.21)	19 J	8.2	1.9	ND (0.11)	ND (1.1)	44	0.089
AOC1-BCW11		02/04/16	0 - 0.5	N	ND (0.21) J	19	14	8.5	ND (0.11)	ND (1.1)	54	10
		02/04/16	2 - 3	N	0.36	38	15	6.3	ND (0.1)	ND (1)	54	19
		02/04/16	5 - 6	N	0.5	54	16	7.3	ND (0.1)	ND (1)	62	52
		02/04/16	9 - 10	N	ND (0.22)	11	6	ND (1.1)	ND (0.11)	ND (1.1)	27	ND (0.19)

TABLE E-2
Constituent Concentrations
Area of Concern (AOC) 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	**Potential Action Area**	**Date**	**Depth (ft bgs)**	**Sample Type**	**Chromium, Hexavalent**	**Chromium, total**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Zinc**	**a TEQ Human b TEQ Mammal**
AOC1-BCW12		02/04/16	0 - 0.5	N	ND (0.23)	29	15	9.8	ND (0.11)	ND (1.1)	74	54
		02/04/16	2 - 3	N	0.8	48	17	10	ND (0.11)	ND (1.1)	58	100
		02/04/16	5 - 6	N	ND (0.21)	12	6.9	2	ND (0.11)	ND (1.1)	30	1.5
		02/04/16	9 - 10	N	ND (0.21)	13	6.5	1.3	ND (0.11)	ND (1.1)	29	---
AOC1-BCW13		02/04/16	0 - 0.5	N	ND (0.21)	29	16	8.7	ND (0.11)	ND (1.1)	62	19
		02/04/16	2 - 3	N	0.22	22	17	1.5	ND (0.11)	ND (1.1)	44	0.37
		02/04/16	5 - 6	N	ND (0.22)	17	11	2	ND (0.11)	ND (1.1)	39	0.21
		02/04/16	9 - 10	N	ND (0.22)	16	6.5	1.5	ND (0.11)	ND (1.1)	35	0.24
AOC1-BCW14		02/04/16	0 - 0.5	N	ND (0.21)	28	12	4.7	ND (0.11)	ND (1.1)	49	11
		02/04/16	2 - 3	N	0.23	15	10	3.6	ND (0.1)	ND (1)	34	1.7
		02/04/16	5 - 6	N	ND (0.21)	14	8.8	1.3	ND (0.1)	ND (1)	34	---
		02/04/16	9 - 10	N	ND (0.21)	19	22	1.2	ND (0.11)	ND (1.1)	29	---
AOC1-BCW15		02/04/16	0 - 0.5	N	ND (0.23)	21	15	9.2	ND (0.12)	ND (1.2)	52	9.6
		02/04/16	2 - 3	N	0.54	43	17	9.9	ND (0.13)	ND (1.2)	49	---
		02/04/16	5 - 6	N	ND (0.22)	14	6.6	1.4	ND (0.11)	ND (1.1)	39	---
		02/04/16	9 - 10	N	ND (0.22)	16	6.9	ND (1.1)	ND (0.11)	ND (1.1)	37	---
AOC1-BCW16		02/04/16	0 - 0.5	N	ND (0.22)	30	13	5.8	ND (0.11)	ND (1.1)	46	26
		02/04/16	2 - 3	N	0.36	50	18	12	ND (0.12)	ND (1.2)	51	18
		02/04/16	5 - 6	N	ND (0.21)	15	8.1	1.3	ND (0.11)	ND (1.1)	28	3.5
		02/04/16	9 - 10	N	ND (0.21)	10	6.2	ND (1.1)	ND (0.11)	ND (1.1)	22	0.21
AOC1-BCW17		02/04/16	0 - 0.5	N	ND (0.23)	15	13	5.1	ND (0.11)	ND (1.1)	36	0.42
		02/04/16	2 - 3	N	ND (0.21)	23	18	1.4	ND (0.11)	ND (1.1)	41	0.14
		02/04/16	5 - 6	N	ND (0.21)	18	18	2	ND (0.11)	ND (1.1)	38	---
		02/04/16	9 - 10	N	ND (0.21)	19	15	1.7	ND (0.11)	ND (1.1)	39	---

TABLE E-2
Constituent Concentrations
Area of Concern (AOC) 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
AOC1-BCW18		02/05/16	0 - 0.5	N	ND (0.26)	46	19	13	ND (0.13)	ND (1.3)	68	29
		02/05/16	2 - 3	N	ND (0.25)	10	7	3.5	ND (0.12)	ND (1.2)	30	0.31
		02/05/16	5 - 6	N	ND (0.22)	9.6	6.9	ND (1.1)	ND (0.11)	ND (1.1)	28	ND (0.13)
		02/05/16	9 - 10	N	ND (0.22)	17	6	1.5	ND (0.11)	ND (1.1)	35	ND (0.1)
AOC1-BCW19		02/05/16	0 - 0.5	N	1.4	58	15	11	ND (0.12)	ND (1.2)	60	210
		02/05/16	2 - 3	N	ND (0.21)	12	6.9	1.4	ND (0.1)	ND (1)	27	---
		02/05/16	5 - 6	N	ND (0.21)	15	6.9	1	ND (0.1)	ND (1)	34	---
		02/05/16	9 - 10	N	ND (0.22)	12	7.7	ND (1.1)	ND (0.11)	ND (1.1)	31	---
AOC1-BCW20		02/05/16	0 - 0.5	N	ND (0.21)	20	8.2	2.2	ND (0.1)	ND (1)	38	5.6
		02/05/16	2 - 3	N	ND (0.21)	14	7.4	1.6	ND (0.11)	ND (1.1)	31	0.22
		02/05/16	5 - 6	N	ND (0.22)	12	8.7	1.4	ND (0.11)	ND (1.1)	29	0.19
		02/05/16	9 - 10	N	ND (0.23)	22	17	2.9	ND (0.11)	ND (1.1)	48	ND (0.12)
AOC1-BCW21		02/05/16	0 - 0.5	N	ND (0.23)	42	17	13	ND (0.11)	ND (1.1)	64	42
		02/05/16	2 - 3	N	ND (0.22)	22	9.7	3.2	ND (0.11)	ND (1.1)	40	0.31
		02/05/16	5 - 6	N	ND (0.22)	15	13	1.6	ND (0.11)	ND (1.1)	33	ND (0.12)
		02/05/16	9 - 10	N	ND (0.22)	19	14	2	ND (0.11)	ND (1.1)	40	ND (0.12)
AOC1-BCW22		02/05/16	0 - 0.5	N	ND (0.21)	12	7	6.1	ND (0.1)	ND (1)	26	7
		02/05/16	2 - 3	N	ND (0.21)	20	10	16	ND (0.11)	ND (1)	43	---
		02/05/16	5 - 6	N	ND (0.21)	16	7.7	4.2	ND (0.1)	ND (1)	36	---
		02/05/16	9 - 10	N	ND (0.22)	15	8.8	ND (1.1)	ND (0.11)	ND (1.1)	33	---
AOC1-BCW23		02/05/16	0 - 0.5	N	ND (0.26)	38	22	16	ND (0.13)	ND (1.3)	84	21
		02/05/16	2 - 3	N	ND (0.24)	17	12	6.9	ND (0.12)	ND (1.2)	47	0.65
		02/05/16	5 - 6	N	ND (0.22)	11	5.7	1.7	ND (0.11)	ND (1.1)	24	---
		02/05/16	9 - 10	N	ND (0.22)	13	7.6	1.5	ND (0.11)	ND (1.1)	33	---

TABLE E-2
Constituent Concentrations
Area of Concern (AOC) 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
AOC1-BCW24		02/05/16	0 - 0.5	N	ND (0.24)	30	14	7.4	ND (0.12)	ND (1.2)	56	27
		02/05/16	2 - 3	N	0.28	29	15	8.8	ND (0.12)	ND (1.2)	49	26
		02/05/16	5 - 6	N	ND (0.22)	11	7.7	1.1	ND (0.11)	ND (1.1)	27	ND (0.18)
		02/05/16	9 - 10	N	ND (0.22)	7.9	4.9	1.3	ND (0.11)	ND (1.1)	21	---
AOC1-BCW25		02/05/16	0 - 0.5	N	ND (0.26)	39	18	11	ND (0.13)	ND (1.3)	69	58
		02/05/16	2 - 3	N	ND (0.26)	21	14	3.8	ND (0.13)	ND (1.3)	42	1.9
		02/05/16	5 - 6	N	ND (0.22)	13	7.9	2.6	ND (0.11)	ND (1.1)	37	0.58
		02/05/16	9 - 10	N	ND (0.22)	16	14	2	ND (0.11)	ND (1.1)	42	ND (0.067)
AOC1-BCW26		02/04/16	0 - 0.5	N	ND (0.22)	35	15	8.9	ND (0.11)	ND (1.1)	59	100
		02/04/16	2 - 3	N	ND (0.25)	12	10	8.2	ND (0.13)	ND (1.3)	43	0.75
		02/04/16	5 - 6	N	ND (0.21)	13	11	3.6	ND (0.11)	ND (1.1)	33	---
		02/04/16	9 - 10	N	ND (0.24)	19	25	3.1	ND (0.12)	ND (1.2)	40	---
AOC1-BCW27		02/05/16	0 - 0.5	N	ND (0.24)	33	17	17	ND (0.12)	ND (1.2)	59	3.9
		02/05/16	2 - 3	N	ND (0.23)	12	8.6	2	ND (0.11)	ND (1.1)	33	0.12
		02/05/16	5 - 6	N	ND (0.21)	9.7	9	1.3	ND (0.11)	ND (1.1)	29	0.13
		02/05/16	9 - 10	N	ND (0.23)	15	7.4	2.2	ND (0.11)	ND (1.1)	31	0.088
AOC1-BCW28		02/05/16	0 - 0.5	N	0.3	49	19	14	ND (0.12)	ND (1.2)	73	180
		02/05/16	2 - 3	N	ND (0.23)	18	10	4.2	ND (0.11)	ND (1.2)	38	0.83
		02/05/16	5 - 6	N	ND (0.22)	18	8.3	1.4	ND (0.11)	ND (1.1)	33	0.6
		02/05/16	9 - 10	N	ND (0.22)	18	11	2.1	ND (0.11)	ND (1.1)	39	ND (0.11)
AOC1-BCW29		02/04/16	0 - 0.5	N	ND (0.26)	33	15	8.3	ND (0.13)	ND (1.3)	56	84
		02/04/16	2 - 3	N	ND (0.27)	17	13	5.2	ND (0.14)	ND (1.4)	49	0.45
		02/04/16	5 - 6	N	ND (0.31)	27	23	7.6	ND (0.15)	ND (1.5)	66	0.56
		02/04/16	9 - 10	N	ND (0.24) J	11	7.1	ND (1.2)	ND (0.12)	ND (1.2)	29	0.55

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Area of Concern (AOC) 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
AOC1-BCW30		02/04/16	0 - 0.5	N	ND (0.24)	42	18	17 J	ND (0.12)	ND (1.2) J	61	140
		02/04/16	2 - 3	N	0.26	14	8.7	2.7	ND (0.12)	ND (1.2)	28	2.2
		02/04/16	5 - 6	N	ND (0.23)	12	8.4	2.9	ND (0.12)	ND (1.2)	29	---
		02/04/16	9 - 10	N	ND (0.23)	8.8	7.8	ND (1.2)	ND (0.12)	ND (1.2)	27	---
AOC1-BCW31		02/20/17‡	0 - 0.5	N	---	---	---	---	---	---	---	0.5
		02/20/17‡	2 - 3	N	---	---	---	---	---	---	---	ND (0.078)
AOC1-BCW32		02/20/17‡	0 - 0.5	N	---	---	---	---	---	---	---	1.9
		02/20/17‡	2 - 3	N	---	---	---	---	---	---	---	0.13
AOC1-BCW7		02/05/16	0 - 0.5	N	0.29	18	18	8	ND (0.1)	ND (1)	34	6.4
		02/05/16	2 - 3	N	0.36	20	8.4	1.7	ND (0.1)	ND (1)	29	3.1
		02/05/16	2 - 3	FD	0.28	23	7.5	1.7	ND (0.1)	ND (1)	27	2.5
		02/05/16	5 - 6	N	ND (0.21)	15	6.2	2.2	ND (0.1)	ND (1)	15	0.17
		02/05/16	9 - 10	N	0.36	24	23	1.4	ND (0.1)	ND (1.1)	26	0.23
		02/05/16	14 - 15	N	ND (0.21)	19	8.4	2.4	ND (0.1)	ND (1.1)	39	---
		02/05/16	19 - 20	N	ND (0.21)	20	7.2	1.8	ND (0.11)	ND (1)	38	---
		02/05/16	19 - 20	FD	ND (0.21)	19	8.7	1.8	ND (0.1)	ND (1.1)	38	---
AOC1-BCW8		02/04/16	0 - 0.5	N	ND (0.22)	21	14	8.3	ND (0.11)	ND (1.1)	53	21
		02/04/16	2 - 3	N	0.44	28	10	4.5	ND (0.1)	ND (1)	45	38
		02/04/16	5 - 6	N	0.24	18	8.4	3.2	ND (0.1)	ND (1)	35	9
		02/04/16	9 - 10	N	ND (0.21)	15 J	9.3	1.1	ND (0.11)	ND (1.1)	35	---
		02/04/16	9 - 10	FD	ND (0.21)	11 J	11	ND (1.1)	ND (0.11)	ND (1.1)	37	---
AOC1-BCW9		02/04/16	0 - 0.5	N	ND (0.22)	35	17	9.3	ND (0.11)	ND (1.1)	61	29
		02/04/16	2 - 3	N	1.2	66	16	11	ND (0.11)	ND (1.1)	57	0.68
		02/04/16	5 - 6	N	ND (0.21)	17	9.5	3	ND (0.1)	ND (1.1)	37	---
		02/04/16	9 - 10	N	ND (0.21)	13	10	ND (1.1)	ND (0.1)	ND (1.1)	32	---

TABLE E-2
Constituent Concentrations
Area of Concern (AOC) 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
AOC1-T1e		01/11/16	0 - 1	N	ND (0.21)	26	13	3.3	---	ND (1)	37	19
		01/11/16	2 - 3	N	ND (0.21)	18	10	2	ND (0.1)	ND (1)	40	2.6
		01/11/16	5 - 6	N	ND (0.21)	16	7.5	1.1	ND (0.1)	ND (1)	30	0.27
		01/11/16	9 - 10	N	ND (0.2)	20	11	1.3	ND (0.1)	ND (1)	32	0.86
		01/11/16	9 - 10	FD	ND (0.21)	17	13	1.5	0.18	ND (1)	32	---
		01/11/16	14 - 15	N	ND (0.22)	17	11	1.3	0.16	ND (1.1)	28	---
AOC1-T1f		01/12/16	0 - 1	N	0.71	49	13	5.5	0.13	ND (1)	41	19
		01/12/16	2 - 3	N	ND (0.21)	20	7.2	1.5	0.13	ND (1)	32	0.092
		01/12/16	5 - 6	N	ND (0.21)	24	11	2	0.11	ND (1.1)	40	0.43
		01/12/16	9 - 10	N	ND (0.21)	18 J	9.1	1.9	0.11	ND (1)	46 J	0.43
		01/12/16	9 - 10	FD	ND (0.21)	30 J	11	2.6	ND (0.1)	ND (1)	35 J	---
		01/12/16	14 - 15	N	0.68	29	9.2	2	ND (0.1)	ND (1)	34	---
AOC1-T1g		02/17/17	0 - 0.5	N	ND (0.2)	26	12	4.1	ND (0.1)	ND (1)	33	6.5
		02/17/17	0 - 0.5	FD	ND (0.2)	24	14	1.6	ND (0.1)	ND (1)	36	12
		02/17/17	2 - 3	N	ND (0.21)	30	13	ND (1)	ND (0.1)	ND (1)	32	19
		02/17/17	5 - 6	N	0.63	23	9.2	1.1	ND (0.1)	ND (1)	30	6
		02/17/17	9 - 10	N	ND (0.21)	14	9.2	ND (1)	ND (0.1)	ND (1)	29	2.4
AOC1-T2f		12/17/15	0 - 1	N	0.22	14	12	7.9	ND (0.1)	3.2	39	---
		12/17/15	2 - 3	N	0.25	17	11	3.1	ND (0.1)	8.2	40	---
AOC1-T2g	AOC1 PAA #2	03/03/16	9 - 10	N	30	2,100	11	5.2	0.26	8.4	140	130
		03/03/16	14 - 15	N	0.77	28	8.9	2	0.16	ND (1.1)	75	18
		03/03/16	19 - 20	N	0.58	27	9.2	2	0.16	ND (1.1)	53	3.6
		03/03/16	29 - 30	N	0.25	21	9.9	2.1	0.15	ND (1.1)	50	---
		03/03/16	39 - 40	N	0.23	19	9.2	1.8	0.14	ND (1.1)	39	---
		03/03/16	39 - 40	FD	ND (0.21)	19	9.8	1.8	0.13	ND (1.1)	39	---
		03/03/16	49 - 50	N	ND (0.21)	18	15	1.9	0.12	ND (1.1)	37	---
		03/03/16	59 - 60	N	ND (0.21)	18	13	2.1	0.15	ND (1.1)	44	---
		03/03/16	69 - 70	N	ND (0.21)	15	8.4	1.4	0.11	ND (1.1)	36	---

TABLE E-2
Constituent Concentrations
Area of Concern (AOC) 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	**Potential Action Area**	**Date**	**Depth (ft bgs)**	**Sample Type**	**Chromium, Hexavalent**	**Chromium, total**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Zinc**	**a TEQ Human b TEQ Mammal**
AOC1-T2h		03/04/16	0 - 1	N	2.5	100 J	9.2 J	2.2	ND (0.1)	ND (1)	39	34
		03/04/16	2 - 3	N	0.42	24	9.9	2.2	ND (0.11)	ND (1.1)	45	19
		03/04/16	5 - 6	N	6.8	200	9.8	3.4	ND (0.1)	ND (1)	85	1.9
		03/04/16	9 - 10	N	0.94	28	16	1.4	ND (0.1)	ND (1)	44	21
		03/04/16	14 - 15	N	0.29	19	9	1.1	ND (0.1)	ND (1)	33	---
		03/04/16	19 - 20	N	0.23	18	12	1.3	ND (0.1)	ND (1.1)	41	---
		03/04/16	29 - 30	N	ND (0.21)	18	8.9	1.2	ND (0.1)	ND (1)	34	---
		03/04/16	39 - 40	N	ND (0.21)	17	8	1.6	ND (0.1)	ND (1.1)	35	---
AOC1-T2i	AOC1 PAA #2	03/05/16	0 - 1	N	0.61	28	10	2.6	ND (0.1)	ND (1)	36	25
		03/05/16	2 - 3	N	0.55	25	9.2	2.5	ND (0.1)	ND (1)	34	14
		03/05/16	5 - 6	N	0.29	16	10	3.5	0.12	ND (1)	40	0.91
		03/05/16	9 - 10	N	0.31	40	12	4.8	ND (0.1)	ND (1)	40	32
		03/05/16	14 - 15	N	0.28	17	9.5	1.4	ND (0.1)	ND (1)	38	---
		03/05/16	19 - 20	N	0.27	18	14	1.3	ND (0.1)	ND (1)	39	---
AOC1-T2j	AOC1 PAA #2	03/05/16	0 - 1	N	0.6	31	8.8	1.9	ND (0.1)	ND (1)	40	4.8
		03/05/16	2 - 3	N	0.38	21	9.3	2.4	ND (0.1)	ND (1)	32	13
		03/05/16	2 - 3	FD	0.39	18	10	1.7	ND (0.1)	ND (1)	29	6.5
		03/05/16	5 - 6	N	ND (0.21)	18	9.2	1.4	0.11	ND (1)	31	4.8
		03/05/16	9 - 10	N	0.37	16	6.4	1.3	ND (0.1)	ND (1)	33	0.71
		03/05/16	14 - 15	N	0.26	26	12	2.1	ND (0.11)	ND (1.1)	44	---
		03/05/16	19 - 20	N	0.7	22 J	8.8	1.7	ND (0.11)	ND (1.1)	46	---
		03/05/16	19 - 20	FD	0.64	30 J	9.3	2	ND (0.11)	ND (1.1)	45	---

TABLE E-2

Constituent Concentrations
Area of Concern (AOC) 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
AOC1-T5D	AOC1 PAA #1	01/12/16	0 - 1	N	ND (0.2)	23	8.3	6.2	ND (0.1)	ND (1)	33	10
		01/12/16	2 - 3	N	2.7	120 J	17	18	ND (0.11)	ND (1.1)	100 J	830
		01/12/16	2 - 3	FD	2.6	69 J	14	16	ND (0.1)	ND (1)	72 J	1,100
		01/12/16	5 - 6	N	2.4	80	9.7	3.7	ND (0.1)	ND (1)	42	92
		01/12/16	9 - 10	N	0.33	23	8.3	4.8	ND (0.1)	ND (1)	40	21
		01/12/16	14 - 15	N	0.92	36	8.8	4.1	ND (0.1)	ND (1)	36	53
		01/12/16	19 - 20	N	0.51	23	8.8	1.8	ND (0.099)	ND (1)	48	32
		01/12/16	19 - 20	FD	0.72	22	8.8	1.8	ND (0.11)	ND (1.1)	52	33
AOC1-T6D		02/09/16	0 - 0.5	N	ND (0.2) J	19	7.6	2.4	ND (0.1)	ND (1)	100	7.3
		02/09/16	2 - 3	N	0.32 J	19	11	1.3	ND (0.1)	ND (1)	38	2.2
		02/09/16	5 - 6	N	0.24 J	19	11	1.7	ND (0.1)	ND (1)	43	1.5
		02/09/16	9 - 10	N	ND (0.21) J	16	8.8	1.4	ND (0.1)	ND (1)	35	0.55
		02/09/16	9 - 10	FD	ND (0.21) J	16	9.5	1.7	ND (0.1)	ND (1)	36	1.3
		02/09/16	14 - 15	N	ND (0.21) J	16	8.3	1.2	ND (0.1)	ND (1)	36	---
		02/09/16	14 - 15	FD	ND (0.2) J	19	9.9	1.7	ND (0.1)	ND (1)	41	---
		02/09/16	19 - 20	N	ND (0.2) J	24	10	1.2	ND (0.1)	ND (1)	41	---
AOC1-T7		02/19/17	0 - 0.5	N	ND (0.21)	23	13	ND (1.1)	ND (0.1)	ND (1.1)	32	5.7
		02/19/17	2 - 3	N	0.33	27	8.9	1.1	ND (0.1)	ND (1)	35	9.8
		02/19/17	5 - 6	N	0.43	18	8.9	7.1	ND (0.1)	ND (1)	30	23
		02/19/17	9 - 10	N	ND (0.21)	17	10	ND (1)	ND (0.1)	ND (1)	30	3.2
AOC1-T8		02/18/17	0 - 0.5	N	0.23	43	11	1.1	ND (0.1)	ND (1)	34	14
		02/18/17	2 - 3	N	ND (0.21)	18	17	1.1	ND (0.1)	ND (1)	28	13
		02/18/17	5 - 6	N	ND (0.21)	14	8.6	ND (1.1)	ND (0.11)	ND (1.1)	36	1.7
		02/18/17	9 - 10	N	0.22	13 J	10	ND (1)	ND (0.1)	ND (1)	31	1.7
		02/18/17	9 - 10	FD	ND (0.21)	17 J	9.2	ND (1)	ND (0.1)	ND (1)	27	4
AOC4-GB10		02/10/10	0 - 0.5	N	ND (0.44)	35 J	16	14	ND (0.11)	ND (1.1)	71 J	87

TABLE E-2

Constituent Concentrations

Area of Concern (AOC) 1 – Area around Former Percolation Bed

Soil Engineering Evaluation/Cost Analysis

PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
		Removal Action Goal (RAG) <2 ft bgs :			3.1	145	145	36	1	22	1,050	a 100
		Removal Action Goal (RAG) 2 to 10 ft bgs :			31	145	145	36	1	22	1,050	b 190
Location	**Potential Action Area**	**Date**	**Depth (ft bgs)**	**Sample Type**	**Chromium, Hexavalent**	**Chromium, total**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Zinc**	**a TEQ Human b TEQ Mammal**
AOC4-GB11		02/10/10	0 - 0.5	N	ND (0.43)	31	13	7.2 J	ND (0.11)	ND (1.1)	46	87
		02/10/10	0 - 0.5	FD	0.57	29	14	16 J	ND (0.11)	ND (1.1)	47	110
AOC4-GB12		02/10/10	0 - 0.5	N	ND (0.44)	35	15	5.5	ND (0.11)	ND (1.1)	43	21
MW-10		06/27/97	1	N	ND (0.05)	14.2	14.1	---	---	---	20.9	---
		06/27/97	3	N	ND (0.05)	13.4	8.3	---	---	---	26.6	---
		06/27/97	6	N	ND (0.05)	19	8.4	---	---	---	23.3	---
		06/27/97	10	N	ND (0.05)	26.7	9.6	2.8	---	0.62	30.4	---
		06/27/97	20	N	ND (0.05)	14.7	7.7	---	---	---	27.1	---
		06/27/97	25	N	ND (0.05)	16.1	10.6	---	---	---	34.1	---
		06/27/97	30	N	ND (0.05)	13.8	9.4	---	---	---	31.5	---
		06/27/97	35	N	---	---	---	3.6	---	ND (0.2)	---	---
		06/27/97	40	N	ND (0.05)	14.5	9.2	---	---	---	29.4	---
		06/28/97	50	N	ND (0.05)	14.3	8.5	---	---	---	31.2	---
		06/27/97	60	N	ND (0.05)	9.1	6	---	---	---	16.3	---
		06/27/97	70	N	ND (0.05)	11.7	8.8	2.2	---	ND (0.2)	24.2	---
		06/27/97	75	N	ND (0.05)	11.5	6.4	---	---	---	24.9	---
		06/27/97	75	FD	0.1	9.6	6.97	---	---	---	21.6	---
		06/27/97	82	N	ND (0.05)	9.9	6.3	2.3	---	ND (0.2)	26.6	---

TABLE E-2
Constituent Concentrations
Area of Concern (AOC) 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	**Potential Action Area**	**Date**	**Depth (ft bgs)**	**Sample Type**	**Chromium, Hexavalent**	**Chromium, total**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Zinc**	**a TEQ Human b TEQ Mammal**
MW-11		06/29/97	1	N	ND (0.05)	12.2	7.5	---	---	---	24.8	---
		06/29/97	3	N	ND (0.05)	31.1	6.6	---	---	---	29.5	---
		06/29/97	6	N	ND (0.05)	26.9	5.3	---	---	---	23.2	---
		06/29/97	10	N	ND (0.05)	13.5	8.3	6.3	---	0.32	38.5	---
		06/29/97	20	N	ND (0.05)	5.9	6	---	---	---	19.9	---
		06/29/97	30	N	ND (0.05)	12.6	6.9	1.8	---	0.8	28.4	---
		06/29/97	40	N	ND (0.05)	9.8	9.8	---	---	---	28.4	---
		06/29/97	50	N	ND (0.05)	13.6	6.9	---	---	---	29.8	---
		06/29/97	60	N	ND (0.05)	9.6	5.8	3	---	0.088 J	26.2	---
		06/29/97	60	FD	ND (0.05)	10	5.74	---	---	---	19.8	---
		06/29/97	69	N	ND (0.05)	16.9	13.8	5	---	ND (0.2)	35.7	---
MW-13		07/09/97	10	N	ND (0.05)	10.8	9.3	---	---	---	27.2	---
		07/09/97	20	N	ND (0.05)	10.5	7.1	2.4	---	0.14 J	28.3	---
		07/09/97	25	N	---	---	---	2.8	---	ND (0.2)	---	---
		07/09/97	30	N	ND (0.05)	12.2	8.6	---	---	---	33.3	---
		07/09/97	40	N	ND (0.05)	10.7	8.1	---	---	---	30.4	---
		07/09/97	40	FD	ND (0.05)	6.4	5.6	---	---	---	17.7	---
Old Well-BCW-1	AOC1 PAA #2	09/11/13	7 - 8	N	80	4,200	14	12 J	ND (0.11)	18	190	350
Old Well-BCW-2	AOC1 PAA #2	09/11/13	4 - 5	N	73	4,400	23	10	ND (0.11)	6.7	150	230
PA-01		11/09/15	0 - 1	N	0.65	20	8.5	9.3	ND (0.1)	ND (1)	80	---
PA-03		11/09/15	0 - 1	N	0.65	26	15	13	ND (0.1)	ND (1)	200	---
PA-04		11/09/15	0 - 1	N	0.69	36	14	25	ND (0.1)	ND (1)	56	---
PA-14		01/27/16	0 - 1	N	ND (0.21)	20	22	10	ND (0.1)	ND (1)	270	23
PA-15		01/27/16	0 - 1	N	1.1	170	26	20	ND (0.1)	ND (1)	120	86
PA-16		01/27/16	0 - 1	N	1.3	47	26	8.5	ND (0.1)	1.2	64	25

TABLE E-2
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Area of Concern (AOC) 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
SD-14		01/11/16	0 - 1	N	0.72	29	14	13	ND (0.1)	ND (1)	37	190
		01/11/16	2 - 3	N	0.63	32	7.6	16	ND (0.1)	ND (1)	47	83
		01/11/16	5 - 6	N	3.1	42	64	120	ND (0.11)	5	660	40
		01/11/16	9 - 10	N	1.1	35	7.8	1.9	ND (0.1)	ND (1)	36	0.32
SD-15		01/12/16	0 - 0.5	N	0.77	19	13	2.7	ND (0.11)	ND (1.1)	32	41
		01/12/16	2 - 3	N	ND (0.21)	25	12	1.8	ND (0.11)	ND (1.1)	32	2
		01/12/16	5 - 6	N	ND (0.21)	21	11	1.5	ND (0.11)	ND (1.1)	32	1.6
		01/12/16	9 - 10	N	ND (0.21)	20	9.3	2.1	ND (0.11)	ND (1.1)	37	0.3
SD-16		01/12/16	0 - 0.5	N	ND (0.21)	16	10	1.8	ND (0.1)	ND (1.1)	32	0.31
		01/12/16	2 - 3	N	ND (0.21)	19	11	2.2	ND (0.1)	ND (1.1)	28	0.13
		01/12/16	5 - 6	N	ND (0.21)	24	9.3	2.4	ND (0.11)	ND (1)	40	0.12
		01/12/16	9 - 10	N	ND (0.21)	13	6.1	1.9	ND (0.1)	ND (1)	33	0.074
SD-17		12/17/15	0 - 0.5	N	ND (0.2)	17	15	15	ND (0.1)	ND (1)	60	---
		12/17/15	2 - 3	N	0.25	18	16	19	ND (0.1)	ND (1)	65	---
SD-18		12/17/15	0 - 0.5	N	ND (0.21)	32	17	3.4	ND (0.11)	ND (1.1)	310	---
SD-19		01/13/16	0 - 0.5	N	ND (0.21)	30	15 J	2	ND (0.1)	ND (1)	33	---
		01/13/16	0 - 0.5	FD	ND (0.21)	28	11 J	2.1	ND (0.11)	1.3	33	---
		01/13/16	2 - 3	N	ND (0.2)	24	10	2.8	ND (0.1)	ND (1)	33	---
		01/13/16	5 - 6	N	ND (0.2)	14	7.9	1.5	ND (0.1)	ND (1)	30	---
		01/13/16	8 - 8.5	N	ND (0.2)	15	7.8	1.8	0.12	ND (1)	35	---
SD-25		03/10/16	0 - 1	N	ND (0.21)	23	15	3.1	0.1	ND (1)	39	4.2
SD-26		03/10/16	0 - 1	N	0.32	24	21	16	ND (0.1)	ND (1)	220	41
SD-OS33		12/20/16	1.5 - 2	N	0.36	29	12	5.2	ND (0.1)	ND (1)	47	---
TCS-4	AOC1 PAA #2	03/25/14	59 - 60	N	2.2	61 J	18 J	32 J	ND (0.1)	ND (1)	30	150
		03/25/14	113	N	ND (0.4)	1,700	580	17	ND (0.1)	35	55	51

TABLE E-2
Constituent Concentrations
Area of Concern (AOC) 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
				Removal Action Goal (RAG) <2 ft bgs :	3.1	145	145	36	1	22	1,050	a 100
				Removal Action Goal (RAG) 2 to 10 ft bgs :	31	145	145	36	1	22	1,050	b 190
TCS4-E	AOC1 PAA #2	03/01/16	4 - 5	N	29 J	3,100	16 J	6.2	ND (0.1)	9.6 J	190 J	780
		03/01/16	4 - 5	FD	50 J	3,400	12 J	5	ND (0.11)	9.1 J	120 J	870
		03/01/16	5 - 6	N	0.99	13	8	ND (1)	ND (0.1)	ND (1)	31	4.6
TCS4-N	AOC1 PAA #2	03/01/16	4 - 5	N	33	3,400	8.7	6.9	ND (0.1)	4.9	82	110
		03/01/16	5 - 6	N	39	3,300	14	6.2	ND (0.11)	15	130	210
TCS4-S	AOC1 PAA #2	03/01/16	4 - 5	N	30	840	9	4.5	ND (0.11)	ND (1.1)	120	180
		03/01/16	5 - 6	N	21	2,200	11	3.1	ND (0.11)	3.4	150	47
SS-1		06/29/97‡	0.5	N	ND (0.05)	38.2	16.5	---	---	---	55	---
		06/29/97‡	1.5	N	ND (0.05)	25.3	13.6	---	---	---	43.4	---
SS-2		06/29/97	0.5	N	ND (0.05)	18.9	14.1	---	---	---	48.3	---
		06/29/97	1.5	N	ND (0.05)	10.2	12.9	---	---	---	42.2	---
SS-3		06/29/97	0.5	N	ND (0.05)	---	---	---	---	---	---	---
SS-4		06/29/97	0.5	N	ND (0.05)	---	---	---	---	---	---	---
SS-5		06/29/97	0.5	N	ND (0.05)	---	---	---	---	---	---	---
SS-6		06/29/97	0.5	N	ND (0.05)	---	---	---	---	---	---	---
SS-7		06/29/97	0.5	N	ND (0.05)	---	---	---	---	---	---	---
SS-8		06/29/97	0.5	N	ND (0.05)	---	---	---	---	---	---	---
SSB-1		06/25/97	1	N	ND (0.05)	13.7	14.9	---	---	---	35.7	---
		06/25/97	3	N	ND (0.05)	13.6	11	---	---	---	29.6	---
		06/25/97	6	N	ND (0.05)	16.7	16.9	---	---	---	34.5	---
		06/25/97	10	N	ND (0.05)	16.5	8.2	1.3	---	ND (0.2)	31.9	---
SSB-6		06/30/97	1	N	ND (0.05)	13.7	8.6	---	---	---	29.1	---
		06/30/97	3	N	ND (0.05)	27.5	6.6	---	---	---	24.8	---
		06/30/97	6	N	0.06	467	33.8	---	---	---	132	---
		06/30/97	10	N	ND (0.05)	14.8	9.6	3.1	---	0.79	33.4	---

TABLE E-2
Constituent Concentrations
Area of Concern (AOC) 1 – Area around Former Percolation Bed
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
SSB-7		06/30/97	1	N	ND (0.05)	19.8	7.7	---	---	---	28.1	---
		06/30/97	3	N	ND (0.05)	24.9	6.5	---	---	---	29.4	---
		06/30/97	6	N	ND (0.05)	8.6	14.7	---	---	---	23	---
		06/30/97	10	N	ND (0.05)	8.1	5.8	1.8	---	ND (0.2)	23.4	---
SSB-8		07/10/97	1	N	ND (0.05)	53.1	15.1	---	---	---	38.3	---
		07/10/97	3	N	ND (0.05)	13.6	14.1	---	---	---	35.3	---
		07/10/97	6	N	ND (0.05)	15.3	7.3	---	---	---	33.5	---
		07/10/97	10	N	ND (0.05)	17.1	10.7	2.8	---	0.071 J	35.8	---
		07/10/97	10	FD	ND (0.05)	13.7	8	---	---	---	30	---
SSB-9		07/10/97	1	N	ND (0.05)	17.3	8.6	---	---	---	35.5	---
		07/10/97	3	N	ND (0.05)	11	6.1	---	---	---	31.8	---
		07/10/97	6	N	ND (0.05)	9.6	6.4	---	---	---	25.3	---
		07/10/97	10	N	ND (0.05)	15.7	7.7	3	---	0.096 J	33.1	---
XMW-9		06/25/97	3	N	ND (0.05)	18.4	12	---	---	---	25.8	---
		06/25/97	10	N	ND (0.05)	45.7	19.7	5.7	---	0.075 J	44.2	---
		06/25/97	10	FD	ND (0.05)	31.1	16.7	---	---	---	38.7	---
		06/25/97	30	N	ND (0.05)	35.6	17.2	7.2	---	0.11 J	50.3	---
		06/25/97	50	N	ND (0.05)	36.3	15.6	4.5	---	ND (0.2)	54.2	---
		06/25/97	70	N	ND (0.05)	6.7	170	6.1	---	1.8	54.6	---

Notes:

Results greater than or equal to the Removal Action Goal are circled.

ǂ	This location is in an area where soil is transitioning into sediment.
---	not analyzed
FD	field duplicate
ft bgs	feet below ground surface
J	concentration or reporting limit estimated by laboratory or data validation
mg/kg	milligrams per kilogram
N	primary sample
ND	not detected at the listed reporting limit
ng/kg	nanogram per kilogram
TEQ	dioxin and furans toxicity equivalent quotient

TABLE E-3

Constituent Concentrations
AOC 9 – Southeast Fence Line
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
AOC9-1		10/01/08	0 - 0.5	N	1.03	23	9.1	19	ND (0.1)	ND (1)	46	---
		10/01/08	2 - 3	N	ND (0.478)	9.7	5	4.5	ND (0.1)	ND (1)	17	---
AOC9-2		09/18/08	0 - 0.5	N	ND (0.401)	16	11	9.6	ND (0.099)	ND (2)	33	1.8
		09/18/08	2 - 3	N	ND (0.406)	11	5.9	4.9	ND (0.1)	ND (2)	20	1.6
AOC9-3		09/18/08	0 - 0.5	N	ND (0.402)	25	17	9	ND (0.1)	ND (2)	49	---
		09/18/08	2 - 3	N	ND (0.454)	15	7.3	23	ND (0.1)	ND (2)	92	---
AOC9-4		09/18/08	0 - 0.5	N	1.06	22	12	13	ND (0.1)	ND (2)	53	---
		09/18/08	2 - 3	N	ND (0.402)	19	11	11	ND (0.1)	ND (2)	42	---
AOC9-5		10/01/08	0 - 0.5	N	0.726	35	19	28	ND (0.1)	ND (1)	100	---
		10/01/08	2 - 3	N	1	38	21	25	0.27	ND (2)	76	---
		10/01/08	2 - 3	FD	0.791	43	19	24	0.23	ND (2)	85	---
AOC9-6		09/18/08	0 - 0.5	N	0.789	25	12	23	0.14	ND (2)	68	---
		09/18/08	2 - 3	N	ND (0.458)	16	9.3	5	ND (0.1)	ND (2.1)	31	---
AOC9-7		09/18/08	0 - 0.5	N	4.37	72	14	15	ND (0.1)	ND (2)	120	---
		09/18/08	2 - 3	N	ND (0.411)	13	6.7	20	ND (0.1)	ND (1)	29	---
AOC9-8	AOC9 PAA #1	10/01/08	0 - 0.5	N	48.6 J	230	11	20	ND (0.1)	1	1,000	---
		10/01/08	2.5 - 3	N	2.41	41	13	59	ND (0.1)	4.5	130	81
		10/01/08	5.5 - 6	N	1.32	13	5.5	4.4	ND (0.1)	ND (1)	21	---
AOC9-9	AOC9 PAA #1	10/01/08	0 - 0.5	N	ND (0.404)	14	8	7	ND (0.1)	ND (1)	34	---
		10/01/08	2.5 - 3	N	ND (0.415)	21	10	3.8	ND (0.1)	ND (1)	41	---
		10/01/08	5.5 - 6	N	1.53	28	11	4.9	ND (0.1)	ND (1)	53	---
		10/01/08	5.5 - 6	FD	1.28	27	10	4.4	ND (0.1)	ND (1)	50	---
AOC9-10		10/01/08	0 - 0.5	N	0.418	28	11	18	ND (0.1)	ND (1)	49	---
		10/01/08	2 - 3	N	0.494	30	15	15	0.11	ND (2)	110	---
AOC9-11		09/18/08	0 - 0.5	N	ND (0.418)	18	8.5	7.7	0.13	ND (2.1)	35	---
		09/18/08	2 - 3	N	ND (0.406)	20	9.7	7.1	ND (0.1)	ND (2)	30	---

TABLE E-3
Constituent Concentrations
AOC 9 – Southeast Fence Line
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	[a] 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	[b] 190
AOC9-12		10/01/08	0 - 0.5	N	0.727	34	19	13	ND (0.1)	ND (2)	57	---
		10/01/08	2 - 3	N	ND (0.415)	40	17	11	ND (0.1)	ND (2.1)	50	---
AOC9-13		09/19/08	0 - 0.5	N	ND (0.404)	18	13	8.3	ND (0.099)	ND (2)	36	---
		09/19/08	2 - 3	N	ND (0.409)	23 J	9.8	10	ND (0.1)	ND (2)	35	---
		09/19/08	2 - 3	FD	ND (0.41)	18 J	9.6	5.6	ND (0.1)	ND (2)	32	---
AOC9-14		10/02/08⊖	0 - 0.5	N	1.7	31	24	34	ND (0.11)	ND (5.4)	81	---
		10/02/08	2 - 3	N	ND (0.412)	38	17	13	ND (0.1)	ND (2)	61	---
AOC9-15		12/06/15	0 - 1	N	ND (0.21)	24 J	17 J	15 J	ND (0.11)	ND (1.1)	52	59
		12/06/15	2 - 3	N	0.58	25	14	23	ND (0.1)	ND (1)	46	160
AOC9-16		01/13/16	0 - 0.5	N	4.4	48	11	22	0.14	ND (1)	69	190
		01/13/16	2 - 3	N	ND (0.2)	17	18	6.8	0.11	ND (1)	34	7.6
		01/13/16	5 - 6	N	ND (0.2)	14	6.3	7.1	ND (0.11)	ND (1)	26	13
		01/13/16	9 - 10	N	ND (0.2)	12	6.2	2.9	ND (0.1)	ND (1)	21	---
AOC9-17		01/10/16	9 - 10	N	1.2	---	---	---	---	---	---	---
		01/14/16	14 - 15	N	ND (0.21)	---	---	---	---	---	---	---
AOC9-18		01/10/16	5 - 6	N	0.55	25	17	14	0.18	ND (1)	57	55
		01/10/16	9 - 10	N	0.94	20	11	28	0.75	ND (1)	53	---
AOC9-19		01/13/16	0 - 0.5	N	---	19	9.3	9.4	0.15	ND (1)	42	24
		01/13/16	2 - 3	N	---	13	15	13	ND (0.1)	ND (1)	35	11
		01/13/16	5 - 6	N	---	13	7.6	7.4	0.12	ND (1)	33	5.9
		01/13/16	9 - 10	N	---	17	14	5.1	ND (0.1)	ND (1)	29	---
AOC9-20		01/13/16	0 - 0.5	N	---	---	---	7.1	0.11	---	---	9.8
		01/13/16	2 - 3	N	---	---	---	11	0.12	---	---	13
		01/13/16	2 - 3	FD	---	---	---	9.3	ND (0.1)	---	---	---
		01/13/16	5 - 6	N	---	---	---	47	0.16	---	---	35
		01/13/16	9 - 10	N	---	---	---	2.2	ND (0.1)	---	---	---

TABLE E-3

Constituent Concentrations
AOC 9 – Southeast Fence Line
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	**Potential Action Area**	**Date**	**Depth (ft bgs)**	**Sample Type**	**Chromium, Hexavalent**	**Chromium, total**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Zinc**	**a TEQ Human b TEQ Mammal**
AOC9-21		01/08/17	0 - 0.5	N	---	34	11	3.8	ND (0.1)	ND (1)	47 J	110
		01/08/17	0 - 0.5	FD	---	33	13	4	ND (0.1)	ND (1.1)	45 J	110
		01/08/17	2 - 3	N	---	48	23	2.7	ND (0.1)	ND (1)	44	0.47
		01/08/17	5 - 6	N	---	57	22	2.4	ND (0.1)	ND (1)	42	ND (0.3)
AOC9-22		01/04/17	0 - 0.5	N	---	30	23	17	ND (0.12)	ND (1.2)	60	28
		01/04/17	2 - 3	N	---	62	27	20	0.17	ND (1)	42	100
		01/04/17 Y	2.5 - 2.6	N	0.79	64	16	5.4	ND (0.14)	ND (1.4)	48	---
		01/04/17	4.5 - 5	N	---	41	13	6.4	ND (0.11)	ND (1.1)	18	4.4
PA-05		11/09/15	0 - 1	N	0.42	27	16	7.4	ND (0.1)	ND (1)	83	---
PA-23		01/27/16	0 - 1	N	0.52	8.9	6.7	5.1	ND (0.11)	ND (1.1)	49	26
#4	AOC9 PAA #1	04/06/00	0 - 3	N	4.2	53.2	12.4	---	---	---	343	---
#5	AOC9 PAA #1	04/06/00	0 - 3	N	2.7	29	13.8	---	---	---	64	---
#6	AOC9 PAA #1	04/06/00	0 - 3	N	2.6	33	12.4	---	---	---	92.7	---
#7	AOC9 PAA #1	04/06/00	0 - 3	N	1.3	32.1	15.3	---	---	---	68	---
#8	AOC9 PAA #1	04/06/00	0 - 3	N	2.8	28.8	12.9	---	---	---	61.1	---
#9	AOC9 PAA #1	04/06/00	0 - 3	N	2.7	92.7	50.4	---	---	---	215	---
#10	AOC9 PAA #1	04/06/00	0 - 3	N	114	398	17.9	---	---	---	744	---
#11		04/06/00	0 - 3	N	---	---	---	---	---	---	80.3	---
#12		04/06/00	0 - 3	N	0.8	38.3	35.6	---	---	---	---	---

TABLE E-3

Constituent Concentrations
AOC 9 – Southeast Fence Line
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Notes:

Results greater than or equal to the Removal Action Goal are circled.

ϴ	white powder sample.
Y	debris sample
---	not analyzed
FD	field duplicate
ft bgs	feet below ground surface
J	concentration or reporting limit estimated by laboratory or data validation
mg/kg	milligrams per kilogram
N	primary sample
ND	not detected at the listed reporting limit
ng/kg	nanogram per kilogram
TEQ	dioxin and furans toxicity equivalent quotient

TABLE E-4
Constituent Concentrations
AOC 10 – East Ravine
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
AOC10-1		10/02/08	0 - 0.5	N	ND (0.401)	6.6	4.9	9.2	ND (0.1)	ND (1)	20	---
		10/02/08	2 - 3	N	ND (0.405)	7.4	5.6	5.8	ND (0.1)	ND (1)	21	---
		10/02/08	5 - 6	N	ND (0.407)	7.5	5.8	5.4	ND (0.1)	ND (1)	20	---
		10/02/08	9 - 10	N	ND (0.406)	6.8	5.7	4.8	ND (0.1)	ND (1)	21	---
AOC10-10		01/22/16	0 - 1	N	0.45	36	15	4.7	ND (0.1)	ND (1)	63	20
		01/22/16	2 - 3	N	ND (0.22)	27	13	2	ND (0.11)	ND (1.1)	41	0.56
		01/22/16	5 - 6	N	0.35	34	13	2.1	ND (0.11)	ND (1.1)	44	0.59
		01/22/16	9 - 10	N	0.35	32	11	2.6	ND (0.11)	ND (1.1)	43	---
		01/22/16	9 - 10	FD	0.39	31	11	2.4	ND (0.11)	ND (1.1)	42	---
AOC10-11		01/22/16	0 - 1	N	0.87	31	9.1	2.7	ND (0.1)	ND (1)	40	18
		01/22/16	0 - 1	FD	0.44	27	14	2.4	ND (0.1)	ND (1)	45	12
		01/22/16	2 - 3	N	0.9	45	13	2.6	ND (0.1)	ND (1)	44	18
		01/22/16	5 - 6	N	1.6	73	31	2.5	ND (0.1)	ND (1)	74	200
		01/22/16	9 - 10	N	0.72	42	19	2.4	ND (0.1)	ND (1)	160	4.1
AOC10-12		01/22/16	0 - 0.5	N	13	460	19	12	ND (0.11)	ND (1)	56	42
		01/22/16	2 - 3	N	0.3	25	9	3.6	ND (0.1)	1.4	34	19
		01/22/16	5 - 6	N	5	130	11	6	ND (0.1)	ND (1)	70	19
		01/22/16	9 - 10	N	0.66	37	16	2.5	ND (0.11)	ND (1)	47	---
AOC10-13		12/03/15	0 - 1	N	ND (0.21)	14	13	9.8	ND (0.11)	1.4	39	---
		12/03/15	0 - 1	FD	ND (0.21)	16	14	10	ND (0.11)	1.4	41	---
AOC10-14		12/03/15	0 - 1	N	ND (0.21)	11	13	5.9	ND (0.1)	1.3	29	---
AOC10-15	AOC10 PAA #3	12/15/15	0 - 1	N	2.6	67	23	21	ND (0.1)	14	98	290
		12/15/15	0 - 1	FD	2.6	70	27	20	ND (0.1)	14	110	270
		12/15/15	2 - 3	N	1.4	41	22	17 J	ND (0.1)	8.2	70 J	110
		12/15/15	5 - 6	N	1.1	33	14	7.6	ND (0.1)	4.2	100	77
		12/15/15	9 - 10	N	ND (0.21)	17	11	1.5	ND (0.1)	ND (1)	44	2.9

TABLE E-4
Constituent Concentrations
AOC 10 – East Ravine
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
AOC10-16		12/15/15	0 - 1	N	0.59	21	8.9	5.9	ND (0.1)	ND (1)	40	1.6
		12/15/15	2 - 3	N	0.24	21	9.7	2.5	ND (0.1)	ND (1)	44	4
		12/15/15	5 - 6	N	0.48	21	12	3.2	ND (0.1)	ND (1)	40	2.6
		12/15/15	9 - 10	N	ND (0.2)	14	9.4	2.4	ND (0.1)	ND (1)	38	1.6
AOC10-17		12/03/15	0 - 1	N	ND (0.21)	9.7	11	9.9	ND (0.1)	7.8	32	---
AOC10-18		12/06/15	0 - 1	N	ND (0.2)	5.6	2.8	1.9	ND (0.1)	ND (1)	13	1.8
		12/06/15	2 - 3	N	ND (0.2)	5.7	4.1	1.9	ND (0.1)	ND (1)	13	1.7
AOC10-19		02/24/16	0 - 1	N	ND (0.2)	27	14	6.7 J	ND (0.1)	ND (1)	48	2.3
		02/24/16	2 - 3	N	0.3	34 J	18	5.8	ND (0.1)	ND (1)	55	4.2
		02/24/16	2 - 3	FD	ND (0.21)	27 J	17	5.8	ND (0.1)	ND (1)	52	---
		02/24/16	5 - 6	N	ND (0.21)	27	17	3.8	ND (0.11)	ND (1)	47	---
AOC10-2		10/02/08	0 - 0.5	N	ND (0.402)	4.9	4.1	5.1	ND (0.1)	ND (1)	14	---
		10/02/08	2 - 3	N	ND (0.417)	17	9.4	3.4	ND (0.1)	ND (1)	38	---
		10/02/08	5 - 6	N	ND (0.415)	19	9.5	4.2	ND (0.1)	ND (2.1)	40	---
		10/02/08	7 - 8	N	ND (0.412)	17	9	3.2	ND (0.1)	ND (1)	32	---
AOC10-20	AOC10 PAA #1	02/17/16	0 - 0.5	N	2,700	2,800	11	6.1	ND (0.1)	ND (1)	38	0.28
		02/25/16	2 - 3	N	12	28	5	2.8	ND (0.1)	ND (1)	16	0.15
AOC10-21	AOC10 PAA #1	02/25/16	0 - 0.5	N	1.4	270	3,100	920	35	9.4	360	53
		02/25/16	2 - 3	N	0.2	8.1	5	2.9	ND (0.099)	ND (1)	16	0.22
AOC10-22	AOC10 PAA #1	02/17/16	0 - 0.5	N	ND (0.2)	35	14	12	ND (0.1)	ND (1)	50	17
		02/17/16	1 - 2	N	0.91	85	200	38	ND (0.11)	2.7	39	48
		02/17/16	2 - 3	N	0.37	35	42	17	ND (0.1)	ND (1)	35	25
		02/17/16	5 - 6	N	ND (0.2)	8.6	5.1	3.4	ND (0.1)	ND (1)	18	0.28
AOC10-23	AOC10 PAA #1	02/25/16	0 - 1	N	1.8	72	140	30	0.24	ND (1)	26	1,100
		02/25/16	1 - 2	N	2.6	130	22	22	ND (0.1)	ND (1)	56	8.8
		02/25/16	2 - 3	N	ND (0.2)	5.5	4.2	2.2	ND (0.1)	ND (1)	11	17

TABLE E-4

Constituent Concentrations
AOC 10 – East Ravine
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	**Potential Action Area**	**Date**	**Depth (ft bgs)**	**Sample Type**	**Chromium, Hexavalent**	**Chromium, total**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Zinc**	**a TEQ Human b TEQ Mammal**
AOC10-24	AOC10 PAA #4	03/07/16	0 - 1	N	---	---	---	---	---	---	---	21
		03/07/16	2 - 3	N	---	---	---	---	---	---	---	190
AOC10-25		01/08/17	0 - 0.5	N	ND (0.2)	15	8	7.9 J	ND (0.1)	ND (1)	32	0.96
		01/08/17	0 - 0.5	FD	ND (0.2)	18	9.5	11 J	ND (0.1)	ND (1)	38	4.3
		01/08/17	2 - 3	N	ND (0.2)	31	11	2.1 J	ND (0.1)	1.4	41	ND (0.35)
		01/08/17	5 - 6	N	ND (0.2)	25	11	1.5	ND (0.1)	ND (1)	45	0.6
		01/08/17	9 - 10	N	ND (0.2)	26	13	1.5	ND (0.1)	ND (1)	42	0.28
AOC10-26	AOC10 PAA #4	02/21/17	0 - 0.5	N	---	---	---	---	---	---	---	9.5
		02/21/17	2 - 3	N	---	---	---	---	---	---	---	80
		02/21/17	2 - 3	FD	---	---	---	---	---	---	---	180
		02/21/17⊖	2.5 - 2.7	N	9.5	340	40	18	0.15	ND (1.4)	110	410
		02/21/17	4.5 - 5	N	---	---	---	---	---	---	---	100
AOC10-27		01/04/17	0 - 0.5	N	---	---	---	---	---	---	---	13
		01/04/17	2 - 3	N	---	---	---	---	---	---	---	13
		01/04/17	4 - 5	N	---	---	---	---	---	---	---	1.7
AOC10-3		09/19/08	0 - 0.5	N	1.91	62	14	7.8	ND (0.1)	ND (2)	40	---
		09/19/08	0 - 0.5	FD	1.7	64	13	7.7	ND (0.1)	ND (2)	41	---
		09/19/08	2 - 3	N	ND (0.412)	43	14	ND (5.1)	ND (0.1)	ND (5.1)	47	---
		09/19/08	5 - 6	N	0.705	37	16	2.9	ND (0.1)	ND (5.1)	61	---
		09/19/08	9 - 10	N	ND (0.412)	28	12	2.8	ND (0.1) J	ND (1)	50	---
AOC10-4		09/19/08	0 - 0.5	N	0.55	33	14	11	ND (0.1)	ND (2)	52	---
		09/19/08	2 - 3	N	ND (0.409)	26	16	4.4	ND (0.1)	ND (2)	38	---
		09/19/08	5 - 6	N	ND (0.418)	27	16	3	ND (0.11)	ND (5.2)	63	---
		09/19/08	9 - 10	N	ND (0.413)	18	12	2.7	ND (0.1) J	ND (1)	48	---

TABLE E-4
Constituent Concentrations
AOC 10 – East Ravine
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
AOC10-5		09/19/08	0 - 0.5	N	1.01	39	27	27	ND (0.1)	ND (5.1)	97	---
		09/19/08	2 - 3	N	0.48	30	21	34	ND (0.1)	ND (5.1)	77	---
		09/19/08	5 - 6	N	ND (0.407)	19	40	6.7	ND (0.1)	ND (5.1)	80	---
		09/19/08	5 - 6	FD	ND (0.407)	18	41	7.3	ND (0.1)	ND (5.1)	79	---
AOC10-6		09/20/08	0 - 0.5	N	ND (0.402)	24	11	26	ND (0.1)	ND (2)	58	5.2
		09/20/08	2 - 3	N	ND (0.404)	23	9.5	4.1	ND (0.1)	ND (1)	45	ND (2.3)
AOC10-7		09/20/08	0 - 0.5	N	ND (0.414)	22	12	8.6	ND (0.1)	ND (1)	54	---
		09/20/08	2 - 3	N	ND (0.406)	27	12	8.1	ND (0.1)	1.1	58	---
		09/20/08	5 - 6	N	ND (0.407)	33	13	4.4	ND (0.1)	ND (2)	58	---
AOC10-8		08/22/08	0 - 0.5	N	ND (0.402)	16	12	15 J	ND (0.1)	ND (2)	87	---
		08/22/08	0 - 0.5	FD	ND (0.416)	18	12	12 J	ND (0.1)	ND (2)	75	---
AOC10-9		12/07/15	0 - 1	N	ND (0.2)	19	12	3.2	ND (0.1)	ND (1)	41	---
		12/07/15	2 - 3	N	ND (0.2)	16	10	2.3	ND (0.1)	ND (1)	49	---
AOC10a-1		10/17/08	0 - 0.5	N	8.25	80	270 J	200 J	0.64	19	1,000 J	---
AOC10a-2		01/13/16	0 - 1	N	ND (0.21)	13	11	9.4	0.12	ND (1.1)	36	17
		01/13/16	2 - 3	N	ND (0.21)	3.6	2.9	2.1	ND (0.1)	ND (1)	10	ND (0.18)
		01/13/16	5 - 6	N	ND (0.21)	3.7	2.6	1.9	ND (0.1)	ND (1)	9.5	---
		01/13/16	9 - 10	N	ND (0.21)	4.6	3.6	2.4	ND (0.11)	ND (1.1)	12	---
AOC10a-3		01/13/16	0 - 1	N	5.3	100	27	4.2	0.13	ND (1)	35	120
		01/13/16	2 - 3	N	1.3	68	25	22	0.21	1.4	70	150
		01/13/16	5 - 6	N	ND (0.21)	45	12	1.7	0.19	ND (1)	34	0.48
		01/13/16	9 - 10	N	ND (0.21)	39	31	2.3	0.16	ND (1)	38	0.36
AOC10a-4		01/08/17	0 - 0.5	N	---	33	30	4	ND (0.11)	ND (1.1)	41	23
		01/08/17	2 - 3	N	---	11	6.3	2.6	ND (0.1)	ND (1)	20	0.33
		01/08/17	5 - 6	N	---	11	6.9	2.5	ND (0.1)	ND (1)	19	---
		01/08/17	9 - 10	N	---	47	14	2.1	ND (0.1)	ND (1)	41	---

TABLE E-4
Constituent Concentrations
AOC 10 – East Ravine
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	**Potential Action Area**	**Date**	**Depth (ft bgs)**	**Sample Type**	**Chromium, Hexavalent**	**Chromium, total**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Zinc**	**a TEQ Human b TEQ Mammal**
AOC10b-1		09/30/08	0 - 0.5	N	0.559	24	9.8	8.6	ND (0.1)	ND (1)	38	24
		09/30/08	2 - 3	N	1.39	63	28	8.4 J	ND (0.1)	ND (1)	110 J	200
		09/30/08	2 - 3	FD	1.39	61	27	12 J	ND (0.1)	1.5	160 J	---
		09/30/08	5 - 6	N	0.425	20	8	4.3	ND (0.1)	ND (1)	39	150
		09/30/08	9 - 10	N	ND (0.407)	29	10	3.7	ND (0.1)	ND (2)	29	---
AOC10b-2		09/30/08	0 - 0.5	N	0.434	29	11	8.2	ND (0.1)	1.1	40	---
		09/30/08	2 - 3	N	1.05	47	15	5.2	ND (0.1)	1.1	44	---
		09/30/08	5 - 6	N	0.453	29	8.8	4.2	ND (0.1)	1	27	---
		09/30/08	9 - 10	N	0.759	39	15	3.8	ND (0.1)	ND (2)	38	---
AOC10b-3		09/30/08	0 - 0.5	N	27.7	820	90	24	ND (0.1)	1.5	240	---
		10/01/08	2 - 3	N	1.82	90	23	5	ND (0.1)	ND (1)	59	---
		10/01/08	5 - 6	N	0.429	38	14	3.8	ND (0.1)	ND (2.1)	40	---
		10/01/08	5 - 6	FD	ND (0.417)	36	16	3.6	ND (0.1)	ND (2.1)	39	---
		10/01/08	9 - 10	N	ND (0.415)	36	13	3.5	ND (0.1)	ND (2.1)	44	---
AOC10b-4		09/30/08	0 - 0.5	N	ND (0.401)	12	5.8	41	ND (0.1)	ND (1)	29	---
		09/30/08	2 - 3	N	ND (0.403)	14	6.7	10	ND (0.1)	ND (1)	31	---
		09/30/08	5 - 6	N	ND (0.407)	20	8.9	3.4	ND (0.1)	ND (1)	35	---
		09/30/08	9 - 10	N	ND (0.415)	26	11	2.8	ND (0.1)	ND (1)	42	---
AOC10c-1		10/01/08	0 - 0.5	N	1.98	55	15	7.8	ND (0.1)	ND (1)	48	---
		10/01/08	2 - 3	N	27.3	490	41	18	ND (0.1)	1.2	76	---
		10/01/08	5 - 6	N	4.78	220	17	5.4	ND (0.1)	ND (2)	42	---
		10/01/08	9 - 10	N	1.37	63	14	3.4	ND (0.1)	1	39	---
AOC10c-2	AOC10 PAA #2	10/01/08	0 - 0.5	N	1.25	51	19	12	ND (0.1)	ND (2)	61	---
		10/01/08	2 - 3	N	3.77	190	37	17	ND (0.1)	2.2	78	---
		10/01/08	2 - 3	FD	3.8	180	34	16	ND (0.1)	1.9	75	---
		10/01/08	5 - 6	N	1.92	110	24	7	ND (0.1)	1.9	51	---
		10/01/08	9 - 10	N	0.605	32	13	2.7	ND (0.1)	ND (1)	50	---

TABLE E-4
Constituent Concentrations
AOC 10 – East Ravine
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
AOC10c-3	AOC10 PAA #2	10/02/08	0 - 0.5	N	2.56	110	42	32	ND (0.1)	ND (2)	140	---
		10/02/08	2 - 3	N	9.27	690	60	31	ND (0.11)	ND (2.1)	140	---
		10/02/08	2 - 3	FD	7.97	660	60	26	ND (0.1)	ND (2.1)	140	---
		10/02/08	5 - 6	N	0.512	29	9	4.5	ND (0.1)	ND (1)	36	---
		10/02/08	9 - 10	N	ND (0.412)	22	11	2.7	ND (0.1)	ND (1)	41	---
AOC10c-4	AOC10 PAA #2	10/01/08	0 - 0.5	N	2.66	120	46	36	ND (0.1)	ND (2.1)	150	360
		10/01/08	2 - 3	N	2.11	90	19	8.9	ND (0.1)	ND (2)	52	66
		10/01/08	5 - 6	N	2.84	27	14	2.6	ND (0.1)	ND (1)	47	3.1
		10/01/08	9 - 10	N	0.436	92	25	13	ND (0.1)	ND (2.1)	74	---
AOC10c-5	AOC10 PAA #2	10/01/08	0 - 0.5	N	2.49	81	29	15	ND (0.1)	ND (2)	80	---
		10/01/08	2 - 3	N	16.4	1,500	110	47	ND (0.1)	2.9	170	---
		10/01/08	5 - 6	N	1.48	82	12	4	ND (0.1)	ND (2.1)	44	---
		10/01/08	9 - 10	N	0.423	47	15	3	ND (0.1)	ND (1)	46	---
AOC10c-6		01/21/16	14 - 15	N	0.54	40	---	---	---	---	---	12
		01/22/16	19 - 20	N	ND (0.21)	31	---	---	---	---	---	---
		01/22/16	29 - 30	N	ND (0.23)	39	---	---	---	---	---	---
		01/22/16	49 - 50	N	ND (0.26)	33	---	---	---	---	---	---
		01/22/16	49 - 50	FD	ND (0.22)	32	---	---	---	---	---	---
		01/22/16	59 - 60	N	ND (0.21)	32	---	---	---	---	---	---
AOC10d-1		09/18/08	0 - 0.5	N	0.644	49	16	8.8	ND (0.1)	ND (2)	58	---
		09/18/08	2 - 3	N	2.86	150	31	6.8	ND (0.1)	ND (2)	76	---
		09/18/08	5 - 6	N	1.06	66	23	5.2	ND (0.11)	ND (5.2)	80	---
		09/18/08	5 - 6	FD	0.703	64	23	5.3	ND (0.1)	ND (5.2)	74	---
		09/18/08	9 - 10	N	ND (0.414)	23	12	3.5	ND (0.1) J	ND (2.1)	58	---

TABLE E-4

Constituent Concentrations
AOC 10 – East Ravine
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	**Potential Action Area**	**Date**	**Depth (ft bgs)**	**Sample Type**	**Chromium, Hexavalent**	**Chromium, total**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Zinc**	**a TEQ Human b TEQ Mammal**
AOC10d-2		09/17/08	0 - 0.5	N	ND (0.403)	22	17	21	ND (0.1)	ND (2)	61	---
		09/17/08	2 - 3	N	1.16	40	14	16	ND (0.1)	ND (2)	54	---
		09/17/08	5 - 6	N	0.597	33	16	6.2	ND (0.1)	ND (5.1)	70	---
		09/17/08	9 - 10	N	ND (0.406)	22	16	3.2	ND (0.1) J	ND (5.1)	73	---
AOC10d-3		09/17/08	0 - 0.5	N	ND (0.406)	20	12	22	ND (0.1)	ND (2)	52	---
		09/18/08	2 - 3	N	1.91	64	18	21	ND (0.1)	ND (2)	61	---
		09/18/08	5 - 6	N	ND (0.407)	30	18	3.3	ND (0.1)	ND (5.1)	60	---
		09/18/08	5 - 6	FD	ND (0.407)	31	18	5.1	ND (0.1)	ND (5.1)	59	---
		09/18/08	9 - 10	N	ND (0.408)	21	11	3.6	ND (0.1) J	ND (2)	56	---
AOC10d-4	AOC10 PAA #4	09/18/08	0 - 0.5	N	0.92	29	25	25	ND (0.1)	ND (5.2)	85	---
		09/18/08	2 - 3	N	3.93	130	27	26	ND (0.11)	ND (2.1)	81	---
		09/18/08	5 - 6	N	ND (0.415)	66	21	17	ND (0.1)	ND (2)	64	---
		09/18/08	9 - 10	N	ND (0.41)	32	16	5.2	ND (0.1) J	ND (5.1)	68	---
AOC10d-9		12/15/15	0 - 1	N	ND (0.2)	20	8.9	20	ND (0.1)	ND (1)	44	1.2
		12/15/15	2 - 3	N	ND (0.21)	20	13	2.4	ND (0.1)	ND (1)	48	0.2
		12/15/15	5 - 6	N	ND (0.21)	27	17	2.3	ND (0.1)	ND (1.1)	49	0.36
		12/15/15	9 - 10	N	ND (0.21)	24	17	2.6	ND (0.1)	ND (1)	54	ND (0.14)
AOC10-OS1		04/06/11	11 - 11.5	N	ND (0.4) J	43	---	---	---	5.9	---	---
AOC10-OS2		04/06/11	5.5 - 6	N	0.78 J	44	---	---	---	5.8	---	---
AOC10-OS4		04/06/11	6.5 - 7	N	ND (0.41) J	170	---	---	---	13	---	---
AOC10-XRF-01		08/25/08	0 - 0.5	N	ND (0.404)	9.2	---	---	---	---	---	---
AOC10-XRF-02		08/25/08	0 - 0.5	N	ND (0.404)	11	---	---	---	---	---	---
AOC10-XRF-03		08/25/08	0 - 0.5	N	ND (0.405)	10	---	---	---	---	---	---
AOC10-XRF-10		09/21/08	3 - 4	N	ND (0.416)	26	---	---	---	---	---	---
DTSC-AOC10d-1		01/18/08⊖	0	N	31.5	652	137	14.3	ND (0.0193)	ND (2.5)	134	---
DTSC-AOC10d-2		01/18/08⊖	0	N	6.03	243	66.5	13.1	ND (0.0192)	ND (4.89)	147	---
DTSC-AOC10d-3		01/18/08⊖	0	N	4.38	224	46.5	12	ND (0.0198)	ND (4.65)	197	---

TABLE E-4
Constituent Concentrations
AOC 10 – East Ravine
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
MW-57BR		01/14/09	3 - 4	N	ND (0.16)	26	11	6.7	ND (0.1)	ND (2)	52	---
		01/14/09	8 - 9	N	ND (0.17)	20	11	2.7	ND (0.1)	1.3	46	---
		01/14/09	8 - 9	FD	ND (0.16)	22	11	2.9	ND (0.1)	1.3	48	---
		01/14/09	18 - 19	N	ND (0.16)	25	12	4.3	ND (0.1)	3	68	---
MW-58BR_S	AOC10 PAA #2	01/29/09	1.5 - 2	N	150	4,000	300	160	0.33	3.5	300	---
		01/29/09	19 - 20	N	0.43	33	24	4	ND (0.11)	ND (2.1)	63	---
		01/29/09	29 - 30	N	ND (0.17)	26	14	3.6	ND (0.11)	ND (2.1)	64	---
		01/29/09	39 - 40	N	0.43	35	17	4.2	ND (0.11)	ND (2.1)	51	---
		01/29/09	49 - 50	N	ND (0.17)	24	17	3.7	ND (0.11)	ND (1.1)	46	---
		01/29/09	59 - 60	N	ND (0.18)	27	58	3.4	ND (0.11)	ND (1.1)	41	---
PA-06		11/09/15	0 - 1	N	0.89	30	15	5.2	ND (0.1)	ND (1)	74	---
PA-18		01/27/16	0 - 1	N	0.28	65	64	47	ND (0.1)	1.4	190	280
		01/26/17	5 - 6	N	---	---	---	---	---	---	---	14
PA-19	AOC10 PAA #1	01/27/16	0 - 1	N	ND (0.46)	34	160	30	ND (0.12)	9.8	550	220
		01/31/17	2 - 3	N	---	---	---	---	---	---	---	0.62
		01/31/17	5 - 6	N	---	---	---	---	---	---	---	0.89
PA-20	AOC10 PAA #1	01/27/16	0 - 1	N	0.82 J	33	11	23	ND (0.1)	ND (1)	84	1,600
		01/31/17	2 - 3	N	---	---	---	---	---	---	---	53
		01/31/17	5 - 6	N	---	---	---	---	---	---	---	130
PA-21	AOC10 PAA #1	01/27/16	0 - 1	N	ND (0.2)	49	26	32	ND (0.1)	1.2	150	580
		01/31/17	2 - 3	N	---	---	---	---	---	---	---	14
		01/31/17	5 - 6	N	---	---	---	---	---	---	---	73
SD-01		01/13/16	0 - 0.5	N	0.24	14	29	7.6	ND (0.1)	ND (1.1)	190	---
		01/13/16	2 - 3	N	ND (0.22)	36	14	3.2	ND (0.11)	ND (1.1)	41	---
		01/13/16	5 - 6	N	ND (0.22)	49	15	2.5	ND (0.11)	ND (1.1)	43	---
		01/13/16	9 - 10	N	ND (0.21)	40	12	1.9	ND (0.11)	ND (1.1)	40	---

TABLE E-4
Constituent Concentrations
AOC 10 – East Ravine
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	**Potential Action Area**	**Date**	**Depth (ft bgs)**	**Sample Type**	**Chromium, Hexavalent**	**Chromium, total**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Zinc**	**a TEQ Human b TEQ Mammal**
SD-02	AOC10 PAA #1	11/10/15	0 - 1	N	0.66	26	16	29	0.17 J	ND (1)	48	---
		11/10/15	2 - 3	N	11	280	590	170	3.2	9.1	300	---
SD-03	AOC10 PAA #1	11/10/15	0 - 1	N	0.28	12	7.3	9.7	ND (0.099)	ND (1)	31	---
		11/10/15	2 - 3	N	ND (0.2)	6.4	3.4	2.5	ND (0.1)	ND (1)	13	---
SD-04	AOC10 PAA #1	11/10/15	0 - 1	N	ND (0.2)	10	5.1	2.7	ND (0.1)	ND (1)	22	---
		11/10/15	2 - 3	N	ND (0.2)	8	4.4	2.5	ND (0.1)	ND (1)	19	---
SD-05		11/10/15	0 - 1	N	ND (0.2)	13 J	9.2	13 J	ND (0.1)	2.5	46	---
		11/10/15	0 - 1	FD	ND (0.2)	19 J	10	37 J	ND (0.1)	1.1	42	---
		11/10/15	2 - 3	N	ND (0.21)	30	12	10	ND (0.1)	ND (1)	41	---
SD-06		11/10/15	0 - 1	N	ND (0.2)	17	9.4	3.9	ND (0.1)	ND (1)	39	---
		11/10/15	2 - 3	N	ND (0.2)	21	10	4.2	ND (0.1)	ND (1)	40	---
		11/10/15	5 - 6	N	ND (0.21)	20	9.5	2.8	ND (0.1)	ND (1)	40	---
SD-21		03/10/16	0 - 1	N	ND (0.2)	21	8.7	2.4	ND (0.1)	ND (1)	44	1.3
		03/10/16	2 - 3	N	0.81	31	10	4.5	ND (0.1)	ND (1)	60	3
SD-22		03/09/16	0 - 1	N	ND (0.21)	22	13	10	ND (0.1)	ND (1)	61	---
		03/09/16	2 - 3	N	ND (0.21)	27	10	4.7	ND (0.1)	ND (1)	49	---
Bank 1		03/07/03	0	N	ND (4)	21.5	13.7	---	---	---	55	---
L-1		02/20/03	0	N	ND (4.1)	88.4	34.8	---	---	---	99.7	---
		02/20/03	2	N	2.5	217	69.6	---	---	---	123	---
L-2	AOC10 PAA #2	02/20/03	0	N	ND (4.7)	86.8	42.7	---	---	---	122	---
		02/20/03	2	N	13	3,360	211	---	---	---	278	---
L-2-2	AOC10 PAA #2	03/05/03	- 2	N	41	1,610	139	---	---	---	203	---
L-2-3	AOC10 PAA #2	03/05/03	- 2	N	99	2,740	288	---	---	---	299	---
L-3		02/20/03	0	N	ND (4.5)	28.4	22.7	---	---	---	74.3	---
		02/20/03	1	N	1.2 J	379	79.7	---	---	---	252	---
		02/20/03	1.5	N	ND (4)	77.7	17.2	---	---	---	61.9	---
L-3-2		03/05/03	0 - 0.5	N	9.4	228	40.5	---	---	---	129	---

TABLE E-4
Constituent Concentrations
AOC 10 – East Ravine
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	**Potential Action Area**	**Date**	**Depth (ft bgs)**	**Sample Type**	**Chromium, Hexavalent**	**Chromium, total**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Zinc**	**a TEQ Human b TEQ Mammal**
PS-21		04/13/99	0	N	0.9	16.5	14.2	---	---	---	43.9	---
		04/13/99	2	N	ND (0.51)	90	12.6	---	---	---	59.1	---
PS-22		04/13/99	0	N	ND (0.5)	24.7	11.4	---	---	---	85.3	---

Notes:

Results greater than or equal to the Removal Action Goal are circled.

⊖	white powder sample.
---	not analyzed
FD	field duplicate
ft bgs	feet below ground surface
J	concentration or reporting limit estimated by laboratory or data validation
mg/kg	milligrams per kilogram
N	primary sample
ND	not detected at the listed reporting limit
ng/kg	nanogram per kilogram
TEQ	dioxin and furans toxicity equivalent quotient

TABLE E-5
Constituent Concentrations
AOC 11 – Topographic Low Areas
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
AOC11-4-OS6		06/11/14	0	N	0.22	18	9.2	7.2	ND (0.1)	ND (1)	39	7.1
AOC11-4-OS5		06/11/14	0	N	ND (0.2)	21	12	6.4	ND (0.1)	ND (1)	43	13
AOC11-4-OS4		06/11/14	0	N	ND (0.2)	16	9.6	3.5	ND (0.1)	ND (1)	40	0.51
AOC11-4-OS3		06/11/14	0	N	ND (0.2)	14	8.6	5.3	ND (0.099)	ND (1)	35	3.3
AOC11-4-OS1		06/11/14	0	N	ND (0.2)	18 J	11 J	4.2 J	ND (0.1)	ND (1) J	47 J	0.44
AOC11-4-OS4		06/11/14	2 - 3	N	ND (0.2)	14	8.6	3.2	ND (0.1)	ND (1)	37	0.38
AOC11-4-OS6		06/11/14	2 - 3	N	ND (0.21)	20	7.7	3.2	ND (0.11)	ND (1.1)	36	1.9
AOC11-4-OS5		06/11/14	2 - 3	N	ND (0.21)	18	9.3	5.4	ND (0.1)	ND (1)	36	17
AOC11-4-OS3		06/11/14	2 - 3	N	0.43	18	7.3	6.4	ND (0.1)	ND (1)	30	11
AOC11-4-OS1		06/11/14	2 - 3	N	ND (0.21)	16	11	3.5	ND (0.11)	ND (1.1)	41	0.51
AOC11-4-OS3		06/11/14	2 - 3	FD	0.43	17	7.7	6.2	ND (0.1)	ND (1)	30	11
AOC11-4-OS4		06/11/14	5 - 6	N	ND (0.21)	17	10	5.5	ND (0.1)	ND (1)	38	2.1
AOC11-4-OS5		06/11/14	5 - 6	FD	ND (0.21)	20	8.9	5.6	ND (0.1)	ND (1)	40	11
AOC11-1		01/05/16	0 - 1	N	ND (0.21)	11	9.7	7.8 J	ND (0.1)	ND (1)	67 J	0.24
		01/05/16	0 - 1	FD	ND (0.21)	11	8.1	5.4 J	ND (0.1)	ND (1)	50 J	---
		01/05/16	2 - 3	N	ND (0.21)	11	9.5	5.2	ND (0.1)	ND (1)	32	ND (0.062)
		01/05/16	5 - 6	N	ND (0.24)	18	8.1	5.3	ND (0.12)	ND (1.2)	38	---
		01/05/16	9 - 10	N	ND (0.28)	15	9.2	6.1	ND (0.14)	ND (1.4)	37	---
AOC11-2		01/05/16	0 - 1	N	ND (0.21)	21	8.7	2.4	ND (0.1)	ND (1)	51	0.39
		01/05/16	2 - 3	N	ND (0.21)	21	10	1.9	ND (0.1)	ND (1)	44	0.15
		01/05/16	5 - 6	N	ND (0.21)	30	12	2.2	ND (0.1)	ND (1)	45	0.09
		01/05/16	9 - 10	N	ND (0.21)	23 J	9.4	1.8	ND (0.11)	ND (1)	45	ND (0.084)
		01/05/16	9 - 10	FD	ND (0.21)	17 J	12	2.7	ND (0.1)	ND (1)	46	ND (0.1)
AOC11-3		01/05/16	0 - 1	N	ND (0.2)	15	8	2.6	ND (0.1)	ND (1)	31	3.1
		01/05/16	2 - 3	N	ND (0.21)	20	10	2.3	ND (0.1)	ND (1)	43	0.2
		01/05/16	5 - 6	N	ND (0.21)	20	11	2.4	ND (0.1)	ND (1)	38	1.6
		01/05/16	9 - 10	N	ND (0.21)	23	10	2.2	ND (0.11)	ND (1.1)	45	0.36
		01/05/16	9 - 10	FD	ND (0.21)	14	7.7	1.8	ND (0.1)	ND (1.1)	34	0.23

TABLE E-5
Constituent Concentrations
AOC 11 – Topographic Low Areas
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
AOC11-4		01/05/16	0 - 1	N	ND (0.2)	25	9.1	4.1	ND (0.1)	1.3	33	1.2
		01/05/16	2 - 3	N	1	16	9	4.1	ND (0.1)	ND (1)	33	2.6
AOC11-5		02/03/16	0 - 0.5	N	ND (0.25) J	27	22	14	ND (0.13)	ND (1.2)	70	30
		02/03/16	2 - 3	N	ND (0.21) J	18	8.9	1.7	ND (0.11)	ND (1.1)	46	0.74
		02/03/16	5 - 6	N	ND (0.21) J	25	10	1.7	ND (0.1)	ND (1)	48	0.23
		02/03/16	9 - 10	N	ND (0.2) J	21	9.3	2	ND (0.1)	ND (1)	56	2
AOC11-6		01/06/16	0 - 1	N	ND (0.22)	20	12	21	ND (0.11)	1.7	67	0.74
		01/06/16	2 - 3	N	ND (0.2)	20	9.5	24	ND (0.1)	ND (1)	62	0.46
		01/06/16	5 - 6	N	ND (0.21)	25	10	2.4	ND (0.1)	ND (1)	59	---
		01/06/16	9 - 10	N	ND (0.21)	14	9.1	6.1	ND (0.1)	ND (1)	79	---
AOC11-7		01/06/16	0 - 1	N	ND (0.22)	11	8	220	ND (0.11)	ND (1.1)	40	3.3
		01/06/16	2 - 3	N	0.52	15	11	30	ND (0.1)	ND (1)	70	0.84
		01/06/16	5 - 6	N	ND (0.2)	15	7.5	8.5	ND (0.1)	ND (1)	79	---
AOC11-8		12/06/15	0 - 1	N	ND (0.2)	12	9.3	26	ND (0.1)	ND (1)	43	0.91
		12/06/15	2 - 3	N	ND (0.2)	9.6	8.1	28	ND (0.1)	ND (1)	45	0.63
AOC11-9		12/06/15	0 - 1	N	ND (0.2)	9.6	7.5	23	ND (0.1)	ND (1)	61	1.1
		12/06/15	2 - 3	N	ND (0.2)	11	8.6	13	ND (0.1)	ND (1)	63	0.32
AOC11a-1		09/21/08	0 - 0.5	N	ND (0.403)	19	12	9.9	ND (0.1)	ND (2)	46	---
		09/21/08	2 - 3	N	ND (0.411)	23	14	20	ND (0.1)	ND (2.1)	58	---
		09/21/08	5 - 6	N	ND (0.41)	22	9	4.7	ND (0.1)	ND (1)	44	---
		09/21/08	9 - 10	N	3	19	10	9.2	ND (0.1) J	ND (2)	44	---
AOC11a-2		09/21/08	0 - 0.5	N	0.417	32	20	15	ND (0.11)	ND (2.1)	75	---
		09/21/08	2 - 3	N	ND (0.413)	19	10	7.7	ND (0.11)	ND (2.1)	42	---
		09/21/08	5 - 6	N	ND (0.408)	25	14	3.4	ND (0.1)	ND (2)	56	---
		09/21/08	9 - 10	N	ND (0.412)	19	6.5	2.2	ND (0.1) J	1	47	---

TABLE E-5
Constituent Concentrations
AOC 11 – Topographic Low Areas
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	**Potential Action Area**	**Date**	**Depth (ft bgs)**	**Sample Type**	**Chromium, Hexavalent**	**Chromium, total**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Zinc**	**[a] TEQ Human [b] TEQ Mammal**
AOC11a-3		09/20/08	0 - 0.5	N	ND (0.411)	22	16	13	ND (0.1)	ND (2)	62	42
		09/20/08	2 - 3	N	ND (0.423)	24	14	17	ND (0.1)	2.2	63	25
		09/20/08	2 - 3	FD	ND (0.418)	24	14	16	ND (0.1)	2.4	61	---
		09/20/08	5 - 6	N	0.634	76	15	25	ND (0.1)	ND (2.1)	75	150
		09/20/08	9 - 10	N	ND (0.407)	23	11	2.9	ND (0.1) J	1.1	48	0.4
AOC11a-4		09/20/08	0 - 0.5	N	ND (0.409)	25	18	17	ND (0.1)	ND (2)	79	---
		09/20/08	2 - 3	N	ND (0.41)	27	13	8	ND (0.1)	ND (2)	52	---
		09/20/08	5 - 6	N	ND (0.407) J	25	11	3.7	ND (0.1)	ND (2)	54	---
		09/20/08	9 - 10	N	ND (0.41)	27	14	3.5	ND (0.1) J	ND (2)	59	---
AOC11a-5		09/21/08	0 - 0.5	N	0.652	32	17	14	ND (0.1)	ND (2.1)	71	72
		09/21/08	2 - 3	N	ND (0.412)	30	12	9.4	ND (0.1)	2.5	57	19
		09/21/08	5 - 6	N	ND (0.411)	18	9.2	3	ND (0.1)	1.5	53	0.24
		09/21/08	5 - 6	FD	ND (0.412)	18	9.6	3.1	ND (0.1)	1.6	51	---
		09/21/08	9 - 10	N	ND (0.415)	24	9.8	3.1	ND (0.1) J	2.5	62	ND (0.68)
AOC11a-SS-1		09/21/08	0 - 0.5	N	ND (0.402)	13	9.4	5.6	ND (0.1) J	1.1	54	0.63
		09/21/08	2 - 3	N	ND (0.404)	19	8.9	6	ND (0.1) J	ND (2)	48	2.5
		09/21/08	5 - 6	N	ND (0.408)	16	7.6	3	ND (0.1) J	ND (1)	42	0.26
		09/21/08	9 - 10	N	ND (0.414)	13	7	3	ND (0.1) J	ND (1)	40	---
AOC11a-SS-2		09/21/08	0 - 0.5	N	ND (0.414)	15	8.1	7.1	ND (0.1) J	ND (1)	42	---
		09/21/08	2 - 3	N	ND (0.402)	19	15	5.9	ND (0.1) J	ND (1)	53	---
AOC11a-SS-3		09/20/08	0 - 0.5	N	0.622	29	17	16	ND (0.1) J	ND (2)	73	53
		09/20/08	2 - 3	N	ND (0.409)	27	15	5.7	ND (0.1) J	ND (2)	57	---
		09/20/08	5 - 6	N	ND (0.412)	19	9.5	3.7	ND (0.1) J	1.1	46	0.28
		09/20/08	9 - 10	N	ND (0.413)	24	11	3	ND (0.1) J	1.4	48	---

TABLE E-5
Constituent Concentrations
AOC 11 – Topographic Low Areas
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
AOC11b-1		09/17/08	0 - 0.5	N	ND (0.402)	27	16	25	ND (0.1)	ND (5)	71	0.36
		09/17/08	0 - 0.5	FD	0.553	25	15	12	ND (0.1)	ND (5)	68	---
		09/17/08	2 - 3	N	ND (0.404)	17	7	8.2	ND (0.1)	ND (2)	28	2.7
		09/17/08	5 - 6	N	ND (0.411)	21	15	22	ND (0.1)	ND (2)	72	3.8
		09/17/08	9 - 10	N	ND (0.411)	20	13	13	ND (0.1) J	ND (2.1)	65	---
AOC11b-2		09/17/08	0 - 0.5	N	0.645	21	13	45	ND (0.1)	ND (2)	76	---
		09/17/08	2 - 3	N	ND (0.41)	32	15	7.6	ND (0.1)	ND (5.1)	74	---
		09/17/08	5 - 6	N	ND (0.411)	24	14	5.9	ND (0.1)	ND (5.1)	75	---
		09/17/08	9 - 10	N	ND (0.407)	24	15	8.2	ND (0.1) J	ND (5.1)	86	---
AOC11c-1		09/21/08	0 - 0.5	N	ND (0.4)	26	9.7	30	ND (0.098)	2.7	47	---
		09/22/08	2 - 3	N	2.03	64	20	26	ND (0.11)	2.1	110	---
		09/22/08	2 - 3	FD	1.47	63	19	25	ND (0.11)	2.3	110	---
		09/22/08	5 - 6	N	2.03	64	20	24	ND (0.1)	ND (2.1)	110	---
		09/22/08	9 - 10	N	3.33	130	17	11	ND (0.1) J	ND (2)	62	---
AOC11c-2		09/21/08	0 - 0.5	N	0.744	26	12	11	ND (0.1)	ND (2)	52	---
		09/22/08	2 - 3	N	2.74	81	21	28	ND (0.11)	2.7	130	---
		09/22/08	5 - 6	N	1.3	56	16	18	ND (0.11)	ND (2.1)	93	---
		09/22/08	9 - 10	N	2.05	70	16	10	ND (0.1) J	ND (2)	70	---
AOC11C-3		02/03/16	14 - 15	N	0.67 J	18	8.4	2.2	ND (0.1)	ND (1.1)	42	---
		02/03/16	19 - 20	N	ND (0.21) J	17	9.7	1.6	ND (0.1)	ND (1)	42	---
		02/03/16	29 - 30	N	ND (0.2) J	27	14	ND (1)	ND (0.1)	ND (1)	39	---

TABLE E-5
Constituent Concentrations
AOC 11 – Topographic Low Areas
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
AOC11c-4		01/28/16	0 - 1	N	0.38	16	7.4	3.1	ND (0.1)	ND (1)	31	18
		01/28/16	2 - 3	N	ND (0.2)	12	9.2	1.8	ND (0.1)	ND (1)	34	0.93
		01/28/16	5 - 6	N	ND (0.2)	13	8.9	2.5	ND (0.1)	ND (1)	62	1.6
		01/28/16	9 - 10	N	ND (0.2)	18	8.4	1.7	ND (0.1)	ND (1)	67	---
		01/28/16	9 - 10	FD	ND (0.2)	16	7.7	1.5	ND (0.1)	ND (1)	63	---
		02/02/16	14 - 15	N	0.25	21	7.8	ND (1)	ND (0.1)	ND (1)	38	---
		02/02/16	19 - 20	N	ND (0.2)	17	8.1	1.1	ND (0.1)	ND (1)	37	---
AOC11c-SS-1		09/21/08	0 - 0.5	N	ND (0.401)	12	5.2	6.8	ND (0.1) J	ND (1)	23	---
		09/22/08	2 - 3	N	ND (0.403)	16	11	5.5	ND (0.1) J	ND (1)	30	---
		09/22/08	5 - 6	N	1.14	37	13	11	ND (0.1) J	2.9	57	---
		09/22/08	9 - 10	N	ND (0.408)	19	6.2	5	ND (0.1) J	ND (2)	31	---
AOC11c-SS-2		09/22/08	0 - 0.5	N	ND (0.401)	14	4.9	8	ND (0.1) J	ND (1)	25	---
		09/22/08	2 - 3	N	ND (0.402)	16	4.9	6.5	ND (0.1) J	ND (1)	30	---
		09/22/08	5 - 6	N	7.78	32	11	8.9	ND (0.1) J	ND (1)	54	---
		09/22/08	9 - 10	N	2.06	73	30	8.6	ND (0.1) J	ND (1)	290	---
AOC11d-1		09/23/08	0 - 0.5	N	0.677	31	19	16	ND (0.1)	ND (2.1)	73	7.2
		09/23/08	0 - 0.5	FD	0.628	33	20	14	ND (0.1)	ND (2)	76	---
		09/23/08	2.5 - 3	N	ND (0.414)	24	12	4.8	ND (0.1)	1.2	48	0.63
		09/23/08	5 - 6	N	ND (0.416)	29	12	5	ND (0.1)	ND (2.1)	52	0.36
		09/23/08	9 - 10	N	0.659	28	11	9.3	ND (0.1) J	ND (2.1)	49	---
AOC11e-1	AOC11 PAA #1	09/23/08	0 - 0.5	N	0.959	43	10	10	ND (0.098)	ND (2)	54	160
		09/23/08	2.5 - 3	N	3.19	92	41	9	ND (0.1)	ND (1)	170	3,200
		09/23/08	5.5 - 6	N	0.961	48	17	6.4	ND (0.1)	ND (1)	59	---
		09/23/08	9.5 - 10	N	3.2	84	31	13	ND (0.1) J	ND (1)	140	---

TABLE E-5

Constituent Concentrations
AOC 11 – Topographic Low Areas
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
AOC11e-2	AOC11 PAA #1	09/24/08	0 - 0.5	N	1.4	37	12	28	ND (0.1)	1.1	160	120
		09/24/08	2 - 3	N	3.78	130	19	11	ND (0.099)	2.6	130	700
		09/24/08	2 - 3	FD	3.51	130	18	11	ND (0.11)	2.9	120	---
		09/24/08	5 - 6	N	2.25	98	30	9.6	ND (0.1)	1.3	150	1,800
		09/24/08	9 - 10	N	ND (0.436)	36	19	4.6	ND (0.11) J	ND (2.1)	53	450
AOC11e-3		01/08/16	0 - 1	N	2.3 J	16	6.3	5.9	ND (0.1)	ND (1)	24	7.8
		01/08/16	0 - 1	FD	0.44 J	17	6.5	5.5	ND (0.1)	ND (1)	27	---
		01/10/16	2 - 3	N	ND (0.2)	11	6.7	3.6	ND (0.1)	ND (1)	21	3.3
		01/10/16	5 - 6	N	ND (0.22)	19	7.5	4.5	ND (0.11)	ND (1.1)	29	1.6
		01/10/16	9 - 10	N	ND (0.21)	12	6.9	4.4	ND (0.1)	ND (1)	25	2.5
		01/10/16	13 - 14	N	ND (0.2)	11	5.9	3.3	ND (0.1)	ND (1)	35	---
AOC11e-4	AOC11 PAA #1	01/28/16	0 - 1	N	1.2	16	7.4	4.3	ND (0.1)	ND (1)	33	14
		01/28/16	2 - 3	N	2.1	32	9	7	ND (0.1)	ND (1)	42	940
		01/28/16	5 - 6	N	0.74	27	22	3.5	ND (0.1)	ND (1.1)	76	250
		01/28/16	14 - 15	N	ND (0.2)	17	22	1.7	ND (0.1)	ND (1)	35	---
AOC11e-5	AOC11 PAA #1	01/19/16	14 - 15	N	ND (0.21)	34 J	21 J	2	ND (0.11)	ND (1.1)	48 J	---
		01/19/16	19 - 20	N	ND (0.21)	40	16	2.4	ND (0.1)	1.5	38	---
		01/19/16	29 - 30	N	ND (0.21)	18	11	1.7	ND (0.1)	ND (1.1)	34	---
		01/19/16	39 - 40	N	ND (0.21)	30	8.3	2	ND (0.11)	ND (1.1)	38	---
		01/20/16	49 - 50	N	ND (0.21)	17	11	1.4	ND (0.1)	ND (1)	36	---
		01/21/16	59 - 60	N	ND (0.21)	25	12	2	ND (0.1)	ND (1.1)	45	---
		01/21/16	69 - 70	N	ND (0.22)	24	12	2.8	ND (0.11)	ND (1.1)	47	---
AOC11e-6		12/03/15	0 - 1	N	16	320	12	8.4	ND (0.1)	1.6	37	4.5
AOC11e-SS-1		09/23/08	0 - 0.5	N	0.698	20	8.7	8.6	ND (0.1) J	ND (1)	35 J	---
		09/23/08	2.5 - 3	N	ND (0.411)	21	7.7	4.8	ND (0.1) J	ND (1)	27	---
		09/23/08	5.5 - 6	N	ND (0.407)	9.2	5.1	5.2	ND (0.1) J	ND (1)	20	---
		09/23/08	9.5 - 10	N	ND (0.407)	10	10	5.4	ND (0.1) J	ND (1)	19	---

TABLE E-5
Constituent Concentrations
AOC 11 – Topographic Low Areas
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
AOC11e-SS-2		09/23/08	0 - 0.5	N	1.38	28	8.1	9.5	ND (0.1) J	ND (1)	39	---
		09/23/08	2.5 - 3	N	0.438	21	9.7	7.4	ND (0.1) J	ND (2)	35	---
		09/23/08	5.5 - 6	N	0.466	26	10	5.1	ND (0.1) J	ND (1)	39	---
		09/23/08	5.5 - 6	FD	0.437	27	9.6	5.5	ND (0.1) J	ND (1)	37	---
		09/23/08	9.5 - 10	N	0.5	21	11	3.8	ND (0.11) J	ND (1.1)	37	---
AOC11g-OS1		04/06/11	8.5 - 9	N	ND (0.4) J	26	11	4.1	ND (0.1) J	7.1	61	---
PA-07		11/09/15	0 - 1	N	1.9	66	19	17	ND (0.1)	1.3	170	---
PA-09		01/27/16	0 - 1	N	ND (0.2)	21	13	150	0.18	ND (1)	130	15
PA-10		01/27/16	0 - 1	N	0.95	40	24	56	ND (0.1)	ND (1)	190	140
		01/26/17	2 - 3	N	---	---	---	---	---	---	---	0.38
		01/26/17	5 - 6	N	---	---	---	---	---	---	---	0.38
PA-11		01/27/16	0 - 1	N	0.35	63	23	28	ND (0.1)	3.3	300	120
		01/25/17	2 - 3	N	---	10	7.1	4.7	ND (0.1)	ND (1)	29	2.1
		01/25/17	2 - 3	FD	---	10	6.9	3.7	ND (0.1)	ND (1)	24	---
		01/25/17	5 - 6	N	---	---	---	---	---	---	---	82
PA-12		01/27/16	0 - 1	N	0.56	50	31	12	ND (0.1)	3.1	130	520
		01/25/17	2 - 3	N	---	13	9.7	5.7	ND (0.1)	ND (1)	37 J	1.7
		01/25/17	5 - 6	N	---	---	---	---	---	---	---	10
SD-08		11/11/15	0 - 1	N	ND (0.2)	9.2 J	6	5.3 J	ND (0.1)	ND (1)	31	---
		11/11/15	0 - 1	FD	0.26	12 J	13	6.8 J	ND (0.1)	ND (1)	37	---
		11/11/15	2 - 3	N	2.7	34	35	7.8	ND (0.1)	ND (1)	97	---
SD-09		11/10/15	0 - 1	N	ND (0.21)	11	6.4	3.8	ND (0.11)	ND (1)	25	---
		11/10/15	2 - 3	N	ND (0.21)	11	5.6	3.1	ND (0.1)	ND (1.1)	21	---
		11/10/15	5 - 6	N	ND (0.21)	12	7.1	4.3	ND (0.1)	ND (1.1)	24	---
SD-10		11/10/15	0 - 1	N	ND (0.2)	7.9	6.7	6.1	ND (0.1)	ND (1)	36	---
		11/10/15	2 - 3	N	1.4	27	9	16	0.37	ND (1)	180	---

TABLE E-5
Constituent Concentrations
AOC 11 – Topographic Low Areas
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
SD-11		12/06/15	0 - 0.5	N	ND (0.2)	38	14	22	ND (0.1)	ND (1)	1,100	---
		12/06/15	2 - 3	N	1	21	10	6.2	ND (0.1)	ND (1)	42	---
SD-11A		03/07/16	0 - 1	N	0.51	110	19	20	ND (0.1)	ND (1)	170	140
		03/07/16	2 - 3	N	0.63	90	44	36	ND (0.1)	ND (1)	310	130 JR
		03/07/16	5 - 6	N	0.79	23	11	11	ND (0.1)	ND (1)	88	67
SD-12		11/10/15	0 - 1	N	ND (0.2)	8.1	5.1	7.2	ND (0.1)	ND (1)	38	---
		11/10/15	2 - 3	N	0.51	16	8.9	4.1	ND (0.1)	ND (1)	27	---
SD-13		11/10/15	0 - 1	N	0.92	33	7.8	3.6	ND (0.1)	ND (1)	30	---
		11/10/15	2 - 3	N	0.34	25	9.4	3	ND (0.11)	ND (1.1)	40	---
SD-20		11/11/15	0 - 1	N	0.5	18 J	7.1	5.3	ND (0.1)	ND (1)	48 J	---
		11/11/15	0 - 1	FD	0.61	14 J	7.3	4.6	ND (0.099)	ND (1)	71 J	---
		11/11/15	2 - 3	N	ND (0.2)	8.9	4.3	2.7	ND (0.1)	ND (1)	17	---
SD-23		03/09/16	0 - 1	N	0.27	19	11	5.6	ND (0.11)	ND (1.1)	87	14
		03/09/16	2 - 3	N	ND (0.22)	31	14	3	ND (0.11)	ND (1.1)	39	---
SD-27		02/15/17	2 - 3	N	ND (0.21)	20	9	ND (1)	ND (0.1)	ND (1)	34	0.96
SD-OS37		11/30/16	0 - 0.5	N	0.41	35	21	36	ND (0.1)	ND (1)	92	---
		11/30/16	3 - 3.5	N	0.24	16	9.4	5.4	ND (0.1)	2.7	24	---
		11/30/16	5 - 5.5	N	ND (0.2)	14	7.4	3.3	ND (0.1)	ND (1)	20	---

Notes:

Results greater than or equal to the Removal Action Goal are circled.

---	not analyzed
FD	field duplicate
ft bgs	feet below ground surface
J	concentration or reporting limit estimated by laboratory or data validation
JR	estimated value, one or more input values is "R" qualified
mg/kg	milligrams per kilogram
N	primary sample
ND	not detected at the listed reporting limit
ng/kg	nanogram per kilogram
R	The result has been rejected; identification and/or quantitation could not be verified because critical QC s
TEQ	dioxin and furans toxicity equivalent quotient

TABLE E-6
Constituent Concentrations
AOC 14 – Railroad Debris Area
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	**Potential Action Area**	**Date**	**Depth (ft bgs)**	**Sample Type**	**Chromium, Hexavalent**	**Chromium, total**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Zinc**	**a TEQ Human b TEQ Mammal**
AOC14-1		09/30/08	0 - 0.5	N	0.841	25	11	18	ND (0.1)	ND (2)	70	---
		09/30/08	2 - 3	N	ND (0.412)	25	8.5	8.7	ND (0.1)	ND (2)	47	---
		09/30/08	5 - 6	N	ND (0.412)	27	9.5	2.3	ND (0.1)	1.6	38	---
		09/30/08	9 - 10	N	ND (0.403)	17	8.2	2.7	ND (0.099)	ND (1)	34	---
		09/30/08	14 - 15	N	ND (0.412)	18	12	2.1	ND (0.1)	ND (1)	34	---
AOC14-2		09/30/08	0 - 0.5	N	0.768	28	44	18	ND (0.1)	ND (2)	49	---
		09/30/08	2 - 3	N	1.04	42	ND (21)	7.6	ND (0.11)	ND (11)	34	---
		10/01/08⊖	3 - 3.25	N	2.16	26	ND (23)	ND (1.1)	ND (0.11)	ND (11)	ND (11)	---
		09/30/08	5 - 6	N	1.32	42	19	21	ND (0.11)	ND (5.2)	51	---
		09/30/08	9 - 10	N	ND (0.405)	21	16 J	1.8	ND (0.1)	ND (1)	40	---
		09/30/08	9 - 10	FD	ND (0.404)	21	11 J	1.9	ND (0.1)	ND (1)	41	---
		09/30/08	14 - 15	N	ND (0.407)	15	9.1	2.1	ND (0.1)	ND (1)	35	---
AOC14-3		10/01/08	0 - 0.5	N	ND (0.403)	31	12	8.4	ND (0.1)	1.6	52	---
		10/01/08	2 - 3	N	ND (0.405)	26	13	6.4	ND (0.1)	ND (1)	46	---
		10/01/08	5 - 6	N	0.877	32	11	9	ND (0.1)	2.1	40	---
		10/01/08	9 - 10	N	ND (0.404)	19	7.1	2	ND (0.1)	ND (1)	33	---
		10/01/08	14 - 15	N	ND (0.403)	17	12	2.2	ND (0.1)	ND (1)	32	---
AOC14-4		10/01/08	0 - 0.5	N	ND (0.402)	13	7.3	7.2	ND (0.1)	ND (1)	31	---
		10/01/08	2 - 3	N	ND (0.405)	16	6.2	3.5	ND (0.1)	1.5	23	---
		10/01/08	5 - 6	N	ND (0.403)	16	5.3	3.5	ND (0.1)	1.5	23	---
		10/01/08	9 - 10	N	ND (0.403)	8.2	2.9	2.8	ND (0.1)	1.2	16	---
		10/01/08	9 - 10	FD	ND (0.404)	8.1	2.7	2.9	ND (0.1)	1.2	16	---
		10/01/08	14 - 15	N	ND (0.406)	15	7.9	2.2	ND (0.1)	ND (1)	29	---
AOC14-5		10/02/08	0 - 0.5	N	ND (0.403)	15	9.6	5.3	ND (0.099)	ND (2)	35	---
		10/02/08	2 - 3	N	ND (0.405)	17	16	16	ND (0.1)	ND (2)	46	---
		10/02/08	5 - 6	N	ND (0.404)	15	7.9	2.7	ND (0.099)	ND (1)	35	---
		10/02/08	9 - 10	N	ND (0.403)	15	9.5	2.3	ND (0.1)	ND (1)	35	---
		10/02/08	14 - 15	N	ND (0.406)	16	7.3	2.2	ND (0.1)	ND (1)	30	---

TABLE E-6
Constituent Concentrations
AOC 14 – Railroad Debris Area
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
Location	**Potential Action Area**	**Date**	**Depth (ft bgs)**	**Sample Type**								
AOC14-6		10/02/08	0 - 0.5	N	ND (0.402)	11	6.1	7.4	ND (0.1)	1.2	35	---
		10/02/08	2 - 3	N	ND (0.403)	23	9.5	3.3	ND (0.1)	2.4	37	---
		10/02/08	5 - 6	N	ND (0.405)	18	9.1	2.3	ND (0.099)	ND (1)	35	---
		10/02/08	9 - 10	N	ND (0.406)	18	9.6	2.4	ND (0.1)	ND (1)	39	---
		10/02/08	9 - 10	FD	ND (0.406)	18	9.7	2.3	ND (0.1)	ND (1)	39	---
		10/02/08	14 - 15	N	ND (0.402)	16	7.2	2.2	ND (0.1)	ND (1)	28	---
AOC14-7		10/02/08	0 - 0.5	N	ND (0.404)	15	7.4	6.1	ND (0.099)	ND (1)	31	---
		10/02/08	2 - 3	N	ND (0.405)	13	10	7.1	ND (0.1)	ND (1)	30	---
		10/02/08	5 - 6	N	ND (0.405)	18	10	4.8	ND (0.1)	ND (2)	35	---
		10/02/08	9 - 10	N	ND (0.404)	26	14	2.9	ND (0.1)	ND (1)	46	---
		10/02/08	14 - 15	N	ND (0.401)	25	9.9	3.5	ND (0.1)	2.4	32	---
AOC14-8		10/02/08	0 - 0.5	N	ND (0.403)	12	7.9	6.4	ND (0.099)	ND (2)	30	---
		10/02/08	2 - 3	N	ND (0.406)	15	8.8	6.8	ND (0.1)	ND (2)	31	---
		10/02/08	5 - 6	N	ND (0.404)	18	6.6	2.4	ND (0.1)	ND (1)	39	---
		10/02/08	9 - 10	N	ND (0.404)	19	12	2.7	ND (0.1)	ND (1)	38	---
		10/02/08	9 - 10	FD	ND (0.404)	19	10	3	ND (0.1)	ND (1)	39	---
		10/02/08	14 - 15	N	ND (0.413)	23 J	18	3.7	ND (0.1)	ND (1)	42 J	---
AOC14-9		10/01/08	0 - 0.5	N	ND (0.404)	13	7.6	5.4	ND (0.1)	ND (1)	28	---
		10/01/08	2 - 3	N	ND (0.407)	12	7.2	6	ND (0.1)	ND (2)	29	---
		10/01/08	5 - 6	N	ND (0.4)	9	4.1	2.8	ND (0.1)	ND (1)	13	---
		10/01/08	9 - 10	N	ND (0.405)	15	7.6	3.6	ND (0.1)	ND (1)	29	---
		10/01/08	14 - 15	N	ND (0.406)	13	8.2	5	ND (0.1)	ND (2)	32	---
AOC14-10		10/01/08	0 - 0.5	N	ND (0.401)	10	3.5	3.5	ND (0.1)	ND (1)	14	---
		10/01/08	2 - 3	N	ND (0.401)	11	3.1	2.9	ND (0.1)	ND (1)	14	---
		10/01/08	5 - 6	N	ND (0.403)	12	4.6	3.4	ND (0.1)	ND (1)	17	---
		10/01/08	5 - 6	FD	ND (0.402)	12	4.1	3.1	ND (0.1)	ND (1)	15	---
		10/01/08	9 - 10	N	ND (0.409)	11	7.1	5.9	ND (0.1)	ND (1)	28	---
		10/01/08	14 - 15	N	ND (0.404)	9.8	ND (8.1)	2.6	ND (0.1)	ND (4)	13	---

TABLE E-6

Constituent Concentrations
AOC 14 – Railroad Debris Area
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	a TEQ Human b TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
AOC14-11		10/01/08	5 - 6	N	ND (0.406)	15	7.3	4.2	ND (0.1)	1	28	---
		10/01/08	9 - 10	N	ND (0.405)	18	13	2	ND (0.1)	ND (1)	37	---
		10/01/08	14 - 15	N	ND (0.41)	20	9	3	ND (0.1)	ND (1)	39	---
AOC14-12		09/30/08	5 - 6	N	ND (0.406)	27	8.4	3.2	ND (0.1)	2.4	36	---
		09/30/08	9 - 10	N	ND (0.405)	17	7.7	3	ND (0.1)	ND (1)	37	---
		09/30/08	14 - 15	N	ND (0.401)	20	9.8	2.8	ND (0.1)	1.2	35	---
AOC14-13		09/30/08	5 - 6	N	ND (0.405)	22	11	3.6	ND (0.099)	2	30	---
		09/30/08	9 - 10	N	ND (0.405)	16	7.2	2.1	ND (0.1)	ND (1)	34	---
		09/30/08	14 - 15	N	ND (0.409)	16	11	2.2	ND (0.1)	ND (1)	33	---
		09/30/08	14 - 15	FD	ND (0.409)	16	13	2.4	ND (0.1)	ND (1)	33	---
AOC14-14E		02/18/16	0 - 1	N	0.27	16	11	7.2	ND (0.1)	ND (1)	44	4.6
		02/18/16	2 - 3	N	0.25	30	13	3	ND (0.1)	ND (1)	42	14
		02/18/16	2 - 3	FD	0.35	26	10	3.5	ND (0.1)	ND (1)	43	12
		02/18/16	5 - 5.5	N	0.8	27	9.8	2.1	ND (0.1)	ND (1)	38	32
		02/18/16	6 - 7	N	ND (0.2)	19	9.9	2.1	ND (0.1)	ND (1)	38	2.5
		02/18/16	9 - 10	N	ND (0.2)	20	8	2.6	ND (0.1)	ND (1)	39	6.6
AOC14-14W	AOC14 PAA #1	02/16/16	0 - 1	N	0.33	16	12	15	ND (0.1)	ND (1)	65	3.5
		02/16/16	2 - 3	N	ND (0.2)	13	12	3.4	ND (0.1)	ND (1)	32	1.1
		02/16/16	5 - 5.5	N	6.7	420	170	160	0.22	4.5	310	480
		02/16/16	6 - 7	N	2.7	65	80	70	ND (0.1)	2.8	260	27
		02/16/16	9 - 10	N	0.66	15	9.7	2.6	ND (0.1)	ND (1)	34	6
AOC14-15	AOC14 PAA #1	02/18/16	0 - 1	N	ND (0.2)	14	11	2.2	ND (0.1)	ND (1)	36	3
		02/18/16	2 - 3	N	0.21	16	12	4.6	ND (0.1)	ND (1)	40	6.1
		02/18/16	5 - 6	N	ND (0.2)	11	9.7	3.1	ND (0.1)	ND (1)	34	4.4
		02/18/16	7 - 8	N	ND (0.2)	16	8.9	2.5	ND (0.1)	ND (1)	33	0.59

TABLE E-6
Constituent Concentrations
AOC 14 – Railroad Debris Area
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
AOC14-16E		02/23/16	0 - 1	N	0.26	20	9.6	5.9	ND (0.1)	ND (1)	62	8.2
		02/23/16	2 - 3	N	ND (0.21)	12	9	3	ND (0.1)	ND (1)	33	3.8
		02/23/16	5 - 6	N	0.22	12	6.7	3	ND (0.1)	ND (1)	30	1.3
		02/23/16	9 - 10	N	ND (0.21)	15	9	1.6	ND (0.1)	ND (1)	31	0.13
AOC14-16W	AOC14 PAA #1	02/22/16	0 - 1	N	ND (0.2)	13	7.3	2.7	0.41	ND (1)	27	0.22
		02/22/16	2 - 3	N	20	360	1,300	110	180	63	110	8.2
		02/22/16	5 - 6	N	3	50	100	28	72	14	61	1.3
		02/22/16	7 - 8	N	0.96	23	35	14	17	ND (1)	45	2.3
		02/22/16	9 - 10	N	ND (0.2)	13	8.7	2.3	ND (0.1)	ND (1)	31	0.11
		02/22/16	9 - 10	FD	ND (0.2)	13	7.1	1.6	ND (0.1)	ND (1)	30	0.074
AOC14-17E		02/24/16	9 - 10	N	ND (0.2)	11	7.8	2.7	ND (0.1)	ND (1)	31	0.075
AOC14-17W		02/24/16	0 - 1	N	ND (0.2)	9	4.7	3.9	ND (0.1)	ND (1)	21	0.44
		02/24/16	1 - 2	N	ND (0.2)	12	9.2	8.5	ND (0.1)	ND (1)	26	0.97
		02/24/16	2 - 3	N	ND (0.2)	13	7.7	3.7	ND (0.1)	ND (1)	29	0.4
		02/24/16	5 - 6	N	ND (0.2)	12	10	3.4	ND (0.1)	ND (1)	24	0.096
		02/24/16	9 - 10	N	ND (0.2)	12	8.6	2.6	ND (0.1)	ND (1)	29	0.11
AOC14-18		02/17/16	0 - 1	N	ND (0.2)	14	13	14	ND (0.1)	ND (1)	41	---
		02/17/16	2 - 3	N	ND (0.21)	13	12	3.5	ND (0.1)	ND (1)	34	---
		02/17/16	5 - 6	N	ND (0.21)	13	12	4.4	ND (0.1)	3	36	---
AOC14-19	AOC14 PAA #1	02/17/16	2 - 3	N	ND (0.21)	380 J	1,800	1,600 J	ND (0.1)	16	2,000 J	140
		02/17/16	3 - 4	N	ND (0.21)	13	19	6.3	ND (0.1)	ND (1)	41	1.2
AOC14-20		04/26/17	0 - 0.5	N	ND (0.2)	14	9	5.6	ND (0.1)	ND (1)	37	0.36
		04/26/17	2 - 3	N	ND (0.2)	12	7.1	3.4	ND (0.1)	ND (1)	31	0.29
		04/26/17	5 - 6	N	ND (0.2)	14	11	2.6	ND (0.1)	ND (1)	29	0.4
		04/26/17	8 - 9	N	ND (0.2)	9.9	6.5	1.1	ND (0.1)	ND (1)	24	0.35

TABLE E-6
Constituent Concentrations
AOC 14 – Railroad Debris Area
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
AOC14-21		04/26/17	0 - 0.5	N	ND (0.2)	15	10	11	ND (0.1)	ND (1)	41	0.85
		04/26/17	2 - 3	N	ND (0.2)	15	11	9.4	ND (0.1)	ND (1)	45	2.9
		04/26/17	2 - 3	FD	ND (0.2)	17	12	9.8	ND (0.1)	ND (1)	44	3.2
		04/26/17	5 - 6	N	ND (0.2)	13	40	1.4	ND (0.1)	ND (1)	39	ND (0.19)
		04/26/17	9 - 10	N	ND (0.2)	14	8.1	2	ND (0.1)	ND (1)	30	0.22
AOC14-SS-1	AOC14 PAA #1	10/01/08	0 - 0.5	N	ND (0.405)	15	9.4	7.2	ND (0.1)	ND (1)	34	---
		10/01/08	2 - 3	N	0.456	22	15	11	0.25	ND (2)	32	---
		10/01/08	5 - 6	N	ND (0.406)	18	15	4.8	ND (0.1)	ND (2)	35	---
		10/01/08	9 - 10	N	ND (0.402)	17	7.4	1.6	ND (0.1)	ND (1)	33	---
		10/01/08	14 - 15	N	ND (0.406)	13	9	2.6	ND (0.1)	ND (1)	31	---
AOC14-SS-2		10/01/08	0 - 0.5	N	ND (0.403)	14	8.8	4.8	ND (0.1)	1.1	27	---
		10/01/08	2 - 3	N	ND (0.407)	14	7.6	5.5	ND (0.1)	ND (2)	29	---
		10/01/08	5 - 6	N	ND (0.405)	10	6.5	5.5	ND (0.1)	ND (2)	25	---
		10/01/08	9 - 10	N	ND (0.407)	9.5	6.7	5.3	ND (0.1)	ND (1)	24	---
		10/01/08	14 - 15	N	ND (0.404)	17	9.6	3	ND (0.1)	ND (1)	32	---
		10/01/08	14 - 15	FD	ND (0.405)	18	9.6	3	ND (0.1)	ND (1)	33	---
AOC14-SS-3		10/02/08	0 - 0.5	N	ND (0.401)	17	11	3.8	ND (0.1)	ND (1)	35	---
		10/02/08	2 - 3	N	ND (0.402)	18	9.5	2.7	ND (0.1)	ND (1)	36	---
		10/02/08	5 - 6	N	ND (0.403)	12	6.7	2	ND (0.1)	ND (1)	29	---
		10/02/08	9 - 10	N	ND (0.404)	16	8.4	2.2	ND (0.1)	ND (1)	32	---
		10/02/08	14 - 15	N	ND (0.404)	17	9.5	2.4	ND (0.1)	ND (1)	35	---
AOC14-SS-4		10/02/08	0 - 0.5	N	ND (0.402)	15	8.1	5.1	ND (0.1)	ND (1)	31	---
		10/02/08	2 - 3	N	ND (0.401)	14	6.9	10	ND (0.1)	ND (1)	27	---
		10/02/08	5 - 6	N	ND (0.403)	16	6.4	11	ND (0.1)	1.5	27	---
		10/02/08	9 - 10	N	ND (0.404)	16	11	2.3	ND (0.1)	ND (1)	32	---
		10/02/08	14 - 15	N	ND (0.405)	17	11	3	ND (0.1)	ND (1)	37	---
		10/02/08	14 - 15	FD	ND (0.405)	17	8.5	1.6	ND (0.1)	ND (1)	34	---

TABLE E-6
Constituent Concentrations
AOC 14 – Railroad Debris Area
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
S1-20		11/01/98	3	N	0.7	31.8	15.7	---	---	---	49.4	---
S2-6		11/01/98[⊖]	3	N	12	45.5	1.8	---	---	---	14.5	---
		11/01/98	5	N	1.8	39.9	9.7	---	---	---	35.7	---
S2-62		11/01/98[⊖]	2	N	1	32	4.1	---	---	---	8.4	---
		11/01/98[β]	3	N	---	72.7	22.2	7.9	0.046 J	0.86 J	ND (29.3)	---
		11/01/98	4	N	ND (0.5)	21.9	11.5	---	---	---	39.8	---
S2-130		11/01/98	1	N	ND (0.5)	22.1	10.6	---	---	---	34.5	---
S3-15		11/01/98	2	N	ND (0.5)	13.8	9.4	---	---	---	24.1	---
		11/01/98	4	N	ND (0.5)	12.1	11	---	---	---	29.2	---
S3-72		11/01/98[⊖]	1	N	ND (0.5)	18.7	6.7	---	---	---	27	---
		11/01/98	2	N	ND (0.5)	11.3	8	---	---	---	28.9	---
S3-120		11/01/98	1	N	ND (0.5)	12.1	4.2	---	---	---	18	---
S4-4		11/01/98[⊖]	4	N	15.4	23.4	3.2	---	---	---	1.9	---
		11/01/98	6	N	1	13.7	10.3	---	---	---	32.6	---
S4-95		11/01/98[⊖]	2	N	ND (0.5)	10.3	2.5	---	---	---	4.3	---
		11/01/98	3	N	ND (0.5)	14.9	8.3	---	---	---	27	---
S4-160		11/01/98	2	N	0.5	25	11.8	---	---	---	38.2	---
S8-23		11/01/98[β]	3	N	---	28.7	14.3	12.5	0.092 J	0.42 J	57	---
S8-30		11/01/98	3	N	0.5	12.8	10.8	---	---	---	40.9	---
GS-1		11/01/98[⊖]	0	N	0.59	33.7	2.2	---	---	---	31.3	---
GS-2		11/01/98[⊖]	0	N	ND (0.5)	21.9	8.2	---	---	---	32.7	---
RR-1		02/02/00	0	N	ND (0.5)	23.4	15.6	---	---	---	44	---
RR-2		02/02/00	0	N	ND (0.5)	16.1	13.8	---	---	---	37.5	---
RR-3		02/02/00	0	N	ND (0.5)	18.3	11.6	---	---	---	35	---
RR-4		02/02/00[⊖]	0	N	0.6	19.4	19.2	---	---	---	27.1	---
RR-5		02/02/00	0	N	5.8	39.5	7.1	---	---	---	34.1	---

TABLE E-6
Constituent Concentrations
AOC 14 – Railroad Debris Area
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
RR-6		02/02/00	0	N	4.8	74.9	7.5	---	---	---	243	---
RR-7		02/02/00ϴ	0	N	ND (0.51)	28.6	9.7	---	---	---	35.1	---
RR-8		02/02/00	0	N	ND (0.51)	28.9	9.9	---	---	---	29.8	---
RR-9		02/02/00ϴ	0	N	2.7	19.6	27.9	---	---	---	15.4	---
RR-10		02/02/00	0	N	ND (0.51)	18.8	12.9	---	---	---	36.3	---
RR-11		02/02/00	0	N	ND (0.51)	18.1	20.2	---	---	---	47.5	---
RR-12		02/02/00ϴ	0	N	ND (0.5)	17.5	3.8	---	---	---	11.3	---

Notes:

Results greater than or equal to the Removal Action Goal are circled.

ϴ	white powder sample.
ß	black sandy material
---	not analyzed
FD	field duplicate
ft bgs	feet below ground surface
J	concentration or reporting limit estimated by laboratory or data validation
mg/kg	milligrams per kilogram
N	primary sample
ND	not detected at the listed reporting limit
ng/kg	nanogram per kilogram
TEQ	dioxin and furans toxicity equivalent quotient

TABLE E-7
Constituent Concentrations
AOC 27 – MW-24 Bench
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
				Removal Action Goal (RAG) <2 ft bgs :	3.1	145	145	36	1	22	1,050	a 100
				Removal Action Goal (RAG) 2 to 10 ft bgs :	31	145	145	36	1	22	1,050	b 190
Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human b TEQ Mammal
24soil-01		01/31/08	2.5 - 3	N	ND (0.4)	15	7.2	6.4	ND (0.1)	0.63	16	---
24soil-02		01/31/08	2.5 - 3	N	ND (0.4)	15	9.1	8.7	ND (0.1)	0.7	17	---
AOC27-1		03/18/16	0 - 1	N	0.35	17	11	28	ND (0.1)	ND (1)	37	---
		03/18/16	2 - 3	N	ND (0.2)	11	12	5.4	ND (0.1)	ND (1)	31	0.12
		03/18/16	5 - 6	N	ND (0.2)	17	11	2.9	ND (0.1)	ND (1)	31	---
		03/18/16	9 - 10	N	ND (0.2)	13	8.6	1.9	ND (0.1)	ND (1)	29	---
AOC27-18		03/17/16	0 - 1	N	0.3	15	8.3	5.7	ND (0.1)	ND (1)	26	9.3
		03/17/16	2 - 3	N	0.36	22	9.7	8.4	ND (0.1)	ND (1)	31	7.6
		03/17/16	5 - 6	N	ND (0.21)	11	7.4	6.9	ND (0.1)	ND (1)	27	6.8
		03/17/16	9 - 10	N	1.2	22	6.8	7.1	ND (0.1)	ND (1)	47	---
AOC27-18E		03/17/16	4 - 5	N	ND (0.2)	11	6.6	10	ND (0.1)	ND (1)	250	11
AOC27-2		03/18/16	0 - 1	N	0.2	13	5.6	3.8	ND (0.1)	ND (1)	24	0.84
		03/18/16	2 - 3	N	0.28	16	8.1	5.7	ND (0.1)	ND (1)	24	0.83
		03/18/16	5 - 6	N	ND (0.2)	11	8.5	4.9	ND (0.1)	ND (1)	30	---
		03/18/16	9 - 10	N	ND (0.2)	14	9.3	3.3	ND (0.1)	ND (1)	32	---
AOC27-20		03/01/16	0 - 1	N	ND (0.2)	17	9.2	8.4	ND (0.1)	ND (1)	38	19
		03/01/16	2 - 3	N	ND (0.21)	19	11	4.6	ND (0.1)	ND (1)	42	5.8
		03/01/16	2 - 3	FD	ND (0.21)	18	9.7	3.6	ND (0.11)	ND (1.1)	42	---
		03/01/16	5 - 6	N	0.29	20	27	15	0.13	ND (1)	74	10
		03/01/16	9 - 10	N	ND (0.21)	20	11	2.7	ND (0.1)	ND (1)	41	---
AOC27-24		03/18/16	0 - 1	N	0.36	29	12	6.2	ND (0.1)	ND (1)	37	---
		03/18/16	2 - 3	N	ND (0.2)	19	9.4	3.6	ND (0.1)	ND (1)	33	---
		03/18/16	5 - 6	N	ND (0.2)	14	11	4.1	ND (0.1)	ND (1)	30	---
		03/18/16	9 - 10	N	ND (0.2)	20	14	3	ND (0.1)	ND (1)	34	---

TABLE E-7
Constituent Concentrations
AOC 27 – MW-24 Bench
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

Location	Potential Action Area	Date	Depth (ft bgs)	Sample Type	Chromium, Hexavalent	Chromium, total	Copper	Lead	Mercury	Molybdenum	Zinc	[a] TEQ Human [b] TEQ Mammal
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
Removal Action Goal (RAG) <2 ft bgs :					3.1	145	145	36	1	22	1,050	a 100
Removal Action Goal (RAG) 2 to 10 ft bgs :					31	145	145	36	1	22	1,050	b 190
AOC27-24SW		03/18/16	0 - 1	N	ND (0.2)	15	13	4.3	ND (0.1)	ND (1)	32	---
		03/18/16	2 - 3	N	0.34	17	8.9	7	ND (0.1)	ND (1)	29	---
		03/18/16	5 - 6	N	ND (0.2)	20	11	2.9	ND (0.1)	ND (1)	33	---
		03/18/16	9 - 10	N	ND (0.2)	12	9.3	1.9	ND (0.1)	ND (1)	29	---
AOC27-27		03/02/16	0 - 1	N	ND (0.2)	22	11	5.5	0.12	ND (1)	38	---
		03/02/16	2 - 3	N	ND (0.21)	16	8.2	3.8	0.1	ND (1)	38	---
AOC27-36		03/17/16	0 - 1	N	ND (0.21)	14	11	6	ND (0.1)	ND (1)	59 J	---
		03/17/16	2 - 3	N	ND (0.21)	14	7	4.3	ND (0.11)	ND (1)	24	---
		03/17/16	5 - 6	N	ND (0.22)	16	8.8	3.7	ND (0.11)	ND (1.1)	29	---
		03/17/16	9.6 - 10	N	ND (0.22)	13	11	6.5	ND (0.11)	ND (1.1)	34	---
AOC27-4		03/17/16	0 - 1	N	0.23	16	7.5	7.3	ND (0.1)	ND (1)	31	20
		03/17/16	0 - 1	FD	0.28	16	8.9	6.6	ND (0.1)	ND (1)	31	26
		03/17/16	2 - 3	N	ND (0.2)	13	9.5	5.9	ND (0.1)	ND (1)	27	2.8
		03/17/16	5 - 6	N	ND (0.2)	14	8.1	2	ND (0.099)	ND (1)	28	ND (0.34)
AOC27-5		03/17/16	0 - 1	N	0.31	15	7.6	7	ND (0.1)	ND (1)	48	---
		03/17/16	2 - 3	N	0.48	21	14	38	ND (0.1)	ND (1)	500	18
		03/17/16	5 - 6	N	ND (0.2)	15	9.2	2.4	ND (0.099)	ND (1)	32	0.2
		03/17/16	9 - 10	N	ND (0.2)	13	8.6	2.5	ND (0.1)	ND (1)	33	---
AOC27-50		03/02/16	0 - 1	N	0.3	25	25	73	0.13	ND (1)	250	12
		03/02/16	2 - 3	N	1.3	50 J	100 J	190 J	0.47	4.7 J	330 J	57
		03/02/16	5 - 6	N	ND (0.21)	18	7.9	2.1	0.13	ND (1)	39	0.41
		03/02/16	9 - 10	N	ND (0.21)	18	9.1	2.1	0.12	ND (1)	38	---
AOC27-51		02/17/17	0 - 0.5	N	ND (0.21)	20	36	19	ND (0.1)	ND (1)	1,200	9.2
		02/17/17	2 - 3	N	ND (0.2)	10	7.4	1.4	ND (0.1)	ND (1)	28	0.65
		02/17/17	5 - 6	N	ND (0.2)	13	8.3	ND (1)	ND (0.1)	ND (1)	30	0.15

TABLE E-7
Constituent Concentrations
AOC 27 – MW-24 Bench
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/kg)
		Removal Action Goal (RAG) <2 ft bgs :			3.1	145	145	36	1	22	1,050	a 100
		Removal Action Goal (RAG) 2 to 10 ft bgs :			31	145	145	36	1	22	1,050	b 190
Location	**Potential Action Area**	**Date**	**Depth (ft bgs)**	**Sample Type**	**Chromium, Hexavalent**	**Chromium, total**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Zinc**	**a TEQ Human b TEQ Mammal**
AOC27-6	AOC27 PAA #1	02/29/16	0 - 1	N	0.87 J	43	500	630	0.51	8.3	700	120
		02/29/16	2 - 3	N	4.8	24	76	37	0.26	ND (1)	130	32
		02/29/16	5 - 6	N	ND (0.21)	39	18	51	0.14	ND (1)	92	6.9
AOC27-7	AOC27 PAA #1	02/29/16	0 - 1	N	2.7	150	580	170	0.32	11	420	110
		02/29/16	2 - 3	N	4	290	1,000	570	0.95	26	1,300	230
		03/01/16	5 - 6	N	0.5	16	9.8	2.6	ND (0.1)	ND (1)	38	4.3
AOC27-8	AOC27 PAA #1	03/01/16	1 - 2	N	0.49	20	29	24	0.17	ND (1)	93	33
		03/01/16	5 - 6	N	ND (0.2)	17	15	6.1	ND (0.1)	ND (1)	45	2.8
AOC27-9		03/08/16	0 - 1	N	ND (0.2)	13	8.2	2.5	ND (0.1)	ND (1)	30 J	5.3
		03/08/16	0 - 1	FD	ND (0.2)	14	14	5.9	ND (0.1)	ND (1)	38 J	---
		03/08/16	2 - 3	N	ND (0.2)	14	8.3	3.7	ND (0.1)	ND (1)	35	2
		03/08/16	5 - 6	N	ND (0.2)	15	11	2.7	ND (0.1)	ND (1)	36	1
		03/08/16	9 - 10	N	ND (0.2)	11	7.8	1.6	ND (0.1)	ND (1)	28	---
PA-13		01/27/16	0 - 1	N	0.26	15	12	5.8	ND (0.1)	ND (1)	45	---

Notes:

Results greater than or equal to the Removal Action Goal are circled.

---	not analyzed
FD	field duplicate
ft bgs	feet below ground surface
J	concentration or reporting limit estimated by laboratory or data validation
mg/kg	milligrams per kilogram
N	primary sample
ND	not detected at the listed reporting limit
ng/kg	nanogram per kilogram
TEQ	dioxin and furans toxicity equivalent quotient

Figure E-1a
Hexavalent Chromium
Soil Sample Results
AOC 1 North
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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Figure E-1b

Total Chromium
Soil Sample Results
AOC 1 North
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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Figure E-1c

Copper
Soil Sample Results
AOC 1 North
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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Figure E-1d

Lead
Soil Sample Results
AOC 1 North
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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Figure E-1e

Human and Mammal Dioxins and Furans TEQ
Soil Sample Results
AOC 1 North
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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Figure E-1f

Mercury
Soil Sample Results
AOC 1 North
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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Figure E-1g

Molybdenum
Soil Sample Results
AOC 1 North
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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Figure E-1h

Zinc
Soil Sample Results
AOC 1 North
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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Figure E-2a

Hexavalent Chromium
Soil Sample Results
AOC 1 South and SWMU 1
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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Figure E-2b

Total Chromium
Soil Sample Results
AOC 1 South and SWMU 1
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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Figure E-2c

Copper
Soil Sample Results
AOC 1 South and SWMU 1
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

\\dc1vs01\GISProj\P\PGE\Topock\MapFiles\2021\EECA\SoilResults_AOC1+SWMU1_EECA.mxd

Figure E-2d

Lead
Soil Sample Results
AOC 1 South and SWMU 1
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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Figure E-2e

Human and Mammal Dioxins and Furans TEQ Soil Sample Results
AOC 1 South and SWMU 1
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

\\dc1vs01\GISProj\P\PGE\Topock\MapFiles\2021\EECA\SoilResults_AOC1+SWMU1_EECA.mxd

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Figure E-2f

Mercury
Soil Sample Results
AOC 1 South and SWMU 1
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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Figure E-2g

Molybdenum
Soil Sample Results
AOC 1 South and SWMU 1
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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Figure E-2h

Zinc
Soil Sample Results
AOC 1 South and SWMU 1
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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LEGEND

- Property Boundary
- Area of Concern
- Solid Waste Management Unit
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Topock Compressor Station Fence Line

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >11 to 15 ft bgs
- >16 ft bgs

Factor of Exceedance (FOE)

- ND
- FOE <=1
- 1>FOE<=10

Note:
Topographic contours shown are in 2-foot intervals

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Hexavalent Chromium
Removal Action Goal <2ft 3.1 mg/kg
Removal Action Goal 2 to 10ft 31 mg/kg

N

0 20 40 80 Feet

Figure E-3a
Hexavalent Chromium Soil Sample Results
AOC 4
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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Note:
Topographic contours shown are in 2-foot intervals

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Total Chromium
Removal Action Goal 145 mg/kg

Figure E-3b
Total Chromium
Soil Sample Results
AOC 4
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

\\dc1vs01\GISProj\P\PGE\Topock\MapFiles\2021\EECA\SoilResults_AOC4_EECA.mxd

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LEGEND

- Property Boundary
- Area of Concern
- Solid Waste Management Unit
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Topock Compressor Station Fence Line

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >11 to 15 ft bgs
- >16 ft bgs

Factor of Exceedance (FOE)

- FOE <=1
- 1>FOE<=10

Note:
Topographic contours shown are in 2-foot intervals

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Copper
Removal Action Goal 145 mg/kg

N

0 20 40 80 Feet

Figure E-3c
Copper
Soil Sample Results
AOC 4
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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Figure E-3d
Lead
Soil Sample Results
AOC 4
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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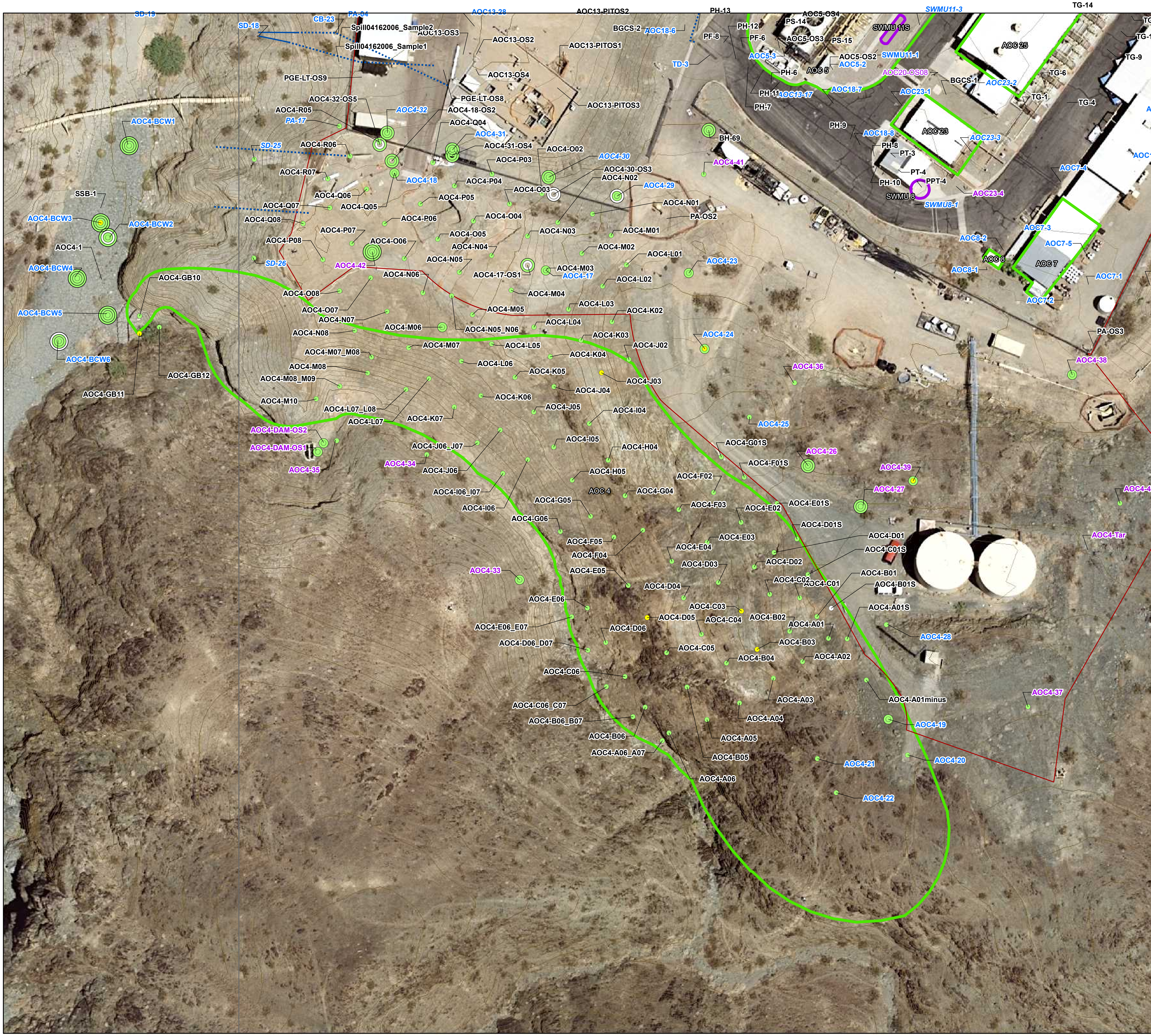

LEGEND

- Property Boundary
- Area of Concern
- Solid Waste Management Unit
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Topock Compressor Station Fence Line

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >11 to 15 ft bgs
- >16 ft bgs

Factor of Exceedance (FOE)

- ND
- FOE <=1
- 1>FOE<=10

Note:
Topographic contours shown are in 2-foot intervals

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Human Dioxins and Furans Toxicity Equivalency Quotient (TEQ)
Removal Action Goal <2ft 100 ng/kg

Mammal Dioxins and Furans Toxicity Equivalency Quotient (TEQ)
Removal Action Goal 2 to 10ft 190 ng/kg

N

0 20 40 80 Feet

Figure E-3e
Human and Mammal Dioxins and Furans TEQ Soil Sample Results
AOC 4
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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JACOBS

LEGEND

- Property Boundary
- Area of Concern
- Solid Waste Management Unit
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Topock Compressor Station Fence Line

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >11 to 15 ft bgs
- >16 ft bgs

Factor of Exceedance (FOE)

- ND
- FOE <=1

Note:
Topographic contours shown are in 2-foot intervals

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Mercury
Removal Action Goal 1 mg/kg

Figure E-3f
Mercury
Soil Sample Results
AOC 4
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

\\dc1vs01\GISProj\P\PGE\Topock\MapFiles\2021\EECA\SoilResults_AOC4_EECA.mxd

JACOBS

LEGEND

- Property Boundary
- Area of Concern
- Solid Waste Management Unit
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Topock Compressor Station Fence Line

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >11 to 15 ft bgs
- >16 ft bgs

Factor of Exceedance (FOE)

- ND
- FOE <=1

Note:
Topographic contours shown are in 2-foot intervals

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Molybdenum
Removal Action Goal 22 mg/kg

N

0 20 40 80 Feet

Figure E-3g
Molybdenum
Soil Sample Results
AOC 4
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

\\dc1vs01\GISProj\P\PGE\Topock\MapFiles\2021\EECA\SoilResults_AOC4_EECA.mxd

JACOBS

LEGEND

- Property Boundary
- Area of Concern
- Solid Waste Management Unit
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Topock Compressor Station Fence Line

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >11 to 15 ft bgs
- >16 ft bgs

Factor of Exceedance (FOE)

- FOE <=1

Note:
Topographic contours shown are in 2-foot intervals

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Zinc
Removal Action Goal 1,050 mg/kg

N

0 20 40 80 Feet

Figure E-3h
Zinc
Soil Sample Results
AOC 4
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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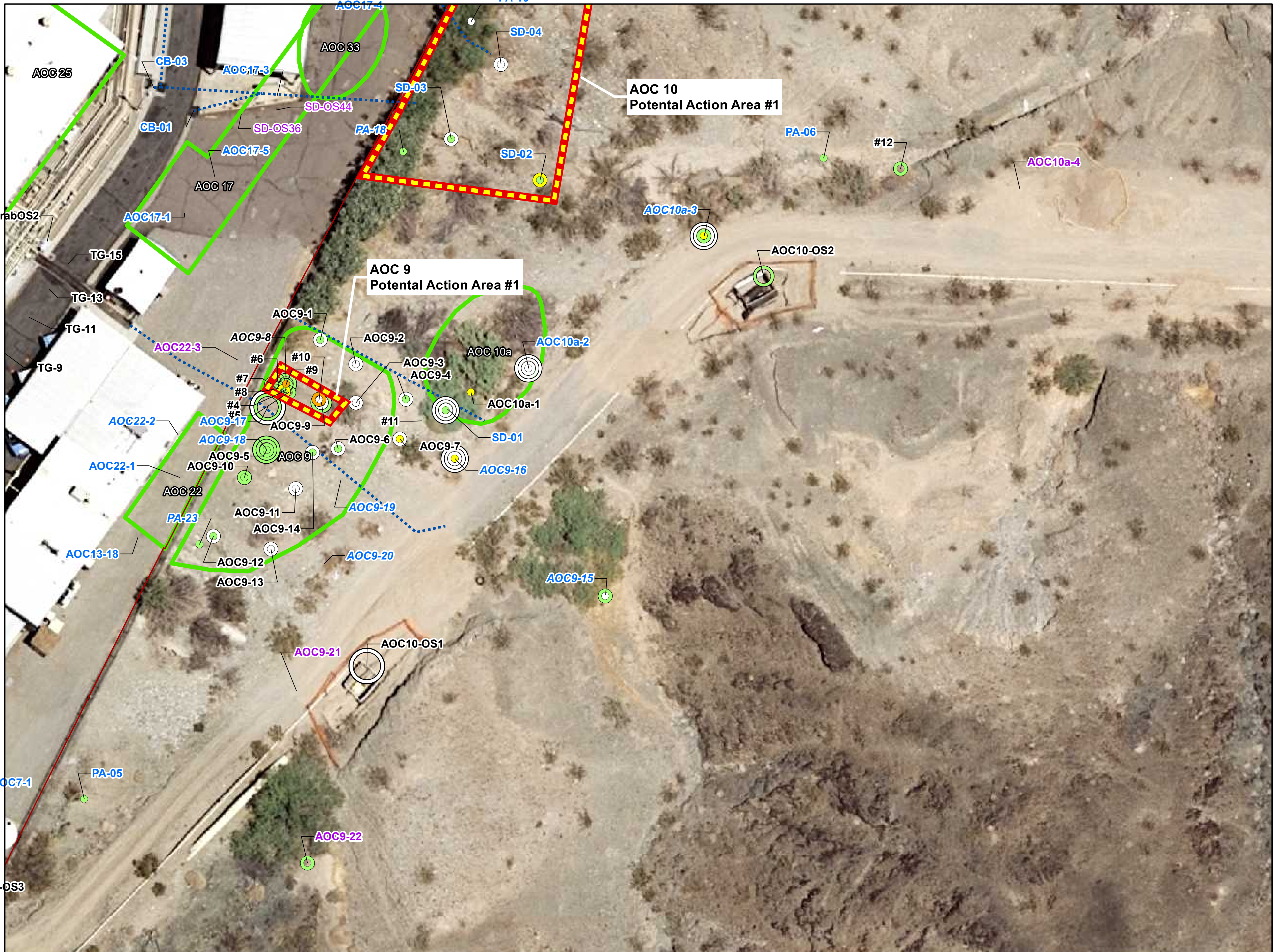
JACOBS



LEGEND

- Property Boundary
- Area of Concern
- Solid Waste Management Unit
- Potential Action Area
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Topock Compressor Station Fence Line

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >10 to 15 ft bgs
- >15 ft bgs

Factor of Exceedance (FOE)

- ND
- FOE <=1
- 1>FOE<=10
- 10>FOE<=100

Note:
Topographic contours shown are in 2-foot intervals

The >15 bgs ring shows the result for the deepest sample collected greater than 15 feet bgs

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Hexavalent Chromium
Removal Action Goal <2ft 3.1 mg/kg
Removal Action Goal 2 to 10ft 31 mg/kg

N

0 15 30 60 Feet

Figure E-4a
Hexavalent Chromium
Soil Sample Results
AOC 9
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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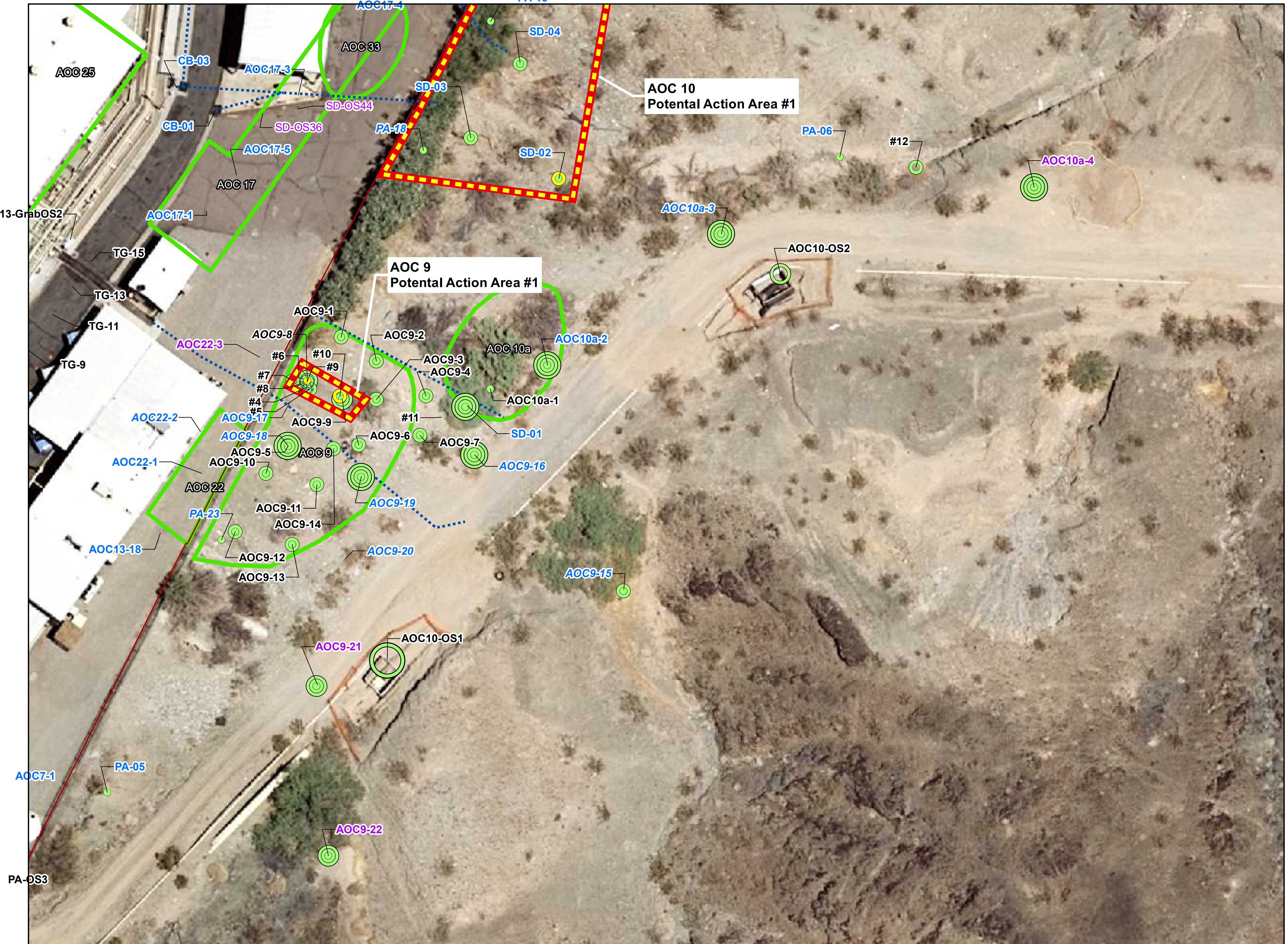

LEGEND

- Property Boundary
- Area of Concern
- Solid Waste Management Unit
- Potential Action Area
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Topock Compressor Station Fence Line

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >10 to 15 ft bgs
- >15 ft bgs

Factor of Exceedance (FOE)

- FOE <=1
- 1>FOE<=10

Note:
Topographic contours shown are in 2-foot intervals

The >15 bgs ring shows the result for the deepest sample collected greater than 15 feet bgs

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Total Chromium
Removal Action Goal 145 mg/kg

Figure E-4b
Total Chromium
Soil Sample Results
AOC 9
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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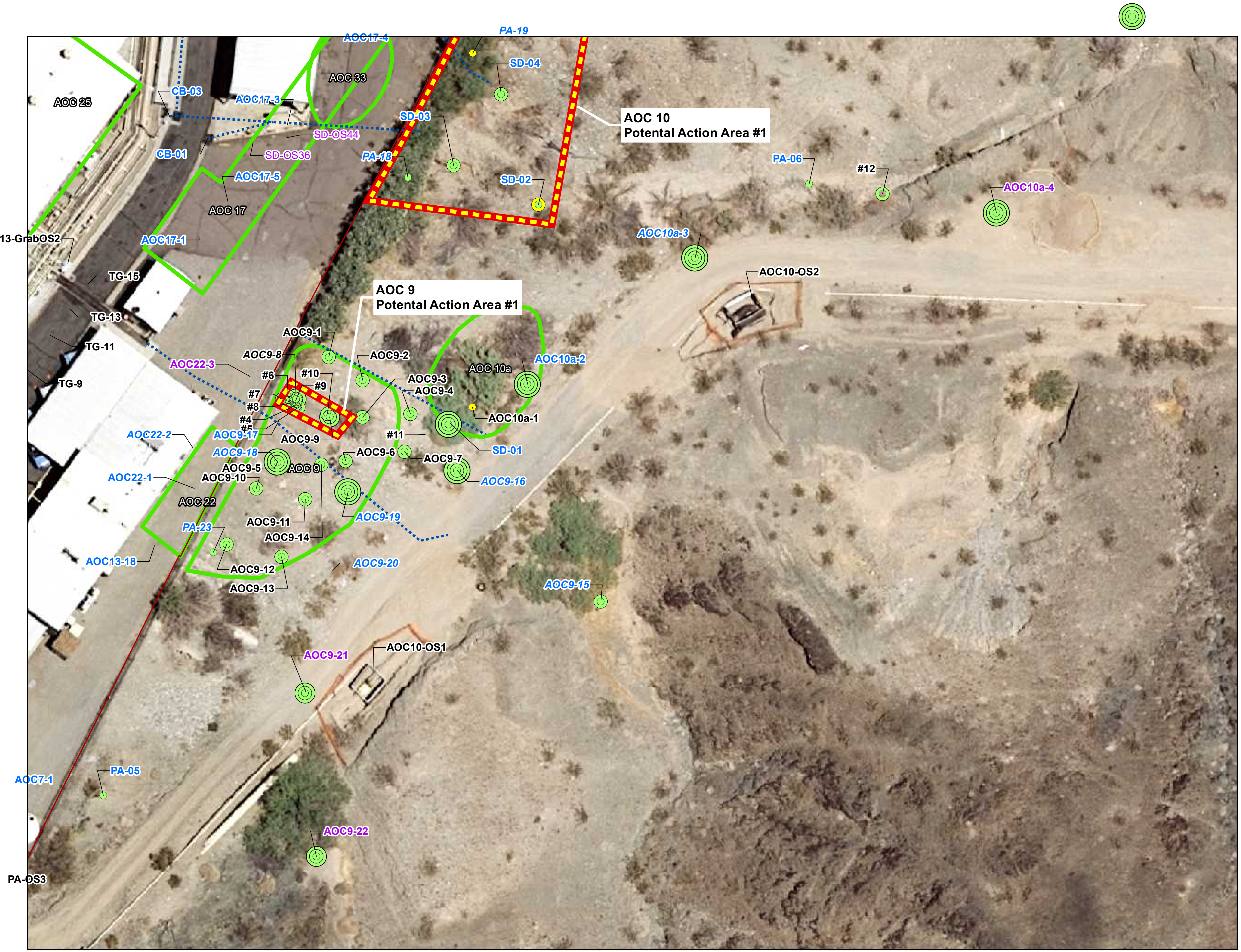

LEGEND

- Property Boundary
- Area of Concern
- Solid Waste Management Unit
- Potential Action Area
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Topock Compressor Station Fence Line

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >10 to 15 ft bgs
- >15 ft bgs

Factor of Exceedance (FOE)

- FOE <=1
- 1>FOE<=10

Note:
Topographic contours shown are in 2-foot intervals

The >15 bgs ring shows the result for the deepest sample collected greater than 15 feet bgs

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Copper
Removal Action Goal 145 mg/kg

N

0 15 30 60 Feet

Figure E-4c
Copper
Soil Sample Results
AOC 9
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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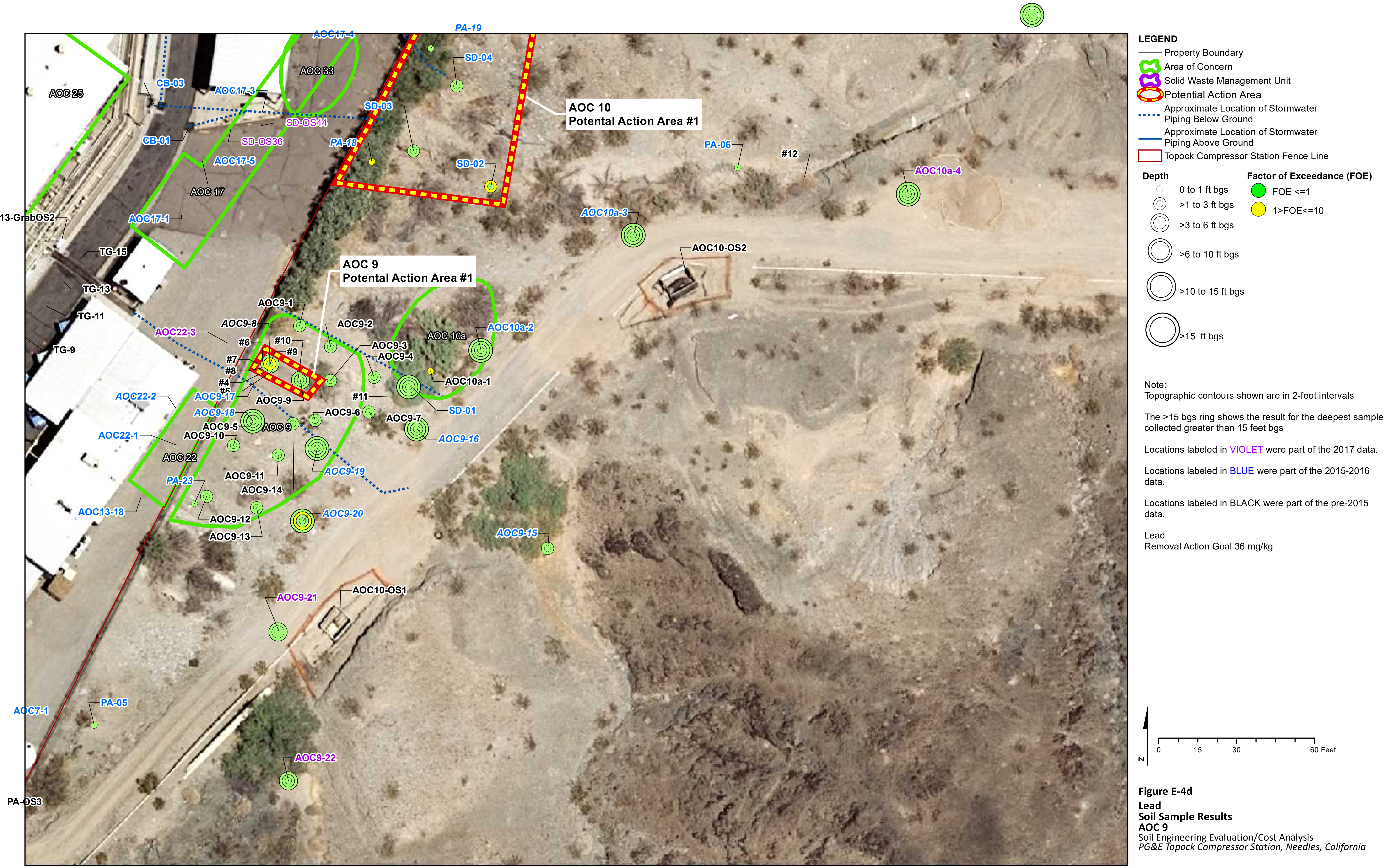

Figure E-4d
Lead
Soil Sample Results
AOC 9
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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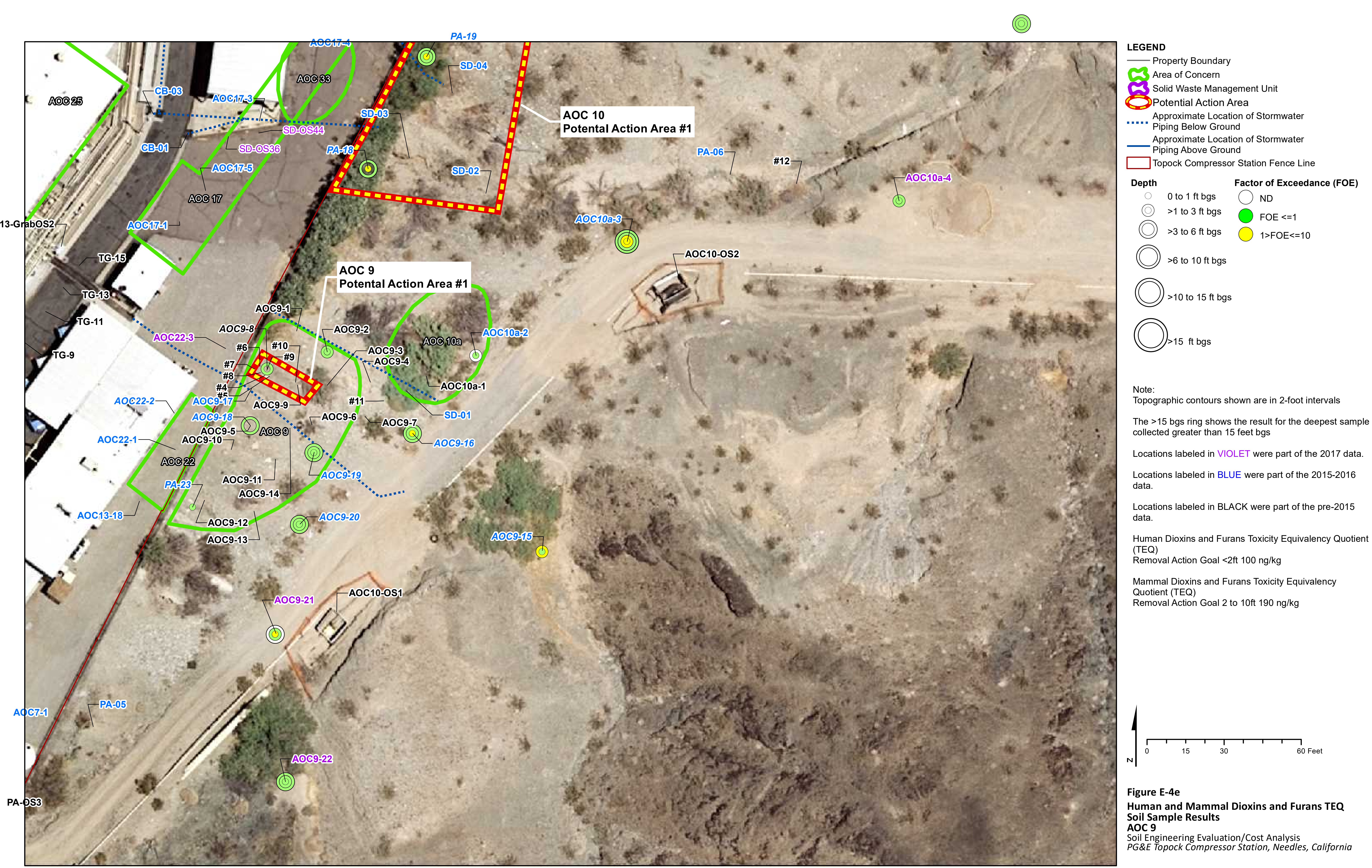
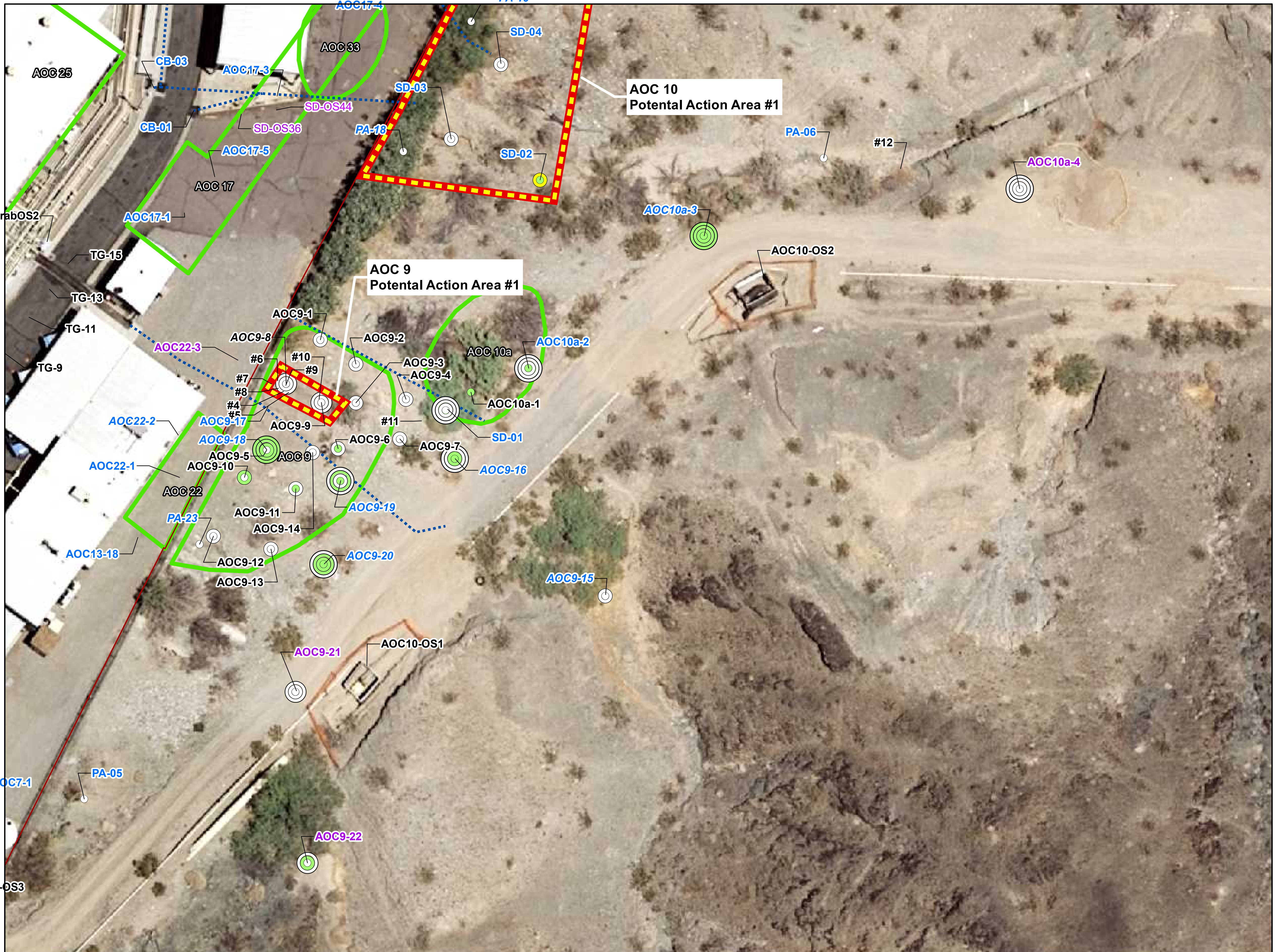


Figure E-4e
Human and Mammal Dioxins and Furans TEQ Soil Sample Results AOC 9
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California



LEGEND

- Property Boundary
- Area of Concern
- Solid Waste Management Unit
- Potential Action Area
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Topock Compressor Station Fence Line

Depth	Factor of Exceedance (FOE)
0 to 1 ft bgs	ND
>1 to 3 ft bgs	FOE <=1
>3 to 6 ft bgs	1>FOE<=10
>6 to 10 ft bgs	
>10 to 15 ft bgs	
>15 ft bgs	

Note:
Topographic contours shown are in 2-foot intervals

The >15 bgs ring shows the result for the deepest sample collected greater than 15 feet bgs

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Mercury
Removal Action Goal 1 mg/kg

N

0 15 30 60 Feet

Figure E-4f
Mercury
Soil Sample Results
AOC 9
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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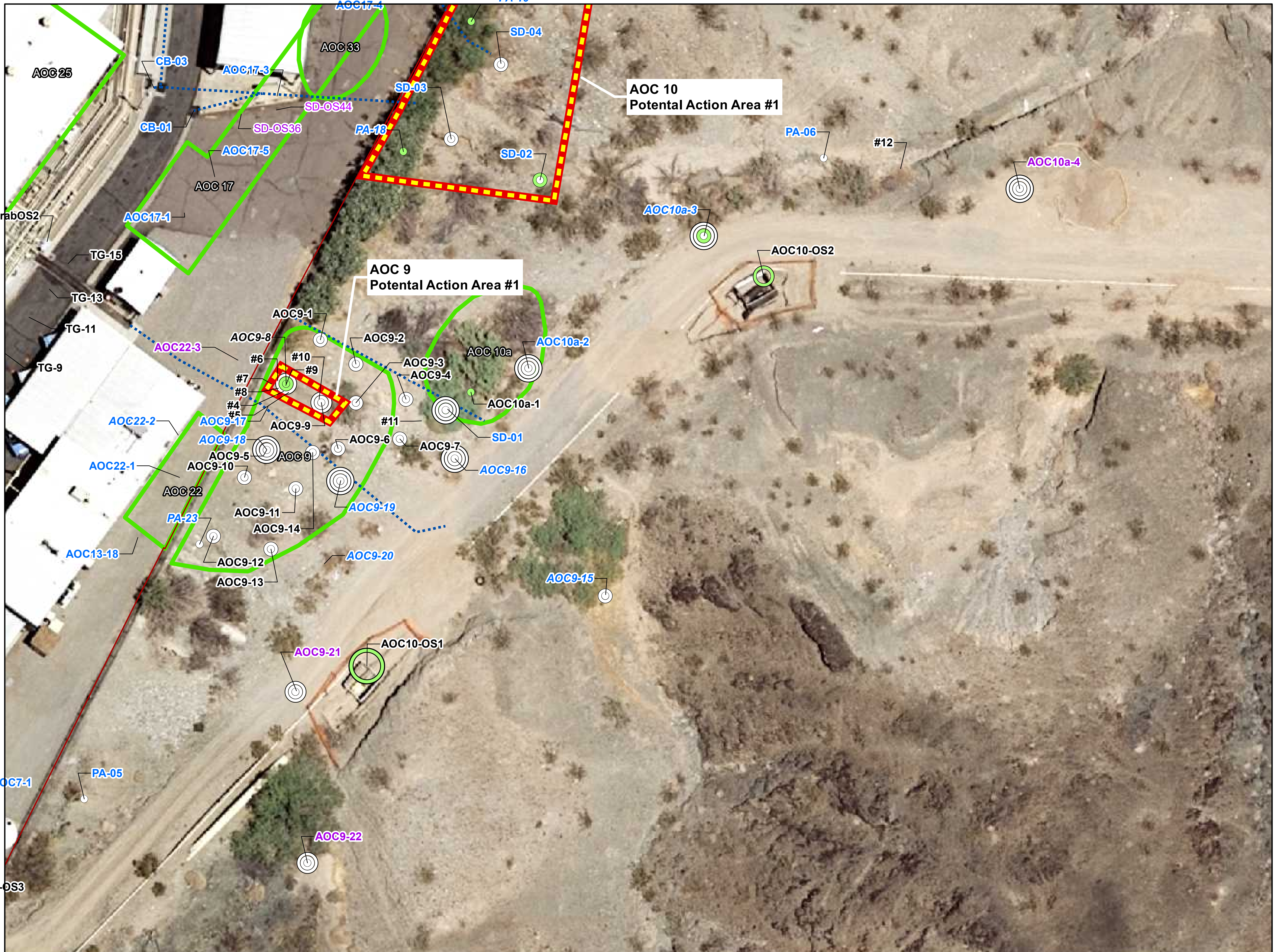

LEGEND

- Property Boundary
- Area of Concern
- Solid Waste Management Unit
- Potential Action Area
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Topock Compressor Station Fence Line

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >10 to 15 ft bgs
- >15 ft bgs

Factor of Exceedance (FOE)

- ND
- FOE <=1

Note:
Topographic contours shown are in 2-foot intervals

The >15 bgs ring shows the result for the deepest sample collected greater than 15 feet bgs

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Molybdenum
Removal Action Goal 22 mg/kg

N

0 15 30 60 Feet

Figure E-4g
Molybdenum
Soil Sample Results
AOC 9
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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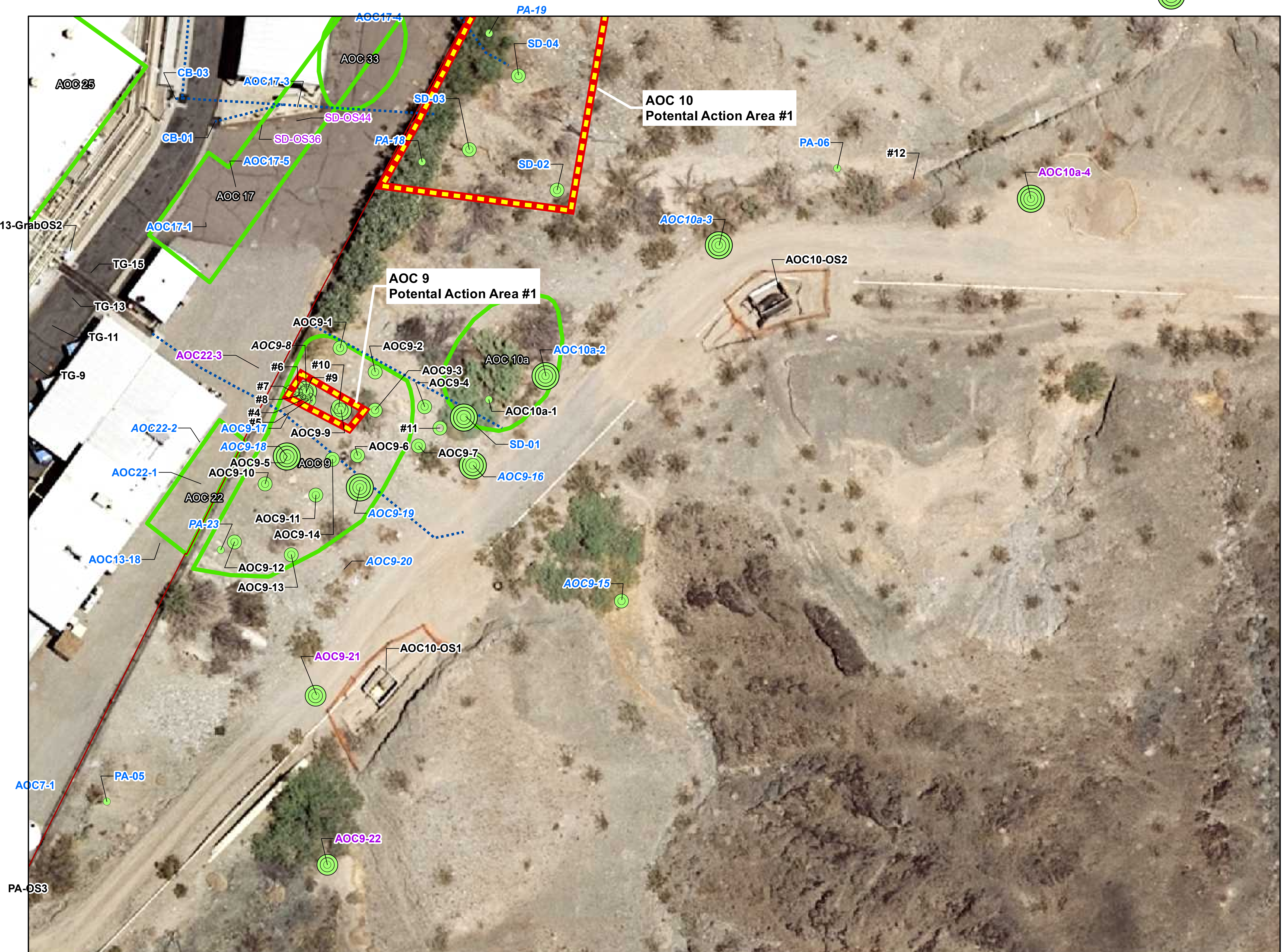

LEGEND

- Property Boundary
- Area of Concern
- Solid Waste Management Unit
- Potential Action Area
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Topock Compressor Station Fence Line

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >10 to 15 ft bgs
- >15 ft bgs

Factor of Exceedance (FOE)

- FOE <=1

Note:
Topographic contours shown are in 2-foot intervals

The >15 bgs ring shows the result for the deepest sample collected greater than 15 feet bgs

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Zinc
Removal Action Goal 1,050 mg/kg

N

0 15 30 60 Feet

Figure E-4h
Zinc
Soil Sample Results
AOC 9
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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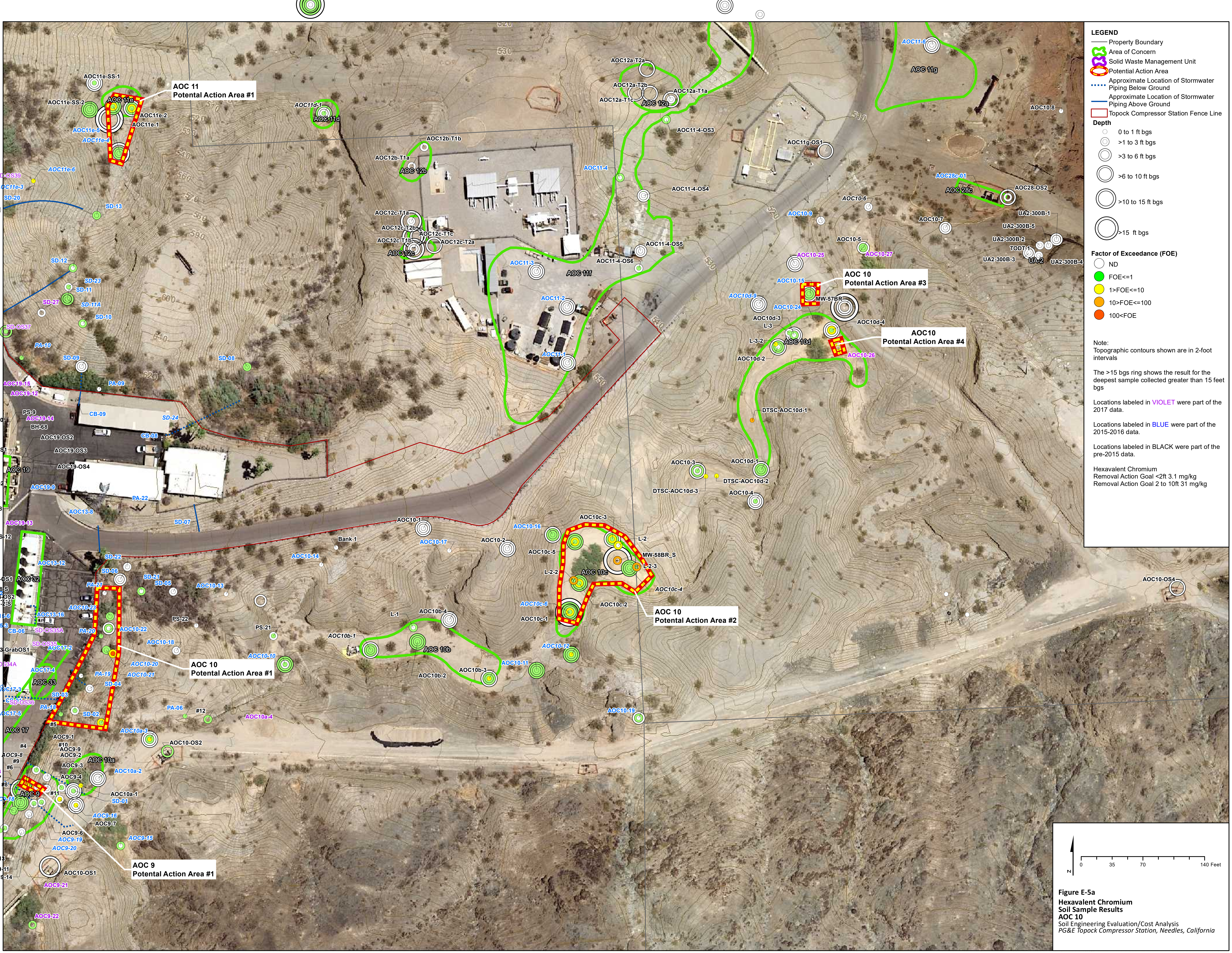

Figure E-5a
Hexavalent Chromium
Soil Sample Results
AOC 10
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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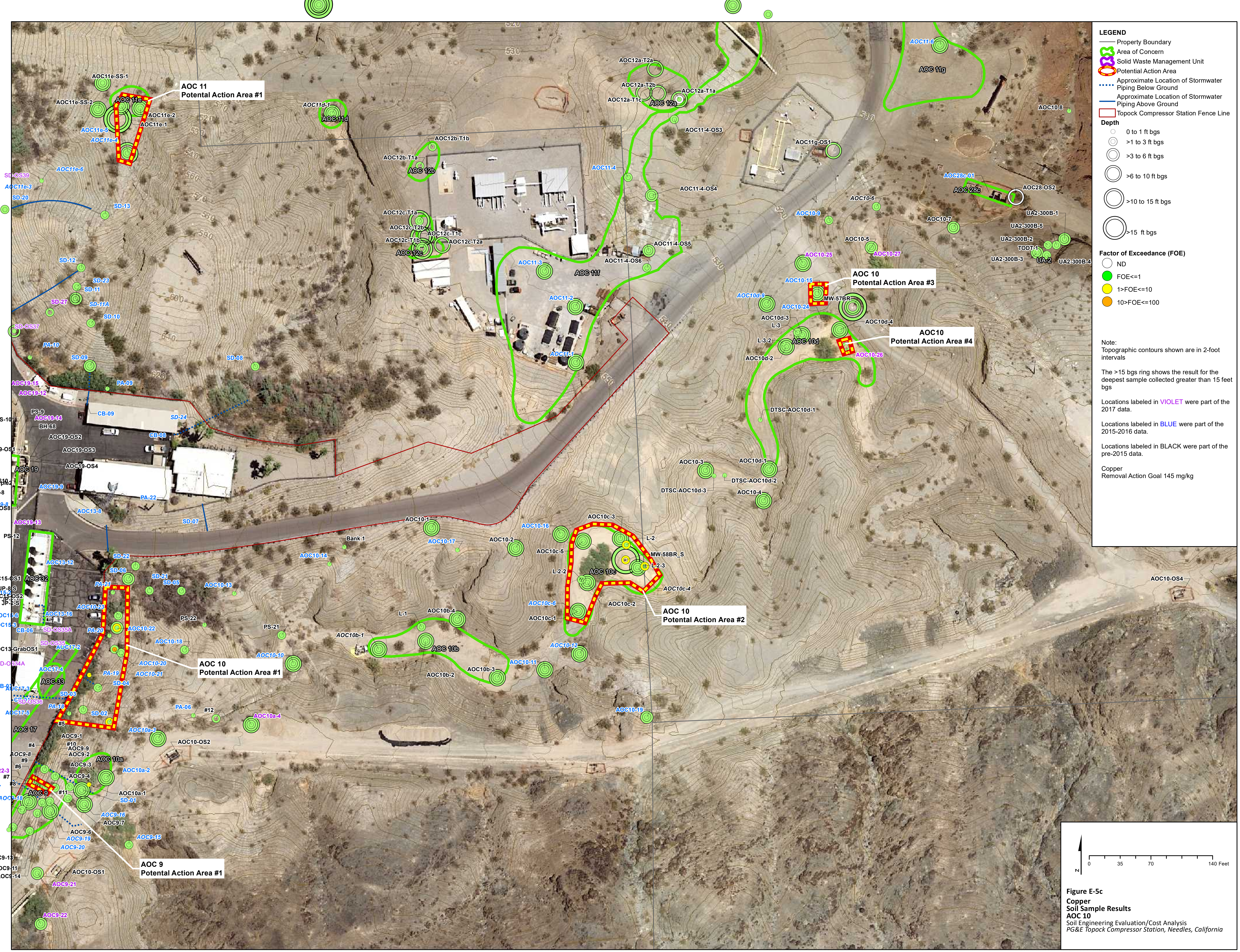

Figure E-5c
Copper
Soil Sample Results
AOC 10
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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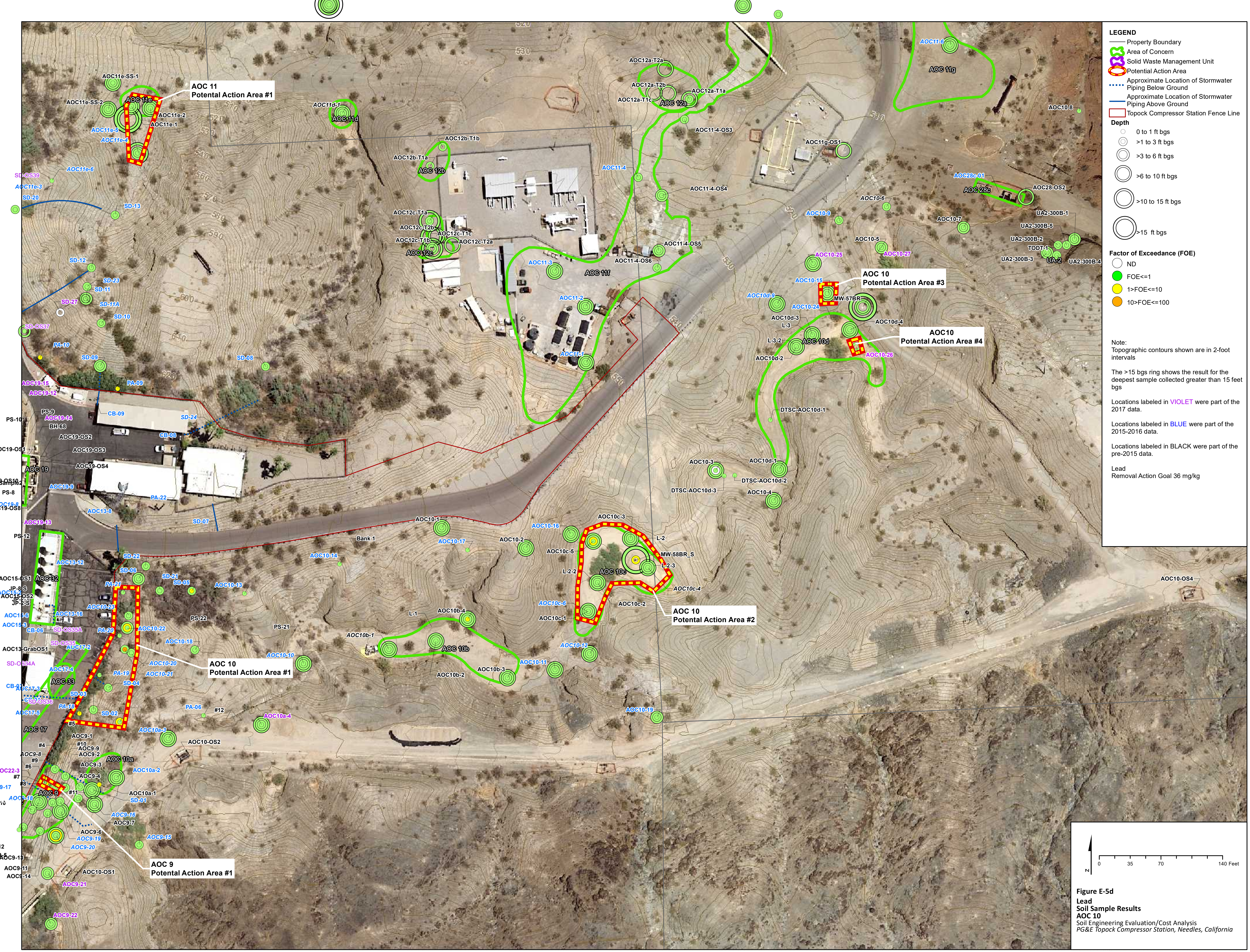

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Figure E-5e
Human and Mammal Dioxins and Furans TEQ Soil Sample Results AOC 10
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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Figure E-5f
Mercury
Soil Sample Results
AOC 10
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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LEGEND
Property Boundary
Area of Concern
Solid Waste Management Unit
Potential Action Area
Approximate Location of Stormwater Piping Below Ground
Approximate Location of Stormwater Piping Above Ground
Topock Compressor Station Fence Line
Depth
0 to 1 ft bgs
>1 to 3 ft bgs
>3 to 6 ft bgs
>6 to 10 ft bgs
>10 to 15 ft bgs
>15 ft bgs
Factor of Exceedance (FOE)
ND
FOE <=1
1>FOE<=10
10>FOE<=100
Note:
Topographic contours shown are in 2-foot intervals
The >15 bgs ring shows the result for the deepest sample collected greater than 15 feet bgs
Locations labeled in VIOLET were part of the 2017 data.
Locations labeled in BLUE were part of the 2015-2016 data.
Locations labeled in BLACK were part of the pre-2015 data.
Hexavalent Chromium
Removal Action Goal <2ft 3.1 mg/kg
Removal Action Goal 2 to 10ft 31 mg/kg
0 30 60 120 Feet
Figure E-6a
Hexavalent Chromium
Soil Sample Results
AOC 11
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California
AOC 11
Potental Action Area #1
AOC 10
Potental Action Area #3
AOC10
Potental Action Area #4
AOC 11a
AOC 11b
AOC 11c
AOC 11d
AOC 11e
AOC 11f
AOC 11g
AOC 12a
AOC 12b
AOC 12c
AOC 10d
AOC 28c
AOC 6
AOC 25
JACOBS


LEGEND
Property Boundary
Area of Concern
Solid Waste Management Unit
Potential Action Area
Approximate Location of Stormwater Piping Below Ground
Approximate Location of Stormwater Piping Above Ground
Topock Compressor Station Fence Line
Depth
0 to 1 ft bgs
>1 to 3 ft bgs
>3 to 6 ft bgs
>6 to 10 ft bgs
>10 to 15 ft bgs
>15 ft bgs
Factor of Exceedance (FOE)
FOE <=1
1>FOE<=10
Note:
Topographic contours shown are in 2-foot intervals
The >15 bgs ring shows the result for the deepest sample collected greater than 15 feet bgs
Locations labeled in VIOLET were part of the 2017 data.
Locations labeled in BLUE were part of the 2015-2016 data.
Locations labeled in BLACK were part of the pre-2015 data.
Total Chromium
Removal Action Goal 145 mg/kg
0 30 60 120 Feet
N
Figure E-6b
Total Chromium
Soil Sample Results
AOC 11
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California
AOC 11
Potental Action Area #1
AOC 10
Potental Action Area #3
AOC10
Potental Action Area #4
AOC 11a
AOC 11b
AOC 11c
AOC 11d
AOC 11e
AOC 11f
AOC 11g
AOC 12a
AOC 12b
AOC 12c
AOC 10d
AOC 28c
AOC11a-SS-1
AOC11a-SS-2
AOC11a-SS-3
AOC11a-1
AOC11a-2
AOC11a-3
AOC11a-4
AOC11a-5
AOC11b-1
AOC11b-2
AOC11c-SS-1
AOC11c-SS-2
AOC11C-3
AOC11c-1
AOC11c-2
AOC11c-4
AOC11d-1
AOC11e-SS-1
AOC11e-SS-2
AOC11e-1
AOC11e-2
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AOC11e-4
AOC11e-5
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AOC11-8
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AOC11-4-OS5
AOC11-4-OS6
AOC11g-OS1
AOC12a-T1a
AOC12a-T1c
AOC12a-T2a
AOC12a-T2b
AOC12b-T1a
AOC12b-T1b
AOC12c-T1a
AOC12c-T1b
AOC12c-T1c
AOC12c-T2a
AOC12c-T2b
AOC10-5
AOC10-6
AOC10-7
AOC10-9
AOC10-15
AOC10-24
AOC10-25
AOC10-26
AOC10-27
AOC10d-2
AOC10d-3
AOC10d-4
AOC10d-9
MW-57BR
L-3
L-3-2
DTSC-AOC10d-1
AOC28c-01
AOC28-OS2
UA2-300B-2
UA2-300B-3
UA2-300B-5
TODT-1
SD-08
SD-09
SD-10
SD-11
SD-11A
SD-12
SD-13
SD-20
SD-23
SD-24
SD-27
SD-OS37
SD-OS39
PA-07
PA-09
PA-10
PA-11
PA-12
BH-67
BH-68
CB-08
CB-09
CB-11
CB-13
AOC13-2
AOC13-3
AOC13-5
AOC20-2
AOC20-OS16
AOC6
AOC6-3
AOC 25
AOC19-12
AOC19-14
AOC19-15
AOC19-OS2
AOC19-OS3
AOC19-6
PS-9
PS-10
TC-13
TC-14
TC-15
TC-17
TC-18
TC-19
TC-21
TC-22
TC-23
490
500
510
520
530
540
560
570
580
590
600
610
620
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LEGEND
Property Boundary
Area of Concern
Solid Waste Management Unit
Potential Action Area
Approximate Location of Stormwater Piping Below Ground
Approximate Location of Stormwater Piping Above Ground
Topock Compressor Station Fence Line
Depth
0 to 1 ft bgs
>1 to 3 ft bgs
>3 to 6 ft bgs
>6 to 10 ft bgs
>10 to 15 ft bgs
>15 ft bgs
Factor of Exceedance (FOE)
ND
FOE <=1
Note:
Topographic contours shown are in 2-foot intervals
The >15 bgs ring shows the result for the deepest sample collected greater than 15 feet bgs
Locations labeled in VIOLET were part of the 2017 data.
Locations labeled in BLUE were part of the 2015-2016 data.
Locations labeled in BLACK were part of the pre-2015 data.
Copper
Removal Action Goal 145 mg/kg
0 30 60 120 Feet
N
Figure E-6c
Copper
Soil Sample Results
AOC 11
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California
AOC 11
Potental Action Area #1
AOC 10
Potental Action Area #3
AOC10
Potental Action Area #4
AOC 11a
AOC 11b
AOC 11c
AOC 11d
AOC 11e
AOC 11f
AOC 11g
AOC 12a
AOC 12b
AOC 12c
AOC 10d
AOC 28c
AOC11a-SS-1
AOC11a-SS-2
AOC11a-SS-3
AOC11a-1
AOC11a-2
AOC11a-3
AOC11a-4
AOC11a-5
AOC11b-1
AOC11b-2
AOC11c-SS-1
AOC11c-SS-2
AOC11c-1
AOC11c-2
AOC11c-4
AOC11d-1
AOC11e-SS-1
AOC11e-SS-2
AOC11e-1
AOC11e-2
AOC11e-4
AOC11e-5
AOC11e-6
AOC11-1
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AOC11-4
AOC11-5
AOC11-6
AOC11-7
AOC11-8
AOC11-9
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AOC11-4-OS3
AOC11-4-OS4
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AOC12a-T1c
AOC12a-T2a
AOC12a-T2b
AOC12b-T1a
AOC12b-T1b
AOC12c-T1a
AOC12c-T1b
AOC12c-T1c
AOC12c-T2a
AOC12c-T2b
AOC10-5
AOC10-6
AOC10-7
AOC10-9
AOC10-15
AOC10-24
AOC10-25
AOC10-26
AOC10-27
AOC10d-2
AOC10d-3
AOC10d-4
AOC10d-9
MW-57BR
L-3
L-3-2
DTSC-AOC10d-1
AOC28c-01
AOC28-OS2
JACOBS


LEGEND
Property Boundary
Area of Concern
Solid Waste Management Unit
Potential Action Area
Approximate Location of Stormwater Piping Below Ground
Approximate Location of Stormwater Piping Above Ground
Topock Compressor Station Fence Line
Depth
0 to 1 ft bgs
>1 to 3 ft bgs
>3 to 6 ft bgs
>6 to 10 ft bgs
>10 to 15 ft bgs
>15 ft bgs
Factor of Exceedance (FOE)
ND
FOE <=1
1>FOE<=10
Note:
Topographic contours shown are in 2-foot intervals
The >15 bgs ring shows the result for the deepest sample collected greater than 15 feet bgs
Locations labeled in VIOLET were part of the 2017 data.
Locations labeled in BLUE were part of the 2015-2016 data.
Locations labeled in BLACK were part of the pre-2015 data.
Lead
Removal Action Goal 36 mg/kg
0 30 60 120 Feet
Figure E-6d
Lead
Soil Sample Results
AOC 11
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California
AOC 11
Potental Action Area #1
AOC 10
Potential Action Area #3
AOC10
Potential Action Area #4
AOC 11a
AOC 11b
AOC 11c
AOC 11d
AOC 11e
AOC 11f
AOC 11g
AOC 12a
AOC 12b
AOC 12c
AOC 10d
AOC 28c
JACOBS


Figure E-6e
Human and Mammal Dioxins and Furans TEQ Soil Sample Results
AOC 11
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California
0 30 60 120 Feet
LEGEND
Property Boundary
Area of Concern
Solid Waste Management Unit
Potential Action Area
Approximate Location of Stormwater Piping Below Ground
Approximate Location of Stormwater Piping Above Ground
Topock Compressor Station Fence Line
Depth
0 to 1 ft bgs
>1 to 3 ft bgs
>3 to 6 ft bgs
>6 to 10 ft bgs
>10 to 15 ft bgs
>15 ft bgs
Factor of Exceedance (FOE)
ND
FOE <=1
1>FOE<=10
10>FOE<=100
Note:
Topographic contours shown are in 2-foot intervals
The >15 bgs ring shows the result for the deepest sample collected greater than 15 feet bgs
Locations labeled in VIOLET were part of the 2017 data.
Locations labeled in BLUE were part of the 2015-2016 data.
Locations labeled in BLACK were part of the pre-2015 data.
Human Dioxins and Furans Toxicity Equivalency Quotient (TEQ)
Removal Action Goal <2ft 100 ng/kg
Mammal Dioxins and Furans Toxicity Equivalency Quotient (TEQ)
Removal Action Goal 2 to 10ft 190 ng/kg
AOC 11
Potental Action Area #1
AOC 10
Potental Action Area #3
AOC10
Potental Action Area #4
AOC 11a
AOC 11b
AOC 11c
AOC 11d
AOC 11e
AOC 11f
AOC 11g
AOC 12a
AOC 12b
AOC 12c
AOC 10d
AOC 28c
AOC 6
AOC 25
AOC11a-SS-2
AOC11a-SS-1
AOC11a-1
AOC11a-3
AOC11a-4
AOC11a-2
AOC11a-5
AOC11a-SS-3
AOC11b-1
AOC11b-2
AOC11c-SS-1
AOC11c-1
AOC11c-4
AOC11c-2
AOC11c-SS-2
AOC11C-3
AOC11-8
AOC11-7
AOC11-9
AOC11-5
AOC11-4-OS1
AOC11-6
AOC11-4-OS3
AOC11-4
AOC11-4-OS4
AOC11-4-OS5
AOC11-4-OS6
AOC11-3
AOC11-2
AOC11-1
AOC11e-SS-1
AOC11e-SS-2
AOC11e-2
AOC11e-1
AOC11e-5
AOC11e-4
AOC11e-6
AOC11e-3
AOC11d-1
AOC11g-OS1
AOC12a-T2a
AOC12a-T2b
AOC12a-T1a
AOC12a-T1c
AOC12b-T1b
AOC12b-T1a
AOC12c-T1a
AOC12c-T2b
AOC12c-T1c
AOC12c-T1b
AOC12c-T2a
AOC28c-01
AOC28-OS2
AOC10-6
AOC10-9
AOC10-7
AOC10-5
AOC10-25
AOC10-27
AOC10-15
MW-57BR
AOC10d-9
AOC10-24
AOC10d-3
AOC10d-4
L-3
L-3-2
AOC10d-2
AOC10-26
DTSC-AOC10d-1
UA2-300B-5
UA2-300B-2
TODT-1
UA2-300B-3
PA-12
BH-67
PA-07
SD-OS39
AOC13-2
SD-20
SD-13
PA-11
CB-13
AOC6-3
AOC13-3
AOC20-2
SD-12
SD-23
SD-11
SD-27
SD-11A
SD-10
CB-11
SD-OS37
PA-10
SD-09
SD-08
AOC20-OS16
AOC13-5
TC-21
TC-22
TC-23
AOC19-15
AOC19-12
TC-19
TC-17
PA-09
CB-09
PS-9
PS-10
AOC19-14
BH-68
TC-15
SD-24
CB-08
AOC13-7
TC-18
AOC19-OS1
AOC19-OS2
AOC19-OS3
TC-14
TC-13
AOC19-6
JACOBS

LEGEND
Property Boundary
Area of Concern
Solid Waste Management Unit
Potential Action Area
Approximate Location of Stormwater Piping Below Ground
Approximate Location of Stormwater Piping Above Ground
Topock Compressor Station Fence Line
Depth
0 to 1 ft bgs
>1 to 3 ft bgs
>3 to 6 ft bgs
>6 to 10 ft bgs
>10 to 15 ft bgs
>15 ft bgs
Factor of Exceedance (FOE)
ND
FOE <=1
Note:
Topographic contours shown are in 2-foot intervals
The >15 bgs ring shows the result for the deepest sample collected greater than 15 feet bgs
Locations labeled in VIOLET were part of the 2017 data.
Locations labeled in BLUE were part of the 2015-2016 data.
Locations labeled in BLACK were part of the pre-2015 data.
Mercury
Removal Action Goal 1 mg/kg
0
30
60
120 Feet
N
Figure E-6f
Mercury
Soil Sample Results
AOC 11
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California
AOC 11
Potental Action Area #1
AOC 10
Potential Action Area #3
AOC10
Potential Action Area #4
AOC11a-SS-2
AOC11a-SS-1
AOC11a-1
AOC11a-3
AOC 11a
AOC11a-2
AOC11a-4
AOC11a-5
AOC11a-SS-3
AOC11-8
AOC11-7
AOC11b-1
AOC 11b
AOC11b-2
AOC11-9
AOC11c-SS-1
AOC11c-1
AOC 11c
AOC11c-4
AOC11c-2
AOC11c-SS-2
AOC11C-3
AOC11-5
AOC11-4-OS1
AOC11-6
AOC 11g
AOC12a-T2a
AOC12a-T2b
AOC12a-T1c
AOC 12a
AOC12a-T1a
AOC11e-SS-1
AOC11e-SS-2
AOC 11e
AOC11e-2
AOC11e-1
AOC11e-5
AOC11e-4
AOC11d-1
AOC 11d
AOC11-4-OS3
AOC12b-T1b
AOC12b-T1a
AOC 12b
AOC11g-OS1
AOC11-4
AOC11-4-OS4
AOC28c-01
AOC 28c
AOC28-OS2
AOC10-6
AOC10-9
AOC10-7
AOC12c-T1a
AOC12c-T2b
AOC12c-T1c
AOC12c-T1b
AOC12c-T2a
AOC 12c
AOC 11f
AOC11-4-OS5
AOC11-4-OS6
AOC11-3
AOC10-5
AOC10-27
AOC10-25
AOC10-15
MW-57BR
AOC10d-9
AOC10-24
AOC11-2
AOC10d-3
L-3
AOC 10d
AOC10d-4
L-3-2
AOC10d-2
AOC10-26
AOC11-1
DTSC-AOC10d-1
UA2-300B-5
UA2-300B-2
UA2-300B-3
TODT-1
PA-12
BH-67
PA-07
B-Tower
SD-OS39
AOC11e-6
AOC11e-3
AOC13-2
SD-20
SD-13
PA-11
AOC 6
CB-13
AOC6-3
AOC13-3
SD-12
SD-23
SD-11
AOC20-2
SD-27
SD-11A
SD-10
SD-OS37
CB-11
PA-10
AOC20-OS16
AOC13-5
TC-21
SD-09
SD-08
TC-22
TC-23
AOC19-15
PA-09
TC-19
AOC19-12
AOC 25
TC-17
PS-9
CB-09
AOC19-14
TC-15
PS-10
BH-68
SD-24
AOC13-7
AOC19-OS2
CB-08
TC-18
AOC19-OS1
AOC19-OS3
TC-14
TC-13
AOC19-6
490
500
510
520
530
540
550
560
570
580
590
600
610
620
JACOBS


LEGEND
Property Boundary
Area of Concern
Solid Waste Management Unit
Potential Action Area
Approximate Location of Stormwater Piping Below Ground
Approximate Location of Stormwater Piping Above Ground
Topock Compressor Station Fence Line
Depth
0 to 1 ft bgs
>1 to 3 ft bgs
>3 to 6 ft bgs
>6 to 10 ft bgs
>10 to 15 ft bgs
>15 ft bgs
Factor of Exceedance (FOE)
ND
FOE <=1
Note:
Topographic contours shown are in 2-foot intervals
The >15 bgs ring shows the result for the deepest sample collected greater than 15 feet bgs
Locations labeled in VIOLET were part of the 2017 data.
Locations labeled in BLUE were part of the 2015-2016 data.
Locations labeled in BLACK were part of the pre-2015 data.
Molybdenum
Removal Action Goal 22 mg/kg
N
0 30 60 120 Feet
Figure E-6g
Molybdenum
Soil Sample Results
AOC 11
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California
AOC 11
Potental Action Area #1
AOC 10
Potential Action Area #3
AOC10
Potential Action Area #4
AOC 11a
AOC 11b
AOC 11c
AOC 11d
AOC 11e
AOC 11f
AOC 11g
AOC 12a
AOC 12b
AOC 12c
AOC 10d
AOC 28c
AOC 6
AOC 25
AOC11a-SS-2
AOC11a-SS-1
AOC11a-1
AOC11a-2
AOC11a-3
AOC11a-4
AOC11a-5
AOC11a-SS-3
AOC11b-1
AOC11b-2
AOC11c-SS-1
AOC11c-1
AOC11c-2
AOC11c-4
AOC11c-SS-2
AOC11C-3
AOC11d-1
AOC11e-SS-1
AOC11e-SS-2
AOC11e-1
AOC11e-2
AOC11e-3
AOC11e-4
AOC11e-5
AOC11e-6
AOC12a-T2a
AOC12a-T2b
AOC12a-T1a
AOC12a-T1c
AOC12b-T1a
AOC12b-T1b
AOC12c-T1a
AOC12c-T2b
AOC12c-T1b
AOC12c-T1c
AOC12c-T2a
AOC11-1
AOC11-2
AOC11-3
AOC11-4
AOC11-5
AOC11-6
AOC11-7
AOC11-8
AOC11-9
AOC11-4-OS1
AOC11-4-OS3
AOC11-4-OS4
AOC11-4-OS5
AOC11-4-OS6
AOC11g-OS1
AOC28c-01
AOC28-OS2
AOC10-5
AOC10-6
AOC10-7
AOC10-9
AOC10-15
AOC10-24
AOC10-25
AOC10-26
AOC10-27
AOC10d-1
AOC10d-2
AOC10d-3
AOC10d-4
AOC10d-9
DTSC-AOC10d-1
MW-57BR
L-3
L-3-2
UA2-300B-2
UA2-300B-3
UA2-300B-5
TODT-1
SD-OS39
SD-OS37
SD-08
SD-09
SD-10
SD-11
SD-11A
SD-12
SD-13
SD-20
SD-23
SD-24
SD-27
PA-07
PA-09
PA-10
PA-11
PA-12
BH-67
BH-68
AOC13-2
AOC13-3
AOC13-5
AOC13-7
AOC20-2
AOC20-OS16
AOC6-3
AOC19-15
AOC19-12
AOC19-14
AOC19-OS1
AOC19-OS2
AOC19-OS3
AOC19-6
CB-08
CB-09
CB-11
CB-13
TC-13
TC-14
TC-15
TC-17
TC-18
TC-19
TC-21
TC-22
TC-23
PS-9
PS-10
490
500
510
520
530
540
550
560
570
580
590
600
610
620
JACOBS


LEGEND
Property Boundary
Area of Concern
Solid Waste Management Unit
Potential Action Area
Approximate Location of Stormwater Piping Below Ground
Approximate Location of Stormwater Piping Above Ground
Topock Compressor Station Fence Line
Depth
0 to 1 ft bgs
>1 to 3 ft bgs
>3 to 6 ft bgs
>6 to 10 ft bgs
>10 to 15 ft bgs
>15 ft bgs
Factor of Exceedance (FOE)
FOE <=1
1>FOE<=10
Note:
Topographic contours shown are in 2-foot intervals
The >15 bgs ring shows the result for the deepest sample collected greater than 15 feet bgs
Locations labeled in VIOLET were part of the 2017 data.
Locations labeled in BLUE were part of the 2015-2016 data.
Locations labeled in BLACK were part of the pre-2015 data.
Zinc
Removal Action Goal 1,050 mg/kg
0 30 60 120 Feet
Figure E-6h
Zinc
Soil Sample Results
AOC 11
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California
AOC 11
Potental Action Area #1
AOC 10
Potential Action Area #3
AOC10
Potential Action Area #4
JACOBS

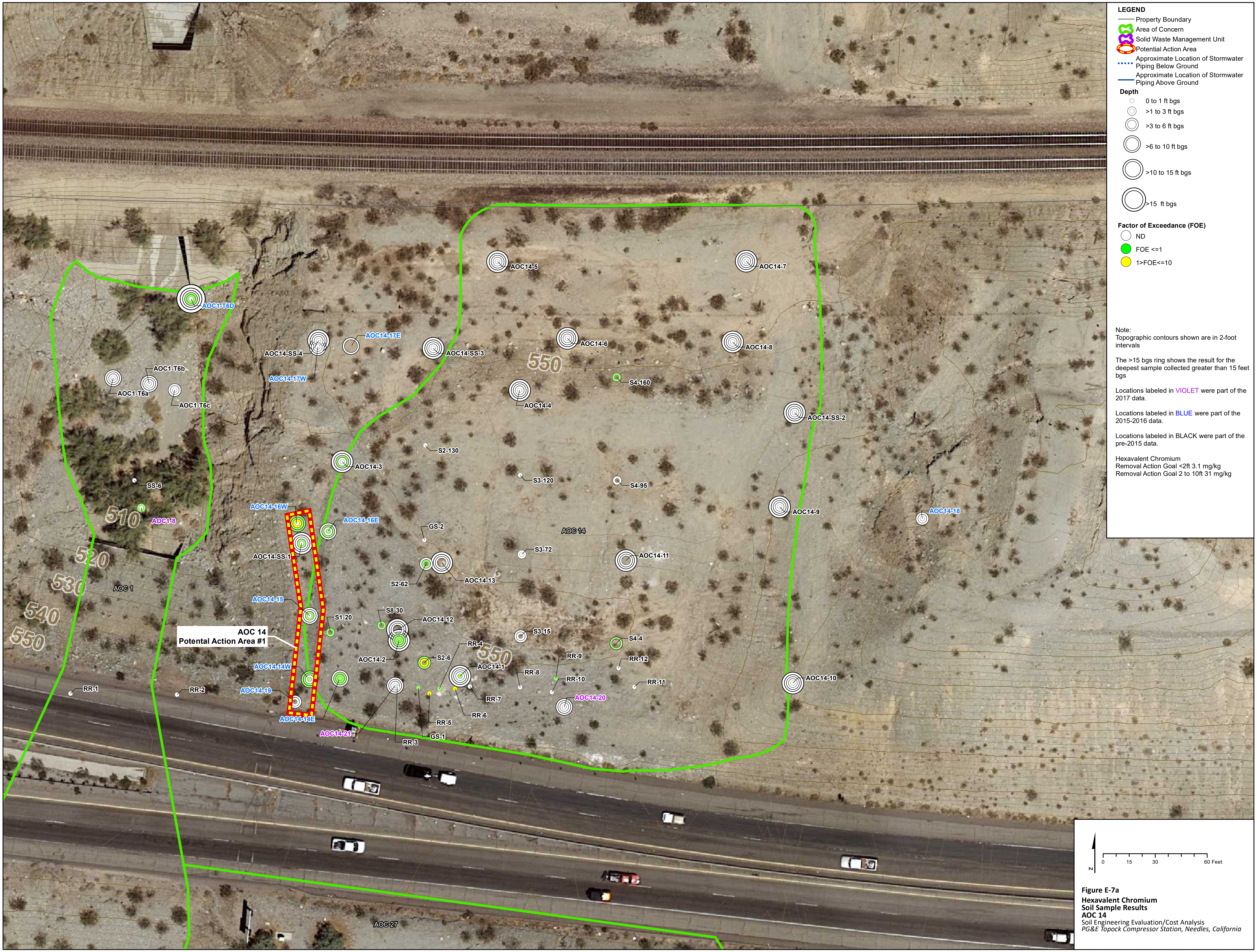

Figure E-7a
Hexavalent Chromium
Soil Sample Results
AOC 14
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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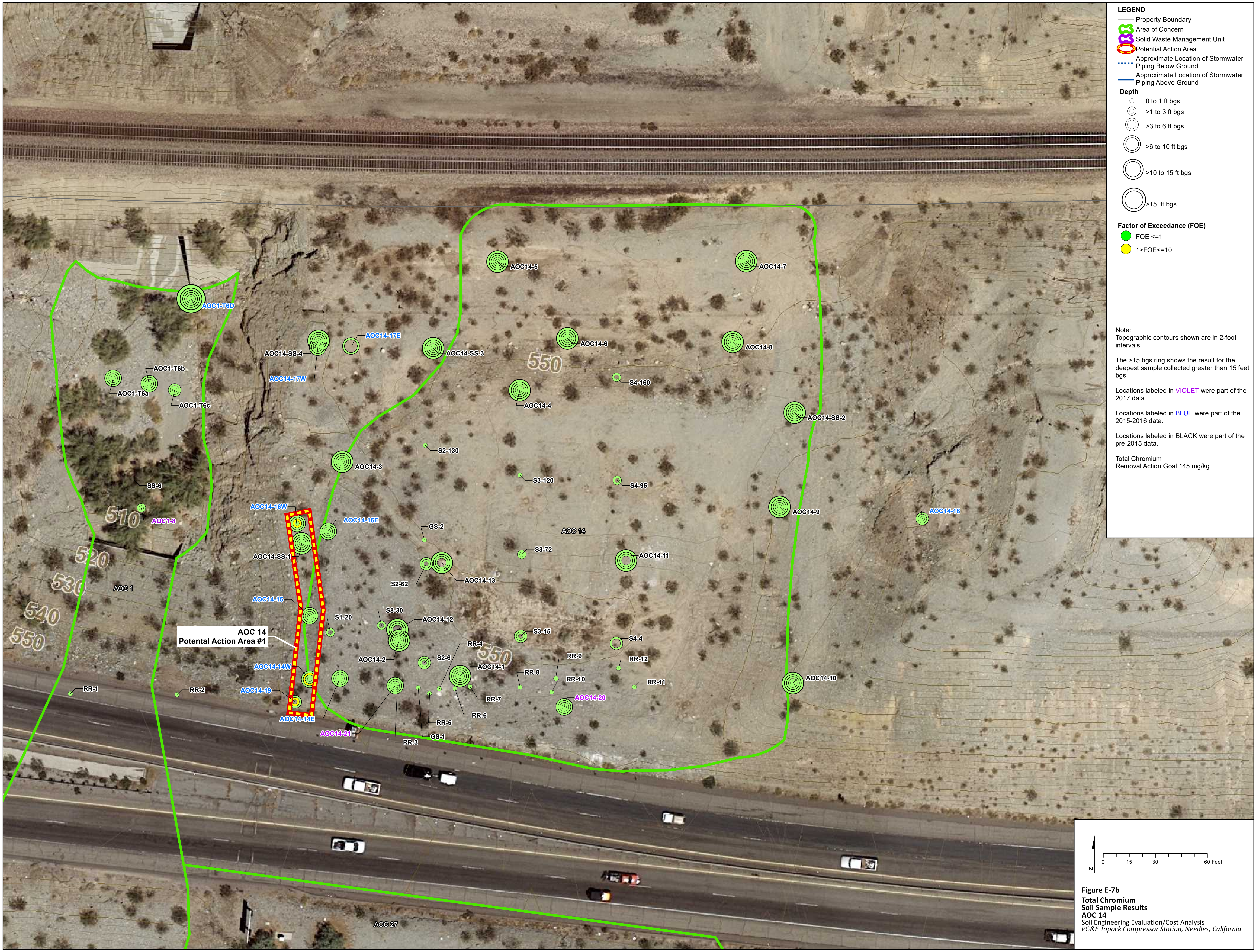

Figure E-7b
Total Chromium
Soil Sample Results
AOC 14
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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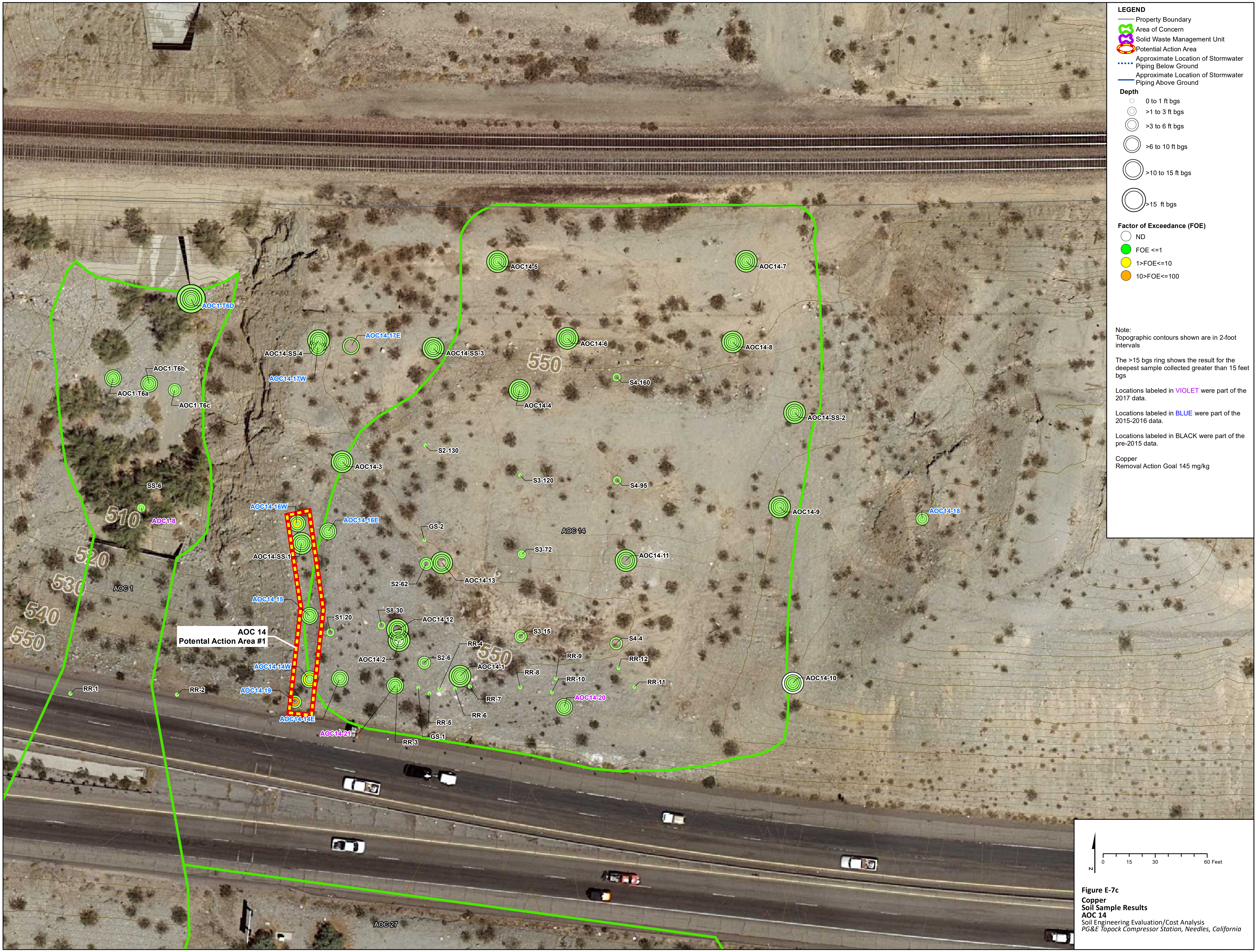

Figure E-7c
Copper
Soil Sample Results
AOC 14
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

JACOBS

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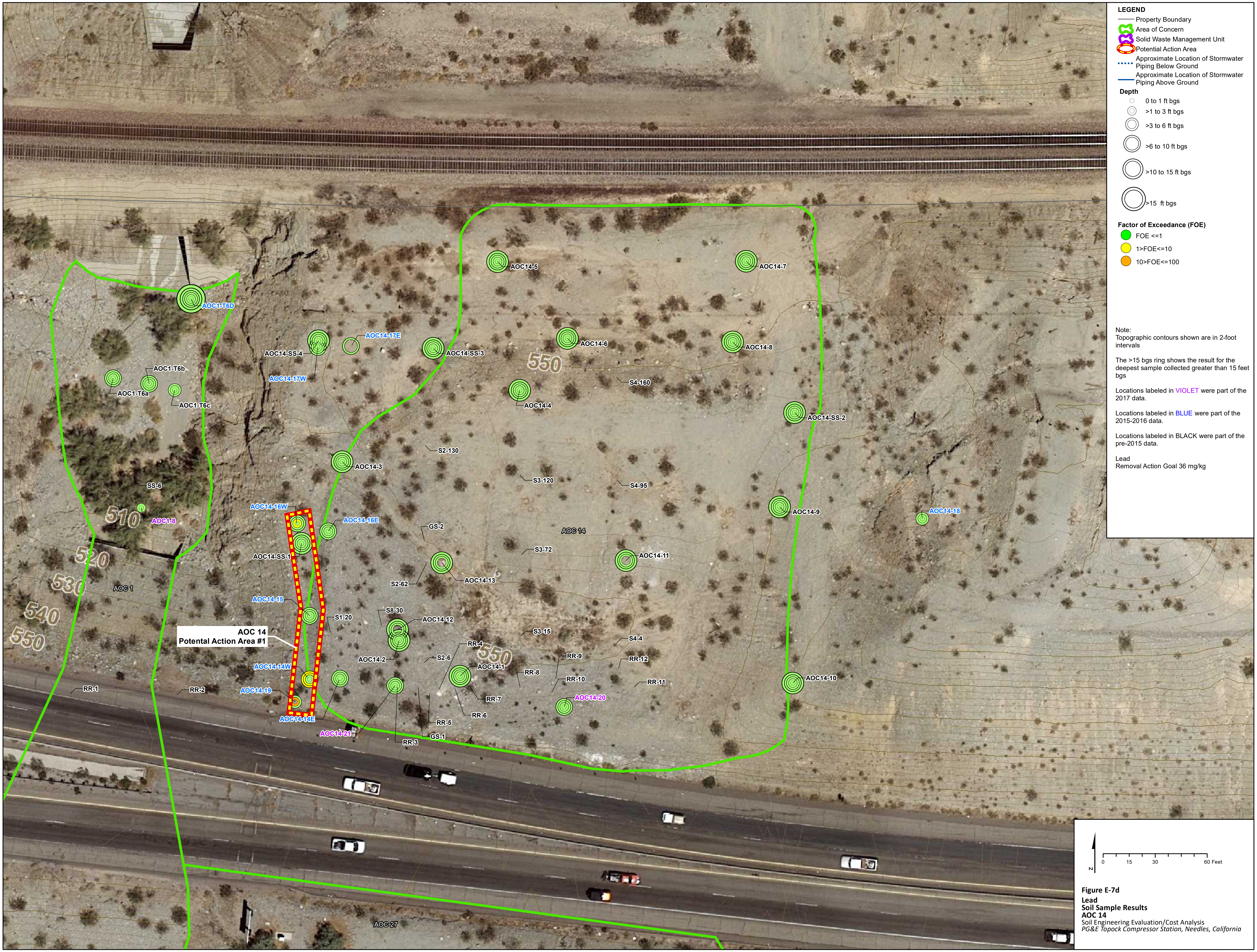

LEGEND

- Property Boundary
- Area of Concern
- Solid Waste Management Unit
- Potential Action Area
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >10 to 15 ft bgs
- >15 ft bgs

Factor of Exceedance (FOE)

- FOE <=1
- 1>FOE<=10
- 10>FOE<=100

Note:
Topographic contours shown are in 2-foot intervals

The >15 bgs ring shows the result for the deepest sample collected greater than 15 feet bgs

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Lead
Removal Action Goal 36 mg/kg

N

0 15 30 60 Feet

Figure E-7d
Lead
Soil Sample Results
AOC 14
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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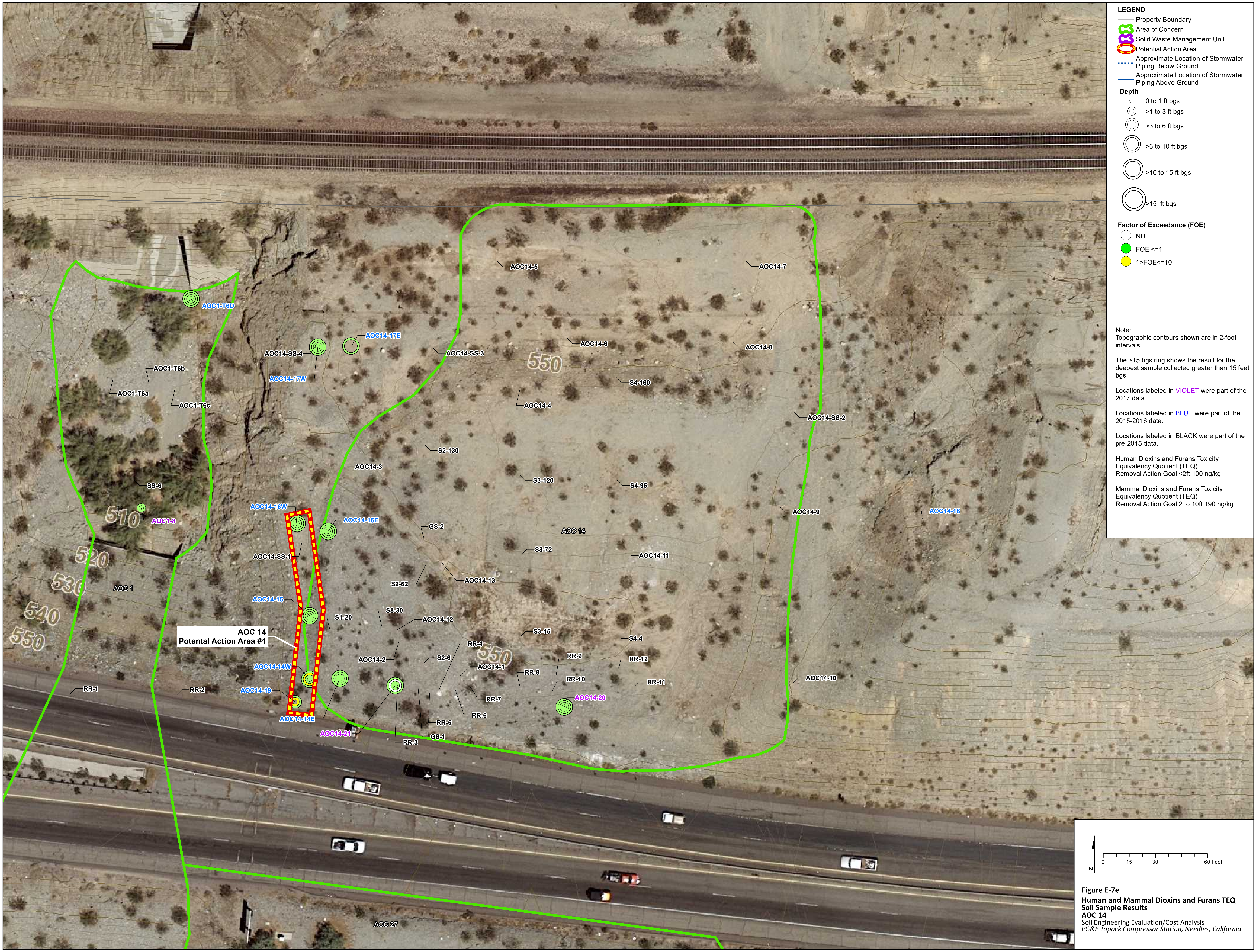

LEGEND

- Property Boundary
- Area of Concern
- Solid Waste Management Unit
- Potential Action Area
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >10 to 15 ft bgs
- >15 ft bgs

Factor of Exceedance (FOE)

- ND
- FOE <=1
- 1>FOE<=10

Note:
Topographic contours shown are in 2-foot intervals

The >15 bgs ring shows the result for the deepest sample collected greater than 15 feet bgs

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Human Dioxins and Furans Toxicity Equivalency Quotient (TEQ)
Removal Action Goal <2ft 100 ng/kg

Mammal Dioxins and Furans Toxicity Equivalency Quotient (TEQ)
Removal Action Goal 2 to 10ft 190 ng/kg

Figure E-7e
Human and Mammal Dioxins and Furans TEQ Soil Sample Results
AOC 14
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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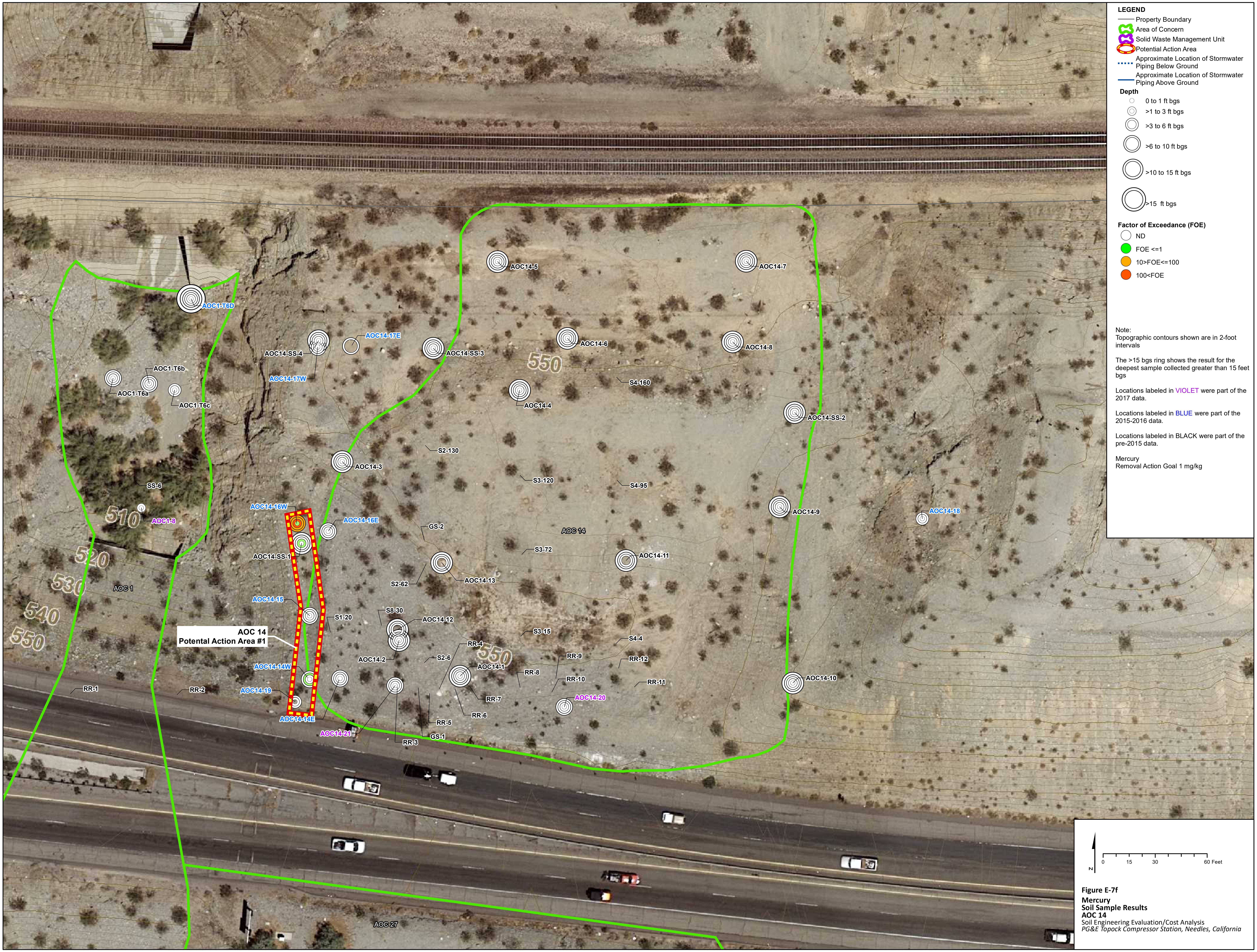
JACOBS



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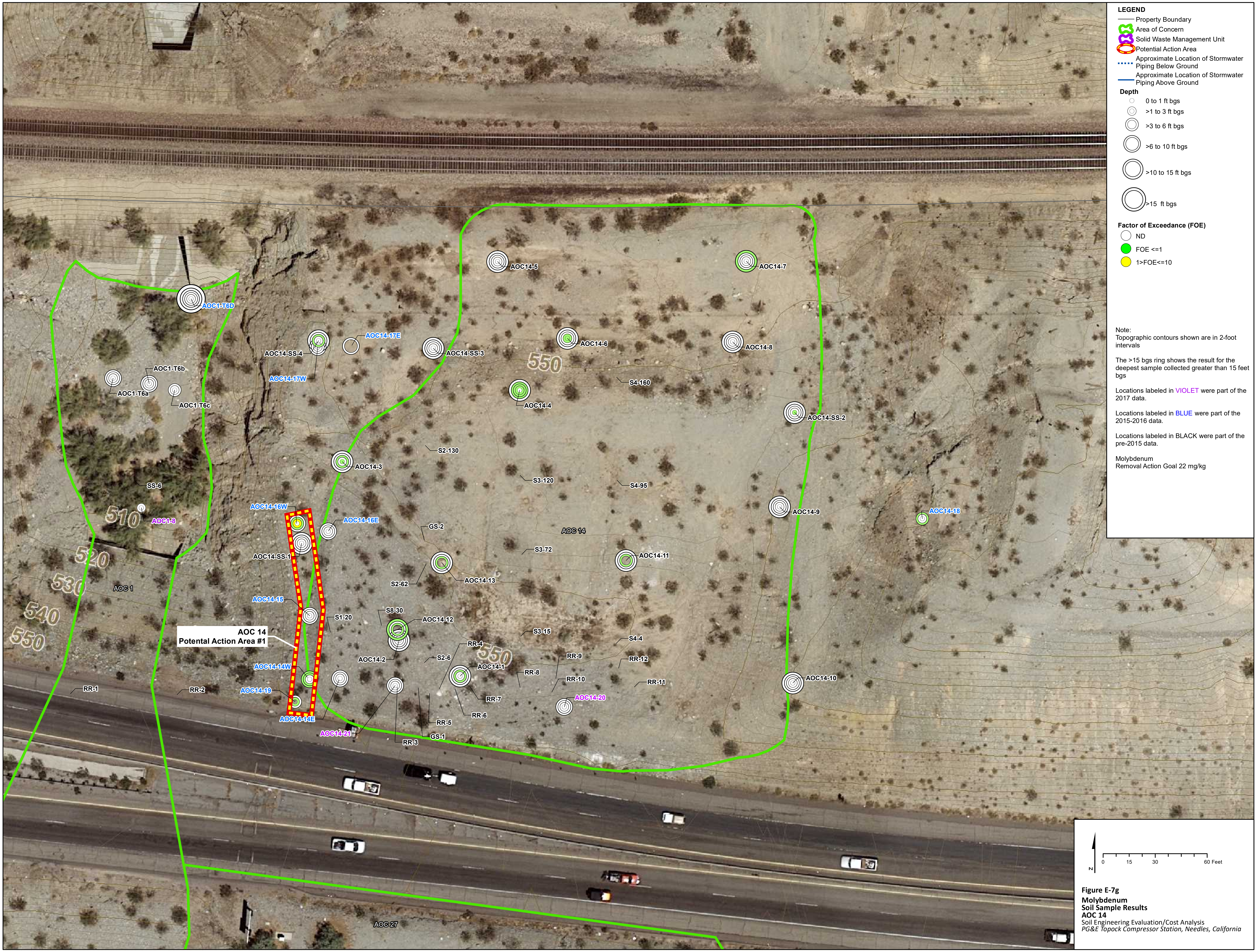

Figure E-7g
Molybdenum
Soil Sample Results
AOC 14
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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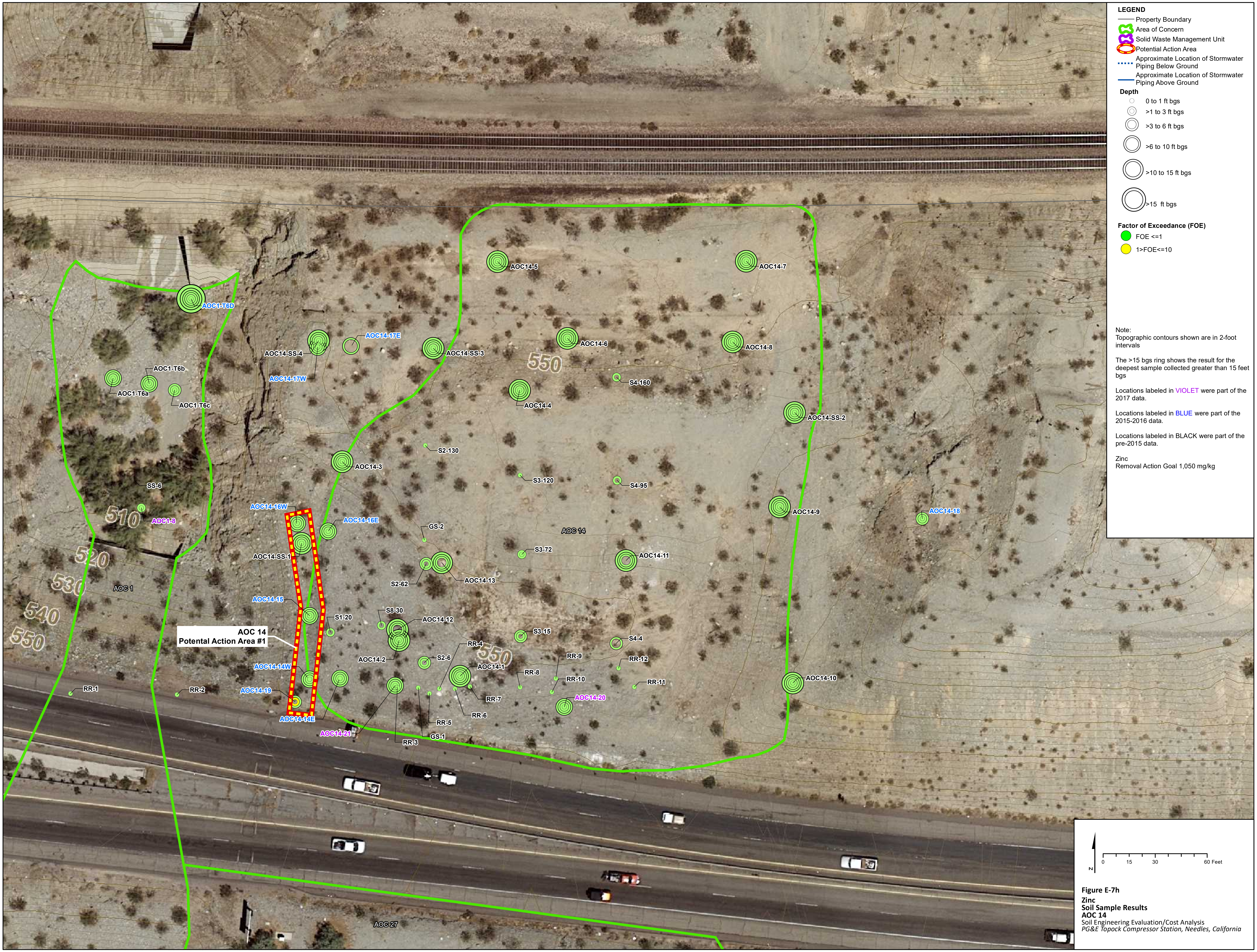

Figure E-7h
Zinc
Soil Sample Results
AOC 14
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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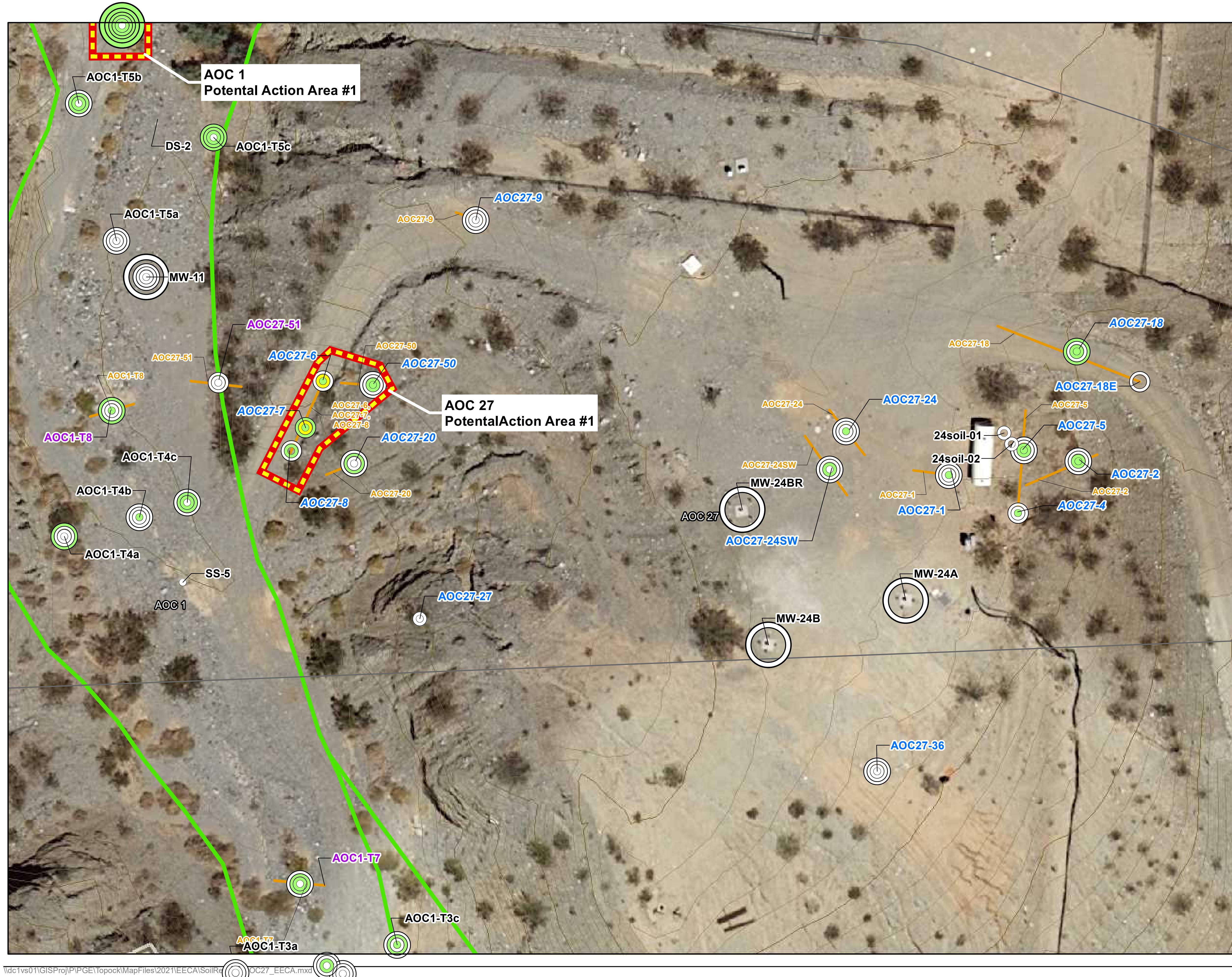
JACOBS



LEGEND

- Property Boundary
- Area of Concern
- Potential Action Area
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Soil Trench

Depth	Factor of Exceedance (FOE)
0 to 1 ft bgs	ND
>1 to 3 ft bgs	FOE <=1
>3 to 6 ft bgs	1>FOE<=10
>6 to 10 ft bgs	
>11 to 15 ft bgs	
>16 ft bgs	

Note:

Topographic contours shown are in 2-foot intervals

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Hexavalent Chromium
Removal Action Goal <2ft 3.1 mg/kg
Removal Action Goal 2 to 10ft 31 mg/kg

N

0 15 30 60 Feet

Figure E-8a

Hexavalent Chromium Soil Sample Results AOC 27

Soil Engineering Evaluation/Cost Analysis

PG&E Topock Compressor Station, Needles, California

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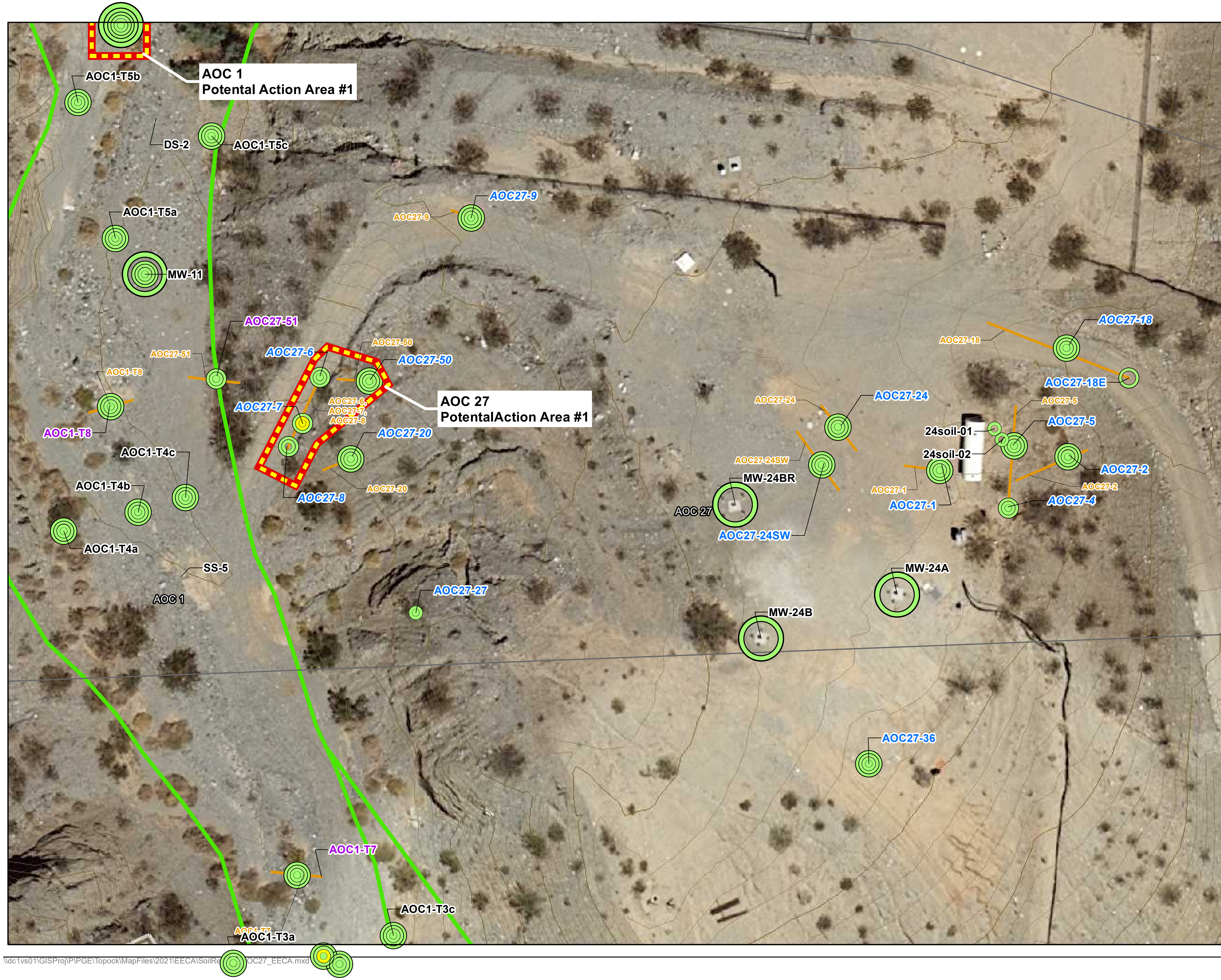
JACOBS



LEGEND

- Property Boundary
- Area of Concern
- Potential Action Area
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Soil Trench

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >11 to 15 ft bgs
- >16 ft bgs

Factor of Exceedance (FOE)

- FOE <=1
- 1>FOE<=10

Note:

Topographic contours shown are in 2-foot intervals

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Total Chromium
Removal Action Goal 145 mg/kg

N

0 15 30 60 Feet

Figure E-8b
Total Chromium
Soil Sample Results
AOC 27
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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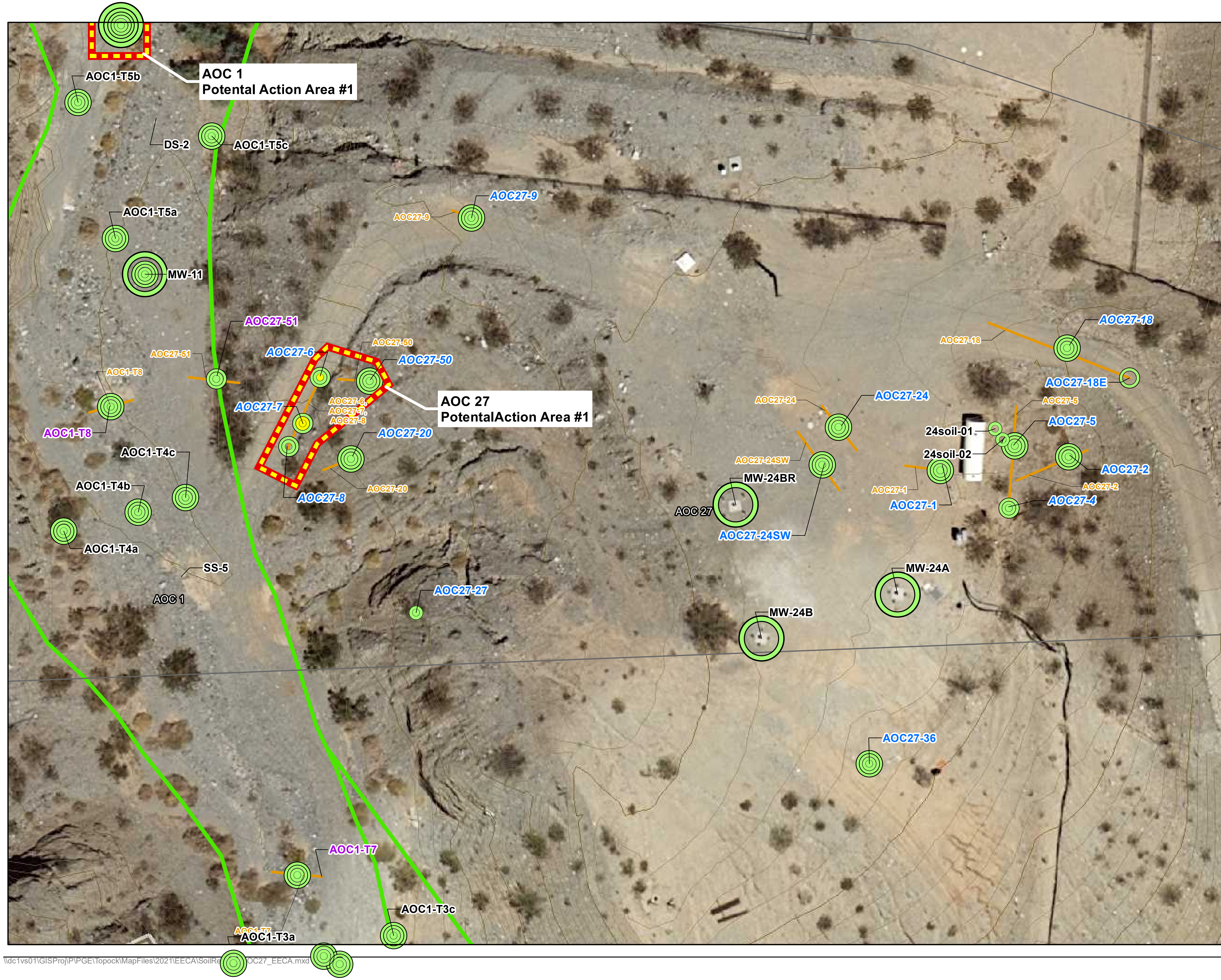
JACOBS



LEGEND

- Property Boundary
- Area of Concern
- Potential Action Area
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Soil Trench

Depth
- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >11 to 15 ft bgs
- >16 ft bgs

Factor of Exceedance (FOE)
- FOE <=1
- 1>FOE<=10

Note:

Topographic contours shown are in 2-foot intervals

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Copper
Removal Action Goal 145 mg/kg

N

0 15 30 60 Feet

Figure E-8c
Copper
Soil Sample Results
AOC 27
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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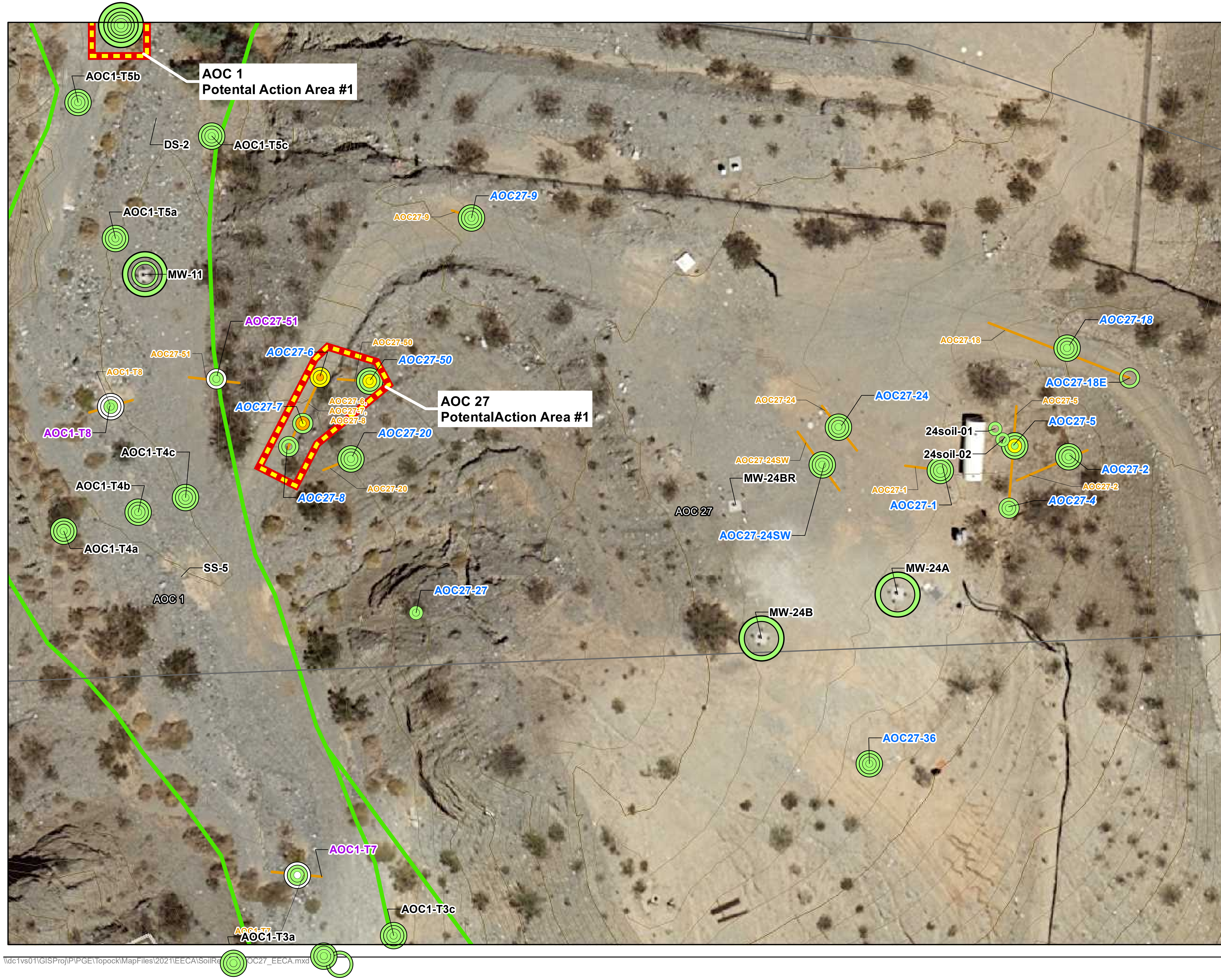
JACOBS



LEGEND

- Property Boundary
- Area of Concern
- Potential Action Area
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Soil Trench

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >11 to 15 ft bgs
- >16 ft bgs

Factor of Exceedance (FOE)

- ND
- FOE <=1
- 1>FOE<=10
- 10>FOE<=100

Note:

Topographic contours shown are in 2-foot intervals

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Lead
Removal Action Goal 36 mg/kg

N

0 15 30 60 Feet

Figure E-8d
Lead
Soil Sample Results
AOC 27
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

JACOBS

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LEGEND

- Property Boundary
- Area of Concern
- Potential Action Area
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Soil Trench

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >11 to 15 ft bgs
- >16 ft bgs

Factor of Exceedance (FOE)

- ND
- FOE <=1
- 1>FOE<=10
- 10>FOE<=100

Note:

Topographic contours shown are in 2-foot intervals

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Human Dioxins and Furans Toxicity Equivalency Quotient (TEQ)
Removal Action Goal <2ft 100 ng/kg

Mammal Dioxins and Furans Toxicity Equivalency Quotient (TEQ)
Removal Action Goal 2 to 10ft 190 ng/kg

N

0 15 30 60 Feet

Figure E-8e

Human and Mammal Dioxins and Furans TEQ Soil Sample Results AOC 27

Soil Engineering Evaluation/Cost Analysis

PG&E Topock Compressor Station, Needles, California

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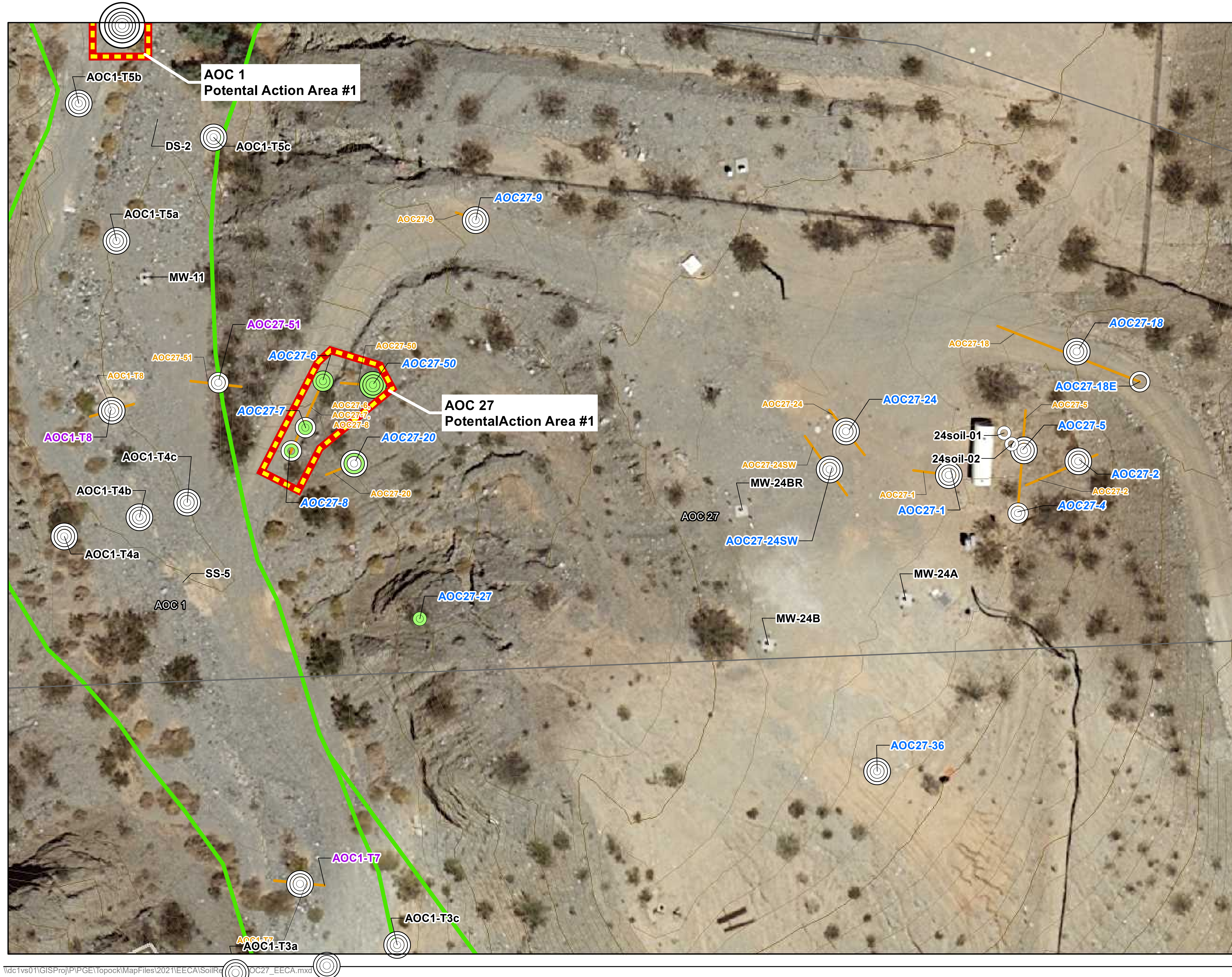

LEGEND

- Property Boundary
- Area of Concern
- Potential Action Area
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Soil Trench

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >11 to 15 ft bgs
- >16 ft bgs

Factor of Exceedance (FOE)

- ND
- FOE <=1

Note:

Topographic contours shown are in 2-foot intervals

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Mercury
Removal Action Goal 1 mg/kg

N

0 15 30 60 Feet

Figure E-8f
Mercury
Soil Sample Results
AOC 27
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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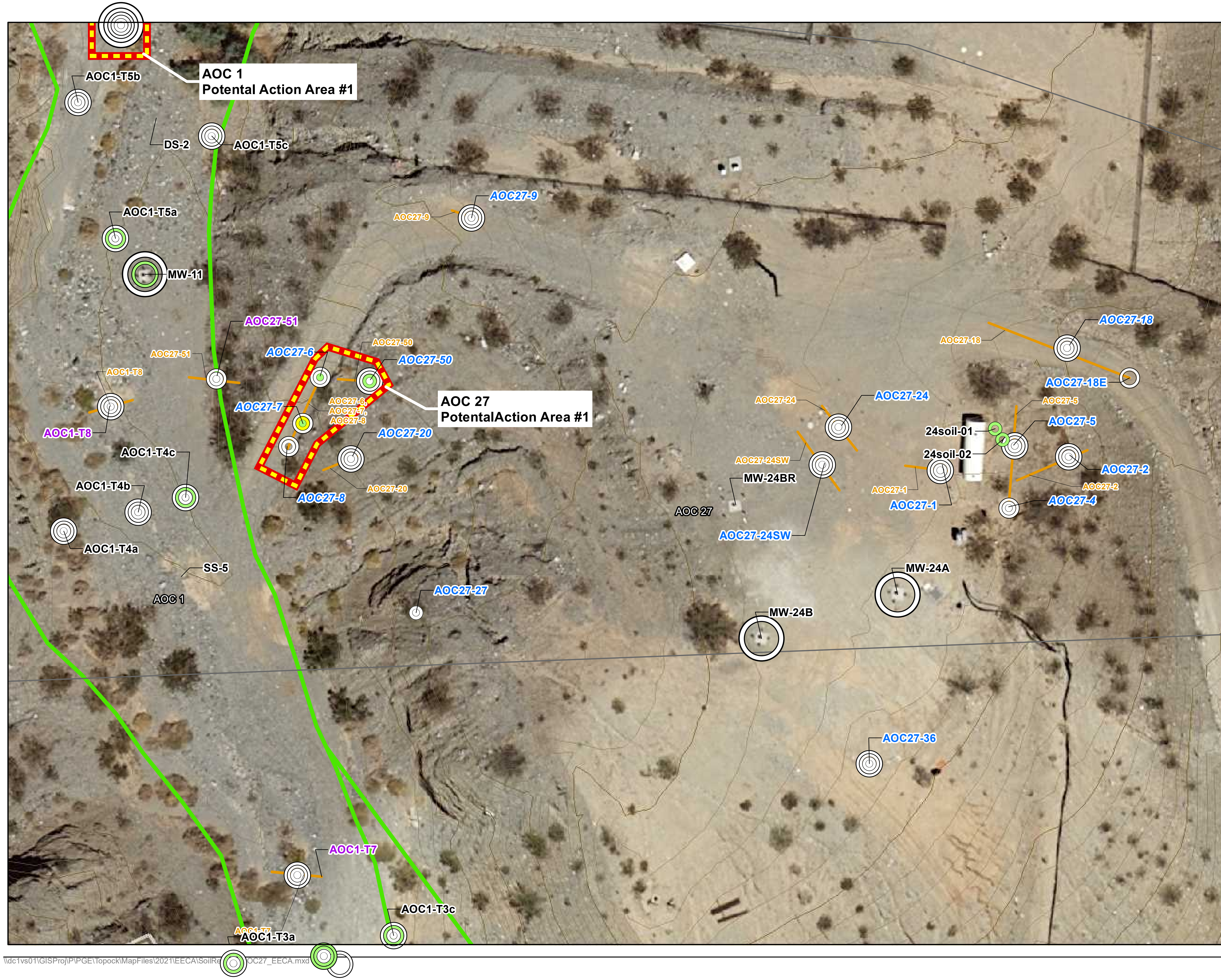

LEGEND

- Property Boundary
- Area of Concern
- Potential Action Area
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Soil Trench

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >11 to 15 ft bgs
- >16 ft bgs

Factor of Exceedance (FOE)

- ND
- FOE <=1
- 1>FOE<=10

Note:

Topographic contours shown are in 2-foot intervals

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Molybdenum
Removal Action Goal 22 mg/kg

N

0 15 30 60 Feet

Figure E-8g
Molybdenum
Soil Sample Results
AOC 27
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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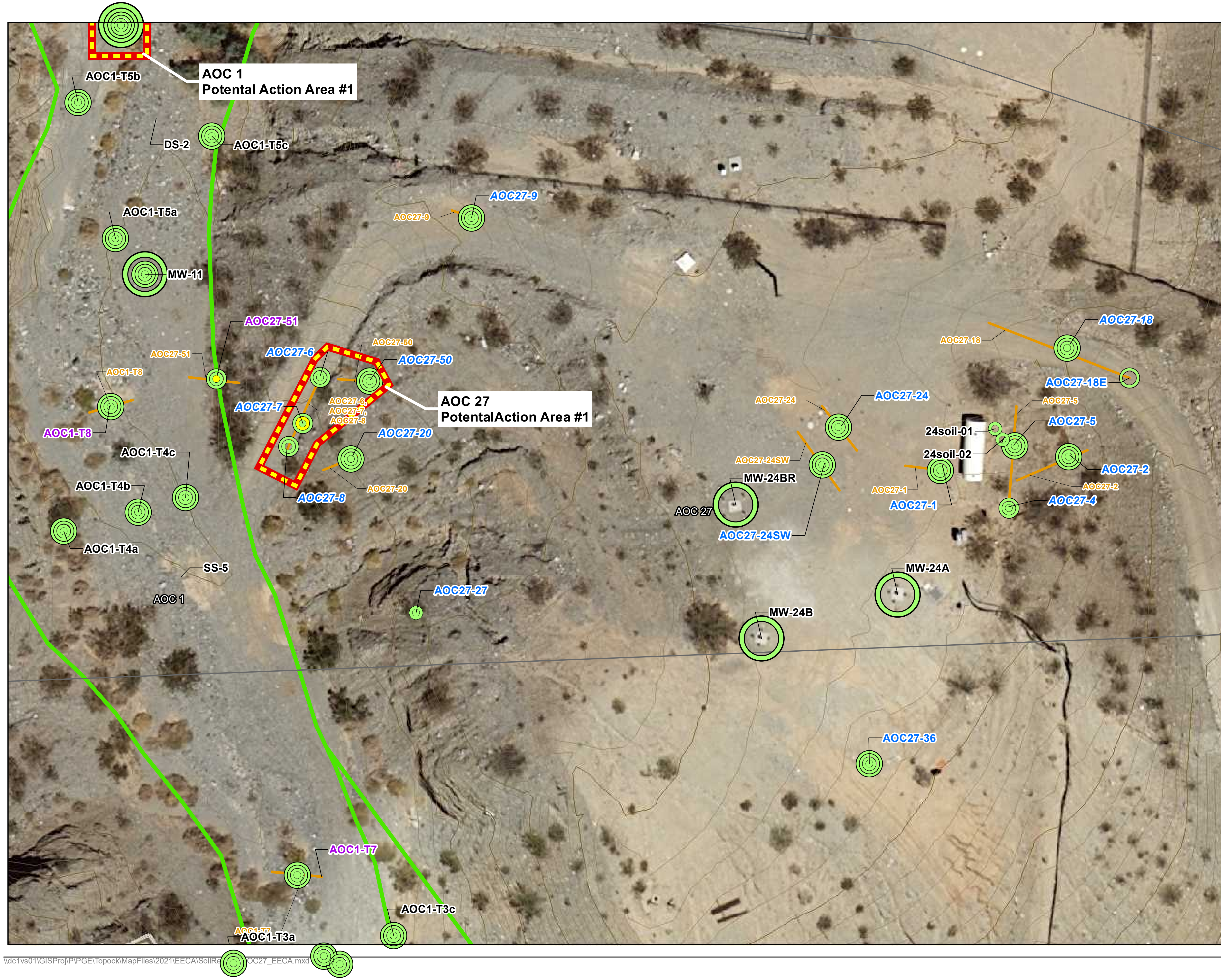

LEGEND

- Property Boundary
- Area of Concern
- Potential Action Area
- Approximate Location of Stormwater Piping Below Ground
- Approximate Location of Stormwater Piping Above Ground
- Soil Trench

Depth

- 0 to 1 ft bgs
- >1 to 3 ft bgs
- >3 to 6 ft bgs
- >6 to 10 ft bgs
- >11 to 15 ft bgs
- >16 ft bgs

Factor of Exceedance (FOE)

- FOE <=1
- 1>FOE<=10

Note:

Topographic contours shown are in 2-foot intervals

Locations labeled in VIOLET were part of the 2017 data.

Locations labeled in BLUE were part of the 2015-2016 data.

Locations labeled in BLACK were part of the pre-2015 data.

Zinc
Removal Action Goal 1,050 mg/kg

N

0 15 30 60 Feet

Figure E-8h
Zinc
Soil Sample Results
AOC 27
Soil Engineering Evaluation/Cost Analysis
PG&E Topock Compressor Station, Needles, California

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Appendix F
Treatability Study Results, Laboratory Data Packages, and Data Quality Evaluation Report

F1:
Treatability Study Results

HAZEN RESEARCH, INC.

4601 Indiana Street · Golden, Colorado 80403 USA
Phone: (303) 279-4501 · Fax: (303) 278-1528
www.hazenresearch.com

November 8, 2019

Email Delivery

Mr. Keith Sheets
Senior Project Manager
Jacobs Engineering Group
2020 SW 4th Avenue
Portland, OR 97201

Subject: Soil Remediation Study, Report
Hazen Project 12661
Report and Appendices A–G

Dear Mr. Sheets:

Jacobs Engineering Group contracted with Hazen Research, Inc. to conduct a bench-scale evaluation of remediation techniques for mitigating dioxin and heavy metals contamination in arid soils. Hazen and Jacobs exchanged information about this evaluation through a series of teleconferences, and Hazen prepared a scope of work and a cost estimate for the work envisioned by Jacobs. That scope of work, which includes a cost estimate, is in Appendix A.

This report presents the results of experiments, size distribution measurements, and analyses conducted on 14 nominally 35 kg soil samples provided by Jacobs.

SOIL SAMPLES

Fourteen 5 gal buckets composed of seven paired buckets were received at Hazen on May 10, 2019, and logged in to Hazen's sample tracking system (Appendix B) and registered in Hazen's treatability sample inventory. Following log-in, the samples were opened, inspected, and photographed. Figure 1 shows the buckets during opening, and Figure 2 illustrates the particle size range observed in the samples. The maximum particle size of the as-received samples was approximately 3 in.

Figure 1. Opening the Soil Sample Shipping Buckets

Figure 2. Appearance and Size Range of Typical Soil Sample

In accordance with the scope of work, the contents of each set of paired buckets were weighed, combined, and blended. The seven blended samples were logged in and assigned Hazen tracking numbers of 55197-1 through -7. These IDs correspond with Jacobs's sample IDs of EECA 1A/1B through 7A/7B.

After consulting with Jacobs, each sample was first scalped at $^3/_4$ in. to remove cobbles that likely contained lower levels of contaminants and that were too large for bench-scale thermal processing experiments. The minus $^3/_4$ in. soil was dry sieved at $^1/_4$ in. (at as-received moisture content), and representative splits were sieved at 4, 10, 30, 35, 70, 100, and 200 US mesh to measure the particle size distribution. All mesh sizes in this report are US mesh. Table 1 summarizes the coarse distribution for the seven soil samples, and Table 2 summarizes the particle size distribution of the minus $^1/_4$ in. soil. Appendix C contains the data reports for the sizing measurements.

Table 1. Summary of Particle Size Distribution, Entire Sample

Fractional Size, in.	Direct Retained, %						
	55197-1	55197-2	55197-3	55197-4	55197-5	55197-6	55197-7
> $^3/_4$	12.3	20.8	21.2	17.8	29.9	26.1	11.0
$^3/_4$ × $^1/_4$	26.8	35.3	32.5	30.6	13.4	13.2	27.2
< $^1/_4$	60.9	43.9	46.4	51.6	56.8	60.7	61.8

Table 2. Summary of Particle Size Distribution, Minus $^1/_4$ in. Soil

Retain Size		Cumulative Retained, %						
Mesh	µm	55197-1	55197-2	55197-3	55197-4	55197-5	55197-6	55197-7
4	4,760	5.8	6.8	6.9	7.4	5.4	5.3	4.7
10	2,000	35.9	43.8	43.8	45.4	33.8	34.2	29.9
30	595	75.9	85.2	80.9	86.7	72.3	75.0	63.3
35	500	80.8	88.7	84.5	90.2	77.1	79.7	68.3
70	210	95.3	98.0	96.6	98.2	93.9	95.1	92.6
100	149	97.1	98.8	97.9	98.8	96.3	97.3	95.9
200	74	98.8	99.5	98.9	99.3	98.8	99.1	99.0
-200	-74	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Because of the small quantity of material reporting to the fine fractions in the sieve analysis of minus $^1/_4$ in. soil, Jacobs requested that separate, larger splits of minus $^1/_4$ in. soil be wet sieved at 200 mesh for Samples 55197-3 and 55197-7. Table 3 summarizes the results of those measurements.

Table 3. Wet Sieving Results at 200 Mesh for Selected Samples

Size, mesh	55197-3		55197-7	
	Mass, kg	Weight %	Mass, kg	Weight %
< $^1/_4$ in. × > 200	1,813.6	95.0	1,700.1	89.2
< 200	94.7	5.0	206.1	10.8
Total	1,908.3		1,906.2	

Selected finer fractions ($^1/_4$ in. by 4 mesh, 4 by 70 mesh, 70 by 200 mesh, and less than 200 mesh) were analyzed for total chromium, hexavalent chromium, and zinc by Asset Laboratories (Las Vegas, Nevada). Table 4 summarizes the results, and Appendix D contains the analytical report.

Jacobs requested bulk density measurements on two of the seven composite samples, 55197-3 and -7. Hazen used 0.5 ft^3 cells to measure loose and packed bulk density values for these samples. Table 5 reports those results.

Table 4. Summary of Size Fraction Analyses[a]

Sample ID	Chromium, total, mg/kg			
	$^{1}/_{4}$ in. × 4 Mesh	4 Mesh × 70 Mesh	70 Mesh × 200 Mesh	< 200 Mesh
55197-1	500	2,100	3,200	4,700
55197-2	110	140	190	330
55197-3	1,000	1,600	2,600	7,400
55197-4	700	710	1,600	3,100
55197-5	340	1,300	1,300	2,500
55197-6	410	790	1,100	3,300
55197-7	210	1,800	2,500	4,600
Sample ID	**Chromium VI, mg/kg**			
	$^{1}/_{4}$ in. × 4 Mesh	4 Mesh × 70 Mesh	70 Mesh × 200 Mesh	< 200 Mesh
55197-1	8.0	17	19	21
55197-2	0.66	3.9	5.2	4.6
55197-3	8.1	17	25	57
55197-4	6.7	10	13	27
55197-5	3.8	16	17	29
55197-6	7.4	17	20	42
55197-7	5.3	22	28	49
Sample ID	**Zinc, mg/kg**			
	$^{1}/_{4}$ in. × 4 Mesh	4 Mesh × 70 Mesh	70 Mesh × 200 Mesh	< 200 Mesh
55197-1	54	110	160	170
55197-2	42	41	44	59
55197-3	90	110	150	330
55197-4	110	99	220	290
55197-5	59	100	110	150
55197-6	71	95	120	280
55197-7	59	190	240	410

[a]Analyses were conducted or coordinated by Asset Laboratories.

Table 5. Bulk Density Data

Sample ID	Bulk Density			
	lbs/ft^3		kg/m^3	
	Loose	Packed	Loose	Packed
55197-3	115	133	1,846	2,126
55197-7	113	131	1,805	2,105

Jacobs also requested measuring the volume percent of the minus $^1/_4$ in. material in the total sample for both Samples 55197-3 and -7. A bulk density cell was filled with the entire particle size range of each sample; the cell then was emptied and the contents were sieved at $^1/_4$ in. The minus $^1/_4$ in. material was replaced in the cell, tapped several times, and leveled. The height of the soil in the cell was measured and the volume was calculated and used to determine the fraction volume percent. Those data are reported in Table 6.

Table 6. Volume Fraction Data, Minus $^1/_4$ in.

Sample ID	Volume Fraction, minus $^1/_4$ in., %
55197-3	52
55197-7	69

Representative splits of the minus $^1/_4$ in. material from each of the seven samples were submitted to Asset Laboratories for US Environmental Protection Agency Method 8290 analysis. Table 7 summarizes the results (totals), and Appendix E contains the full analytical report.

Table 7. Summary of Dioxin Compounds Analyses[a] Minus $^1/_4$ in.

	Sample ID	55197-1	55197-2	55197-3	55197-4	55197-5	55197-6	55197-7
Dioxin Compounds[b] (Totals) ng/kg	TCDF	45	1	220	36	66	14	26
	TCDD	7	0	20	4	3	3	4
	PeCDF	490	15	3,400	360	700	280	500
	PeCDD	84	1	430	63	66	56	95
	HxCDF	1,700	45	9,400	840	2,200	1,800	3,900
	HxCDD	1,200	58	7,000	760	1,200	1,300	2,900
	HpCDF	4,000	97	21,000	1,100	4,700	9,000	31,000
	HpCDD	18,000	990	120,000	9,600	16,000	23,000	70,000
	OCDF	3,200	95	10,000	890	2,700	11,000	32,000
	OCDD	200,000	7,400	910,000	97,000	160,000	160,000	430,000

[a]The analyses were conducted or coordinated by Asset Laboratories.
[b]The abbreviations shown were used by the analytical laboratory to denote families of dioxin and furan compounds.

DIOXIN AND CHROMIUM TREATMENT: SOIL WASHING EXPERIMENTS

The scope of work specified batch, bench-scale thermal processing experiments to evaluate dioxin mitigation. Discussions with Jacobs resulted in a change in scope, specifically, eliminating thermal processing as an option. The decision considered complexities associated with onsite setup and operation of a suitable thermal device. Such a device would require significant site preparation, a high-volume natural gas supply, and possibly off-gas treatment equipment to ensure all contaminants were captured. Additionally, because dioxin thermal destruction requires strongly oxidizing high temperature combustion, there was concern that the trivalent chromium present in the soils could oxidize to hexavalent chromium. Finally, the thermally treated solids would require soil washing to remove heavy metal contaminants that were thought to be unaffected by the thermal treatment.

Because soil washing was indicated for metals removal, the revised scope prescribed soil washing experiments to evaluate removing both metals and dioxin. Hazen assembled batch washing vessels designed to roughly model the action of a trommel. The vessels were 1–gal plastic bottles, each fitted with two 1 in. polyethylene baffles that ran the length of the vessel. These vessels were rotated on rubber rollers as shown in Figure 3.

Figure 3. Batch Trommel Soil Washing Equipment Setup

In consultation with Jacobs, the experiment design was four experiments using the most contaminated sample, 55197-3. Minus $^{1}/_{4}$ in. material was used. Two baseline or control experiments used plain water as the wash solution, and two experiments used strong dosages (11.8 g/kg, dry solids basis) of Union Carbide Triton X-100 surfactant. The solids concentration in the slurry was 30% by weight, and the slurries were agitated on the rollers for 15 min each. After agitation, the vessel contents were wet sieved to separate the solids by size for analysis. Each pair of experiments (water, Triton X-100) was sieved at 35 and 70 mesh (500 and 210 μm, respectively). The oversized solids were dried at 50°C overnight. The undersized slurry was filtered to recover the solids, which were also dried at 50°C overnight. Figures 4 and 5 show examples of the oversized and undersized solids, respectively.

Figure 4. Example of Washed Oversized Solids

Figure 5. Example of Washed and Filtered Undersized Solids

Representative samples of the dried oversized and undersized washed solids were sent to Asset Laboratories for metals and dioxin compound analysis to evaluate the washing efficiency. Appendix F contains the data reports for these experiments. Appendix G contains Asset Laboratories' metals and dioxin analytical reports. Table 8 summarizes the results for metallic contaminants, and Table 9 summarizes the analytical results for and distribution of dioxin compounds.

Table 8. Summary of Trommel Soil Washing Experimental Data, Metals

Sample ID	Aqueous Phase	Sieve Size	Sample ID	Weight Percent	Analysis, mg/kg			Distribution,[a] %		
					Cr	Zn	Cr^{VI}	Cr	Zn	Cr^{VI}
55197-03	--	Minus 1/4 in.	Feed	--	1,644	112	17			
3973-51	Triton	35 (500 μm)	Oversize	82.9	540	71	3.8	27.1	52.4	18.5
			Undersize	17.1	4,000	210	21	41.5	32.0	21.1
3973-52	Water	35 (500 μm)	Oversize	82.4	540	63	4.1	26.8	46.0	47.8
			Undersize	17.6	2,900	160	21	30.8	24.9	52.2
3973-53	Triton	70 (210 μm)	Oversize	91.3	630	70	5.2	35.2	73.9	66.2
			Undersize	8.7	5,900	260	28	31.3	26.1	33.8
3973-54	Water	70 (210 μm)	Oversize	91.1	720	84	6.4	39.9	78.3	75.8
			Undersize	8.9	5,300	240	21	28.5	21.7	24.2

[a]Distribution values for each analyte do not total 100%, presumably because of analytical error and/or dissolution of the metal in the solution.

Table 9. Summary of Trommel Soil Washing Experimental Data, Dioxin Compounds (totals)

Experiment or Sample ID: / Washing Solution: / Washed Solids Cut, Mesh:		3973-51 / Triton X-100 / 35 (500 µm)				3973-52 / Water / 35 (500 µm)				3973-53 / Triton X-100 / 70 (210 µm)				3973-54 / Water / 70 (210 µm)				Site Soil Sample EECA 3A/3B 55197-3
		Analysis, ng/kg		Distribution,[a] %		Analysis, ng/kg		Distribution,[a] %		Analysis, ng/kg		Distribution,[a] %		Analysis, ng/kg		Distribution,[a] %		Analysis, ng/kg
		Oversize	Undersize	Oversize	Undersize	Oversize	Undersize	Oversize	Undersize	Oversize	Undersize	Oversize	Undersize	Oversize	Undersize	Oversize	Undersize	<1/4 in.
Dioxin Compounds[b] (Totals)	TCDF	17	640	6	50	69	1,200	26	95	25	1,300	10	52	17	1,900	7	76	220
	TCDD	nd	68	0	58	5	140	18	122	1	160	4	70	3	210	13	93	20
	PeCDF	210	8,400	5	42	680	16,000	16	82	320	17,000	9	44	230	26,000	6	68	3,400
	PeCDD	33	1,400	6	56	82	2,400	16	97	62	2,800	13	57	41	4,100	9	84	430
	HxCDF	710	32,000	6	58	1,500	53,000	13	98	1,000	66,000	10	61	830	93,000	8	88	9,400
	HxCDD	630	26,000	7	63	960	44,000	11	110	970	54,000	13	67	700	74,000	9	94	7,000
	HpCDF	1,600	79,000	6	64	2,000	120,000	8	100	2,200	190,000	10	79	1,800	230,000	8	97	21,000
	HpCDD	7,700	550,000	5	78	9,100	550,000	6	80	12,000	950,000	9	69	8,100	660,000	6	49	120,000
	OCDF	1,200	140,000	10	239	1,100	130,000	9	227	1,400	290,000	13	253	1,200	380,000	11	336	10,000
	OCDD	70,000	5,300,000	6	99	77,000	5,800,000	7	111	120,000	7,800,000	12	75	80,000	7,400,000	8	72	910,000

nd = not detected

[a]Distribution values greater than 100% indicate analytical discrepancy. For oversize plus undersize values less than 100%, the balance is assumed to have reported to the aqueous phase, or indicates analytical discrepancy.

[b]The abbreviations shown were used by the analytical laboratory to denote families of dioxin and furan compounds.

The data show that metals and dioxin compounds concentrated in the undersized fraction for all four experiments, as expected. For the metals and the dioxin compounds, the use of Triton X-100 surfactant did not appear to significantly affect the distribution of contaminants when compared with the baseline using water.

After reviewing these results, Jacobs elected to end this phase of the treatability study.

Thank you for the opportunity to conduct this work. Please contact me with any questions that arise during your review of the information.

Regards,

R. Lee Schwartz
Project Manager

RLS/lch

xc: Tom Broderick, Hazen Research, Inc.

APPENDIX A

Hazen Scope of Work and Cost Estimate

Keith,

Thank you for requesting a preliminary cost estimate from Hazen for bench-scale evaluation of dioxin- and metals-contaminated soil remediation techniques. Based on our email exchange over the past week or so, I put together a scope of work to serve as the basis of the estimate.

Jacobs will obtain 7 soil samples in 14 nominally 5-gallon pails, 2 pails per each unique sample. The particle size distribution may range from cobble size to fine sand. The soil samples are contaminated with both dioxin and regulated metals. Hazen will receive these samples, log them into its internal sample logging system and assign unique identification numbers, and enter the samples and quantities into the treatability sample logging system.

After the samples are opened, Hazen will observe all recommended exposure prevention techniques including engineering controls for dust and vapor, and PPE including APRs, nitrile gloves, Tyvek suits, etc.

Each pair of buckets will be opened, photographed, then blended to create a single sample. This procedure will result in seven composite samples for subsequent study. If the top size of the samples is larger than a size specified by Jacobs, each sample will be scalped at the specified with the minus fraction advanced to subsequent study. The oversized material will be reserved for alternative study and/or return to Jacobs.

The seven undersized scalped samples will be split down using cone-and-quarter or riffle splitter techniques to obtain seven representative head samples. These will be containerized, packaged and shipped to Asset Laboratories for dioxin and metals analysis (metals TBD). The results of analysis will guide the selection of the two samples with the highest concentration of contaminants.

The two selected samples will be sieved, either in their entirety of by obtaining a representative sample of each, to measure the particle size distribution. The bottom sieve size will be 53 µm. The size distribution of the minus 53 µm solids optionally can be obtained using Hazen's laser diffractometer.

The selected samples will be scalped at a size specified by Jacobs, and the over- and under-sized material will be split down to obtain representative head samples. These two sample pairs (undersized and oversized) will be containerized and sent for dioxin and metals (TBD) analysis by Asset Laboratories.

Six thermal treatment experiments will be conducted on the bulk selected samples (2), the oversized selected samples (2), and the undersized selected samples (2). Hazen will consult with Jacobs to confirm the type and conditions of the thermal treatment. Treated samples will be analyzed for dioxin and metals (TBD) by Asset Laboratories.

The two selected samples will be scalped at a size specified by Jacobs; the oversized solids will be used in soil washing studies. Hazen proposes to utilize a batch, bench-scale attrition cell for these experiments.

Attrition cell operation involves high-rpm stirring of a dense slurry using aggressive impellers in a vessel providing a high ratio of prop diameter to vessel diameter. Two experiments for each sample (2) are proposed: one using hot tap water as the lixiviant, and one using Dow Triton X-100 (nonionic organic surfactant) in water at an arbitrary dosage. The experiments using tap water will provide baseline data for comparison purposes. Although many potentially effective surfactants are available, the two experiment types proposed should indicate the potential for dioxin and metals removal using this technique. Because Hazen conducts projects on a time-and-materials basis, the scope readily can be increased based on the results of experimentation.

The attritioned slurry samples will be filtered and washed with hot water or dilute surfactant solution as appropriate. The washed solids will be dried at low temperature in a vented oven. Dried solids and filtrate/wash samples will be analyzed for dioxin and metals, and the removal efficiencies of each experiment will be calculated.

A data packet including procedural data, photographs, analytical results, and experiment data reports will be prepared and issued to Jacobs following completion of the program. All samples, and experiment products must be returned to Jacobs at the conclusion of the work.

The preliminary estimated cost of the work described above is $37,800 including a 15% contingency; the estimated charges are itemized in Table 1. Note that analytical work will be subcontracted and therefore is shown as a direct cost.

Table 1. Summary of Estimated Costs
Hazen Proposal 2019-129

Task Description	Task #	Estimated Costs, $US			
		Labor	Analytical	Directs	Sub-total
Receive and log in samples, initiate treatability study	1	700	0	0	700
Scalp and composite bucket pairs, prepare head samples	2	1,100	0	0	1,100
Submit head samples for SW846 Method 8290, metals	3	400	0	5,600	6,000
Select 2 composites; conduct PSD; analyze minus 3/8"	4	700	0	1,700	2,400
Thermal treatment (TBD); 2 composites; analysis by 8290					
Bulk sample, analyze treated solids for metals, by 8290	5	1,700	0	1,700	3,400
Minus 3/8", analyze treated solids for metals, by 8290	6	1,700	0	1,700	3,400
Plus 3/8", analyze treated solids for metals, by 8290	7	1,700	0	1,700	3,400
Soil washing experiments on coarse-grained solids, analysis	8	2,500	0	6,400	8,900
Data reduction, prepare data package	9	3,500	0	0	3,500
	Sub-total:	14,000	0	18,800	32,800
				Contingency, 15%:	5,000
				Total estimated cost:	37,800

The work is estimated to require 8 weeks to complete. Figure 1 illustrates the projected schedule. Note that the schedule is quite aggressive, and allows 2 weeks for analysis of experiment products, including shipping times.

Task Description	Task #	Week 1	2	3	4	5	6	7	8
Receive and log in samples, initiate treatability study	1								
Scalp and composite bucket pairs, prepare head samples	2								
Submit head samples for SW846 Method 8290, metals	3		Analysis						
Select 2 composites; conduct PSD; analyze minus 3/8"	4					Analysis			
Thermal treatment (TBD); 2 composites; analysis by 8290									
Bulk sample, analyze treated solids for metals, by 8290	5					Analysis			
Minus 3/8", analyze treated solids for metals, by 8290	6					Analysis			
Plus 3/8", analyze treated solids for metals, by 8290	7					Analysis			
Soil washing experiments on coarse-grained solids, analysis	8					Analysis			
Data reduction, prepare data package	9								

Work can begin upon execution of a contractual agreement and receipt of the samples and an initial deposit of $7,500. Hazen's Professional Services Agreement, a simple time and materials contract, may be used if it is agreeable to Jacobs.

APPENDIX B

Hazen Sample Log-In

HAZEN

Sample Received

HRI Number: 55197

Project Number: 12661

Proposal Number:

Project Manager: Schwartz, Robert

Client: Jacobs Engineering/Arcadis

Client Rep:

Rep Contact Info:

Via:

HRI Comments:

Description: dioxin contaminated soil w/heavy metals

Entered by Employee: Benton, Gary

Date Received: 5/10/2019

Sample Physical State: Solid

Sample Container Type: Bucket

Total No of Samples: 7

Approx Wt. of Sample: > 100 lb

Treatability Study (Yes/No): Yes

Hazards

Dust (Yes/No): Yes

Radioactive (Yes/No): No

Toxic (Yes/No): No

Unknown (Yes/No): No

Flammable (Yes/No): No

Coorosive (Yes/No): No

Other Hazard (Yes/No): yes Description: dioxin/furan

Non-Hazardous (Yes/No): No

UniqueID	HRI Sample	Split	Sub Split	SampleID or Description	Container Type	Physical State	Sample Net Wt.	Net Wt. Units
2019I-000367	55197-0001			EECA 1A/1B	Bucket	Solid	68.6	kg
2019I-000368	55197-0002			EECA 2A/2B	Bucket	Solid	71.8	kg
2019I-000369	55197-0003			EECA 3A/3B	Bucket	Solid	73.9	kg
2019I-001048	55197-0003	001		EECA 3A/3B	Bucket	Solid	400	g
2019I-001049	55197-0003	002		EECA 3A/3B	Bucket	Solid	400	g
2019I-001050	55197-0003	003		EECA 3A/3B	Bucket	Solid	400	g
2019I-001051	55197-0003	004		EECA 3A/3B	Bucket	Solid	400	g
2019I-000370	55197-0004			ECCA 4A/4B	Bucket	Solid	71.3	kg
2019I-000371	55197-0005			ECCA 5A/5B	Bucket	Solid	72.1	kg

Sample Received

UniqueID	HRI Sample	Split	Sub Split	SampleID or Description	Container Type	Physical State	Sample Net Wt.	Net Wt. Units
2019I-000372	55197-0006			ECCA 6A/6B	Bucket	Solid	69.8	kg
2019I-000373	55197-0007			ECCA 7A/7B	Bucket	Solid	71	kg

APPENDIX C

Sample 55197-1 through -7 Particle Size Distribution Measurement Reports

Particle Size Distribution
Hazen Project 12661

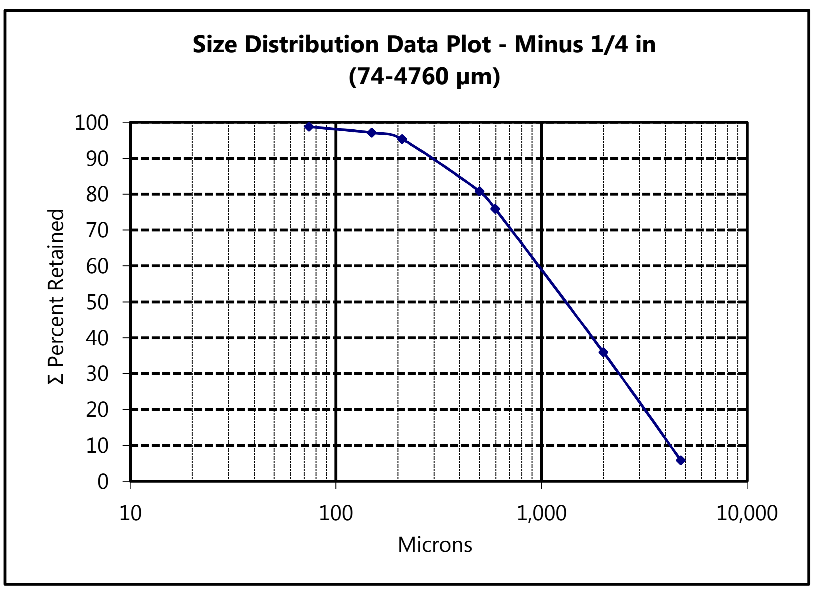
Sample ID: 55197-1

Procedure: The sample was dry-screened at each sieve size listed.

Fractional Size, in	Direct Mass, kg	Direct Weight %
>3/4	8.02	12.3
3/4 x 1/4	17.4	26.8
<1/4	39.62	60.9
Total:	65.04	100

US Standard Sieve Data

Minus 1/4-in Split						Entire Sample Basis	
Retain Size		Direct		Cumulative Weight %		Direct	
mesh	microns	Weight, g	Weight, %	Passing	Retained	Mass, <1/4 in, kg	Weight, % <1/4 in
4	4760	59.7	5.8	94.2	5.8	2.32	3.6
10	2000	307.4	30.1	64.1	35.9	11.93	18.3
30	595	408.2	40.0	24.1	75.9	15.84	24.3
35	500	49.4	4.8	19.2	80.8	1.92	2.9
70	210	148.6	14.6	4.7	95.3	5.77	8.9
100	149	18.4	1.8	2.9	97.1	0.71	1.1
200	74	17.1	1.7	1.2	98.8	0.66	1.0
-200	-74	12.4	1.2	0.0	100.0	0.48	0.7
		1021.2	100.0			39.62	60.9



Particle Size Distribution
Hazen Project 12661

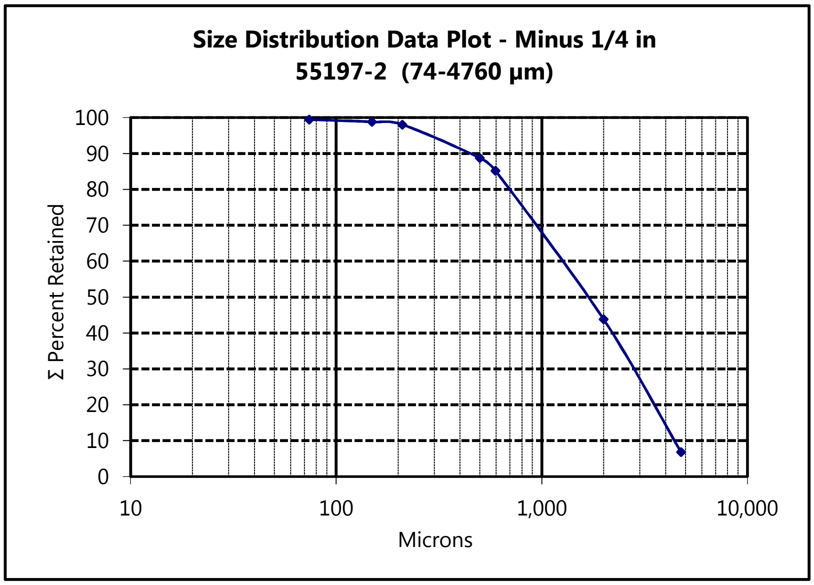
Sample ID: 55197-2

Procedure: The sample was dry-screened at each sieve size listed.

Fractional Size, in	Direct Mass, kg	Direct Weight %
>3/4	14.18	20.8
3/4 x 1/4	24.1	35.3
<1/4	29.94	43.9
Total:	68.22	100

US Standard Sieve Data

Minus 1/4-in Split						Entire Sample Basis	
Retain Size		Direct		Cumulative Weight %		Direct	
mesh	microns	Weight, g	Weight, %	Passing	Retained	Mass, <1/4 in, kg	Weight, % <1/4 in
4	4760	70.1	6.8	93.2	6.8	2.05	3.0
10	2000	379.2	36.9	56.2	43.8	11.06	16.2
30	595	424.9	41.4	14.8	85.2	12.40	18.2
35	500	36.6	3.6	11.3	88.7	1.07	1.6
70	210	95.3	9.3	2.0	98.0	2.78	4.1
100	149	8.0	0.8	1.2	98.8	0.23	0.3
200	74	6.6	0.6	0.5	99.5	0.19	0.3
-200	-74	5.6	0.5	0.0	100.0	0.16	0.2
		1026.3	100.0			29.94	43.9



Particle Size Distribution
Hazen Project 12661

Sample ID: 55197-3

Procedure: The sample was dry-screened at each sieve size listed.

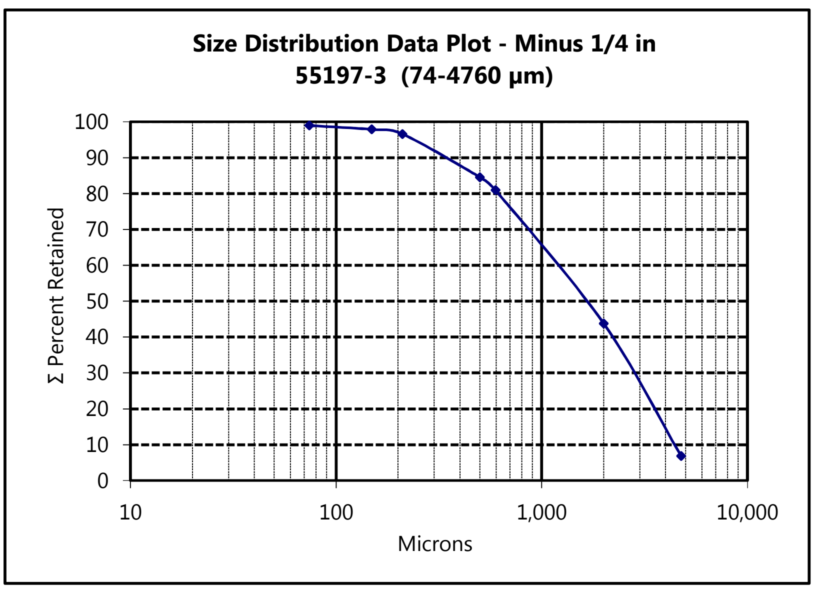
Fractional Size, in	Direct Mass, kg	Direct Weight %
>3/4	14.8	21.2
3/4 x 1/4	22.7	32.5
<1/4	32.42	46.4
Total:	69.92	100

The sample was wet-screened at each sieve size listed.

Minus 1/4" Size, mesh	Direct Mass, kg	Direct Weight %
>200	1813.6	95.0
<200	94.7	5.0
	1908.3	

US Standard Sieve Data

Minus 1/4-in Split						Entire Sample Basis	
Retain Size		Direct		Cumulative Weight %		Direct	
mesh	microns	Weight, g	Weight, %	Passing	Retained	Mass, <1/4 in, kg	Weight, % <1/4 in
4	4760	69.4	6.9	93.1	6.9	2.23	3.2
10	2000	373.1	36.9	56.2	43.8	11.96	17.1
30	595	375.5	37.1	19.1	80.9	12.04	17.2
35	500	36.7	3.6	15.5	84.5	1.18	1.7
70	210	121.7	12.0	3.4	96.6	3.90	5.6
100	149	12.9	1.3	2.1	97.9	0.41	0.6
200	74	10.9	1.1	1.1	98.9	0.35	0.5
-200	-74	10.8	1.1	0.0	100.0	0.35	0.5
		1011.0	100.0			32.42	46.4



Particle Size Distribution
Hazen Project 12661

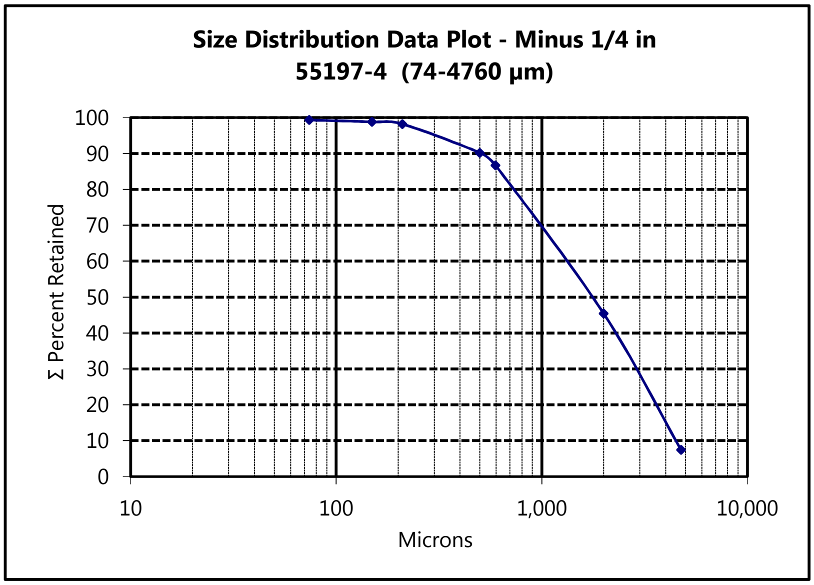
Sample ID: 55197-4

Procedure: The sample was dry-screened at each sieve size listed.

Fractional Size, in	Direct Mass, kg	Direct Weight %
>3/4	12.02	17.8
3/4 x 1/4	20.68	30.6
<1/4	34.84	51.6
Total:	67.54	100

US Standard Sieve Data

Minus 1/4-in Split						Entire Sample Basis	
Retain Size		Direct		Cumulative Weight %		Direct	
mesh	microns	Weight, g	Weight, %	Passing	Retained	Mass, <1/4 in, kg	Weight, % <1/4 in
4	4760	74.5	7.4	92.6	7.4	2.59	3.8
10	2000	379.9	38.0	54.6	45.4	13.23	19.6
30	595	413.0	41.3	13.3	86.7	14.38	21.3
35	500	34.7	3.5	9.8	90.2	1.21	1.8
70	210	80.5	8.0	1.8	98.2	2.80	4.2
100	149	5.9	0.6	1.2	98.8	0.21	0.3
200	74	5.2	0.5	0.7	99.3	0.18	0.3
-200	-74	6.8	0.7	0.0	100.0	0.24	0.4
		1000.5	100.0			34.84	51.6



Particle Size Distribution
Hazen Project 12661

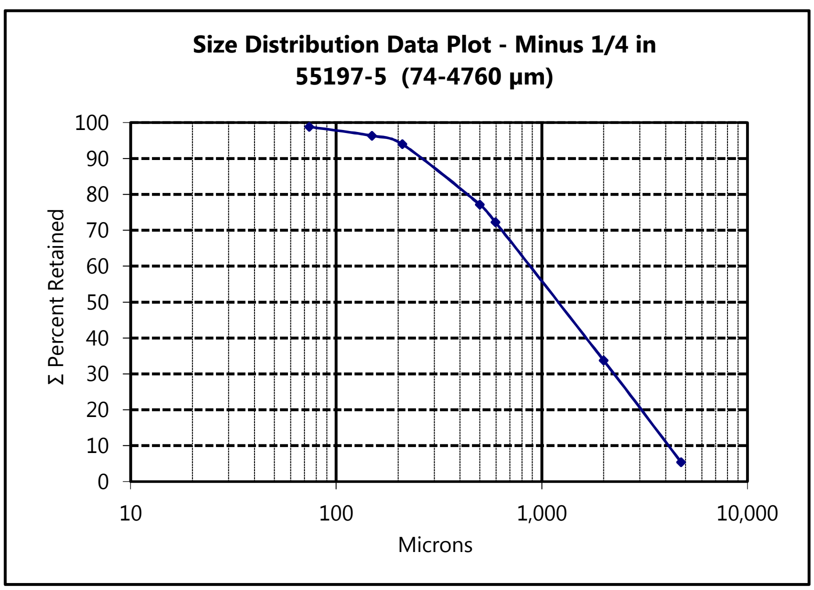
Sample ID: 55197-5

Procedure: The sample was dry-screened at each sieve size listed.

Fractional Size, in	Direct Mass, kg	Direct Weight %
>3/4	20.34	29.9
3/4 x 1/4	9.12	13.4
<1/4	38.66	56.8
Total:	68.12	100

US Standard Sieve Data

Minus 1/4-in Split						Entire Sample Basis	
Retain Size		Direct		Cumulative Weight %		Direct	
mesh	microns	Weight, g	Weight, %	Passing	Retained	Mass, <1/4 in, kg	Weight, % <1/4 in
4	4760	54.1	5.4	94.6	5.4	2.10	3.1
10	2000	282.9	28.3	66.2	33.8	10.96	16.1
30	595	384.3	38.5	27.7	72.3	14.88	21.8
35	500	48.6	4.9	22.9	77.1	1.88	2.8
70	210	168.0	16.8	6.1	93.9	6.51	9.6
100	149	23.9	2.4	3.7	96.3	0.93	1.4
200	74	24.6	2.5	1.2	98.8	0.95	1.4
-200	-74	11.9	1.2	0.0	100.0	0.46	0.7
		998.3	100.0			38.66	56.8



Particle Size Distribution
Hazen Project 12661

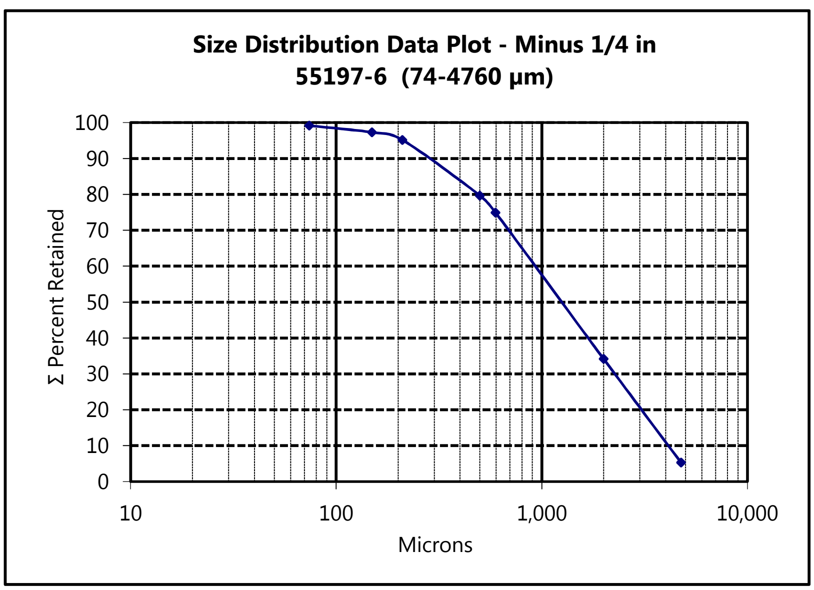
Sample ID: 55197-6

Procedure: The sample was dry-screened at each sieve size listed.

Fractional Size, in	Direct Mass, kg	Direct Weight %
>3/4	17.32	26.1
3/4 x 1/4	8.72	13.2
<1/4	40.24	60.7
Total:	66.28	100

US Standard Sieve Data

Minus 1/4-in Split						Entire Sample Basis	
Retain Size		Direct		Cumulative Weight %		Direct	
mesh	microns	Weight, g	Weight, %	Passing	Retained	Mass, <1/4 in, kg	Weight, % <1/4 in
4	4760	54.4	5.3	94.7	5.3	2.12	3.2
10	2000	298.3	28.9	65.8	34.2	11.63	17.5
30	595	421.1	40.8	25.0	75.0	16.41	24.8
35	500	48.7	4.7	20.3	79.7	1.90	2.9
70	210	159.6	15.5	4.9	95.1	6.22	9.4
100	149	22.3	2.2	2.7	97.3	0.87	1.3
200	74	19.1	1.9	0.9	99.1	0.74	1.1
-200	-74	8.8	0.9	0.0	100.0	0.34	0.5
		1032.3	100.0			40.24	60.7



Particle Size Distribution
Hazen Project 12661

Sample ID: 55197-7

Procedure: The sample was dry-screened at each sieve size listed.

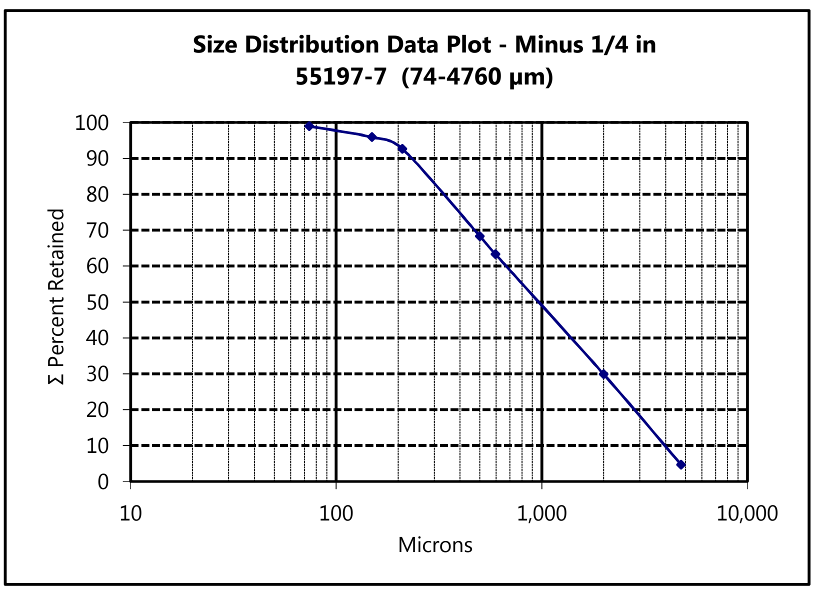
Fractional Size, in	Direct Mass, kg	Direct Weight %
>3/4	7.46	11.0
3/4 x 1/4	18.38	27.2
<1/4	41.76	61.8
Total:	67.6	100

The sample was wet-screened at each sieve size listed.

Minus 1/4" Size, mesh	Direct Mass, kg	Direct Weight %
>200	1700.1	89.2
<200	206.1	10.8
	1906.2	

US Standard Sieve Data

Minus 1/4-in Split						Entire Sample Basis	
		Direct				Direct	
Retain Size		Weight,	Weight,	Cumulative Weight %		Mass,	Weight, %
mesh	microns	g	%	Passing	Retained	<1/4 in, kg	<1/4 in
4	4760	46.2	4.7	95.3	4.7	1.95	2.9
10	2000	248.9	25.2	70.1	29.9	10.52	15.6
30	595	330.1	33.4	36.7	63.3	13.96	20.6
35	500	49.4	5.0	31.7	68.3	2.09	3.1
70	210	240.3	24.3	7.4	92.6	10.16	15.0
100	149	32.3	3.3	4.1	95.9	1.37	2.0
200	74	30.1	3.0	1.0	99.0	1.27	1.9
-200	-74	10.3	1.0	0.0	100.0	0.44	0.6
		987.6	100.0			41.76	61.8



F2:
Laboratory Data Packages

APPENDIX D

Size Fraction Metals Analysis, Asset Laboratories

July 05, 2019

Lee Schwartz
CH2M HILL
155 Grand Avenue, Suite 1000
Oakland, CA 94612
TEL: (303) 279-4501
FAX: (510) 622-9129

Workorder No.: N036051

RE:

Attention: Lee Schwartz

Enclosed are the results for sample(s) received on June 14, 2019 by ASSET Laboratories. The sample(s) are tested for the parameters as indicated in the enclosed chain of custody in accordance with the applicable laboratory certifications.

Thank you for the opportunity to service the needs of your company.

Please feel free to call me at (702) 307-2659 if I can be of further assistance to your company.

Sincerely,

Nancy Sibucao for

Quennie Manimtim
Laboratory Director

CLIENT:	CH2M HILL	
Project:		**CASE NARRATIVE**
Lab Order:	N036051	

SAMPLE RECEIVING/GENERAL COMMENTS:

All sample containers were received intact with proper chain of custody documentation.

Information on sample receipt conditions including discrepancies can be found in attached Sample Receipt Checklist Form.

Cooler temperature and sample preservation were verified upon receipt of samples if applicable.

Samples were analyzed within method holding time.

Subcontracted Analyses:

Metals by EPA 6010B was subcontracted to BC Labs- Bakersfield,CA.

Analytical Comments for EPA 7199:

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) are outside recovery criteria in QC samples N036051-027A-MS and N036051-027A-MSD possibly due to matrix interference. Post Spike and Matrix Spike Insoluble met acceptance criteria. The associated Laboratory Control Sample (LCS) recovery was also acceptable.

CLIENT: CH2M HILL
Project:
Lab Order: N036051
Contract No:

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date	Date Received	Date Reported
N036051-001A	55197-1, -1/4x4M	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-002A	55197-1, -4Mx70M	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-003A	55197-1 70x200	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-004A	55197-1-200	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-005A	55197-2 1/4X4	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-006A	55197-2 4x701	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-007A	55197-2 70x200	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-008A	55197-2-200	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-009A	55197-3 1/4x4	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-010A	55197-3 4x701	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-011A	55197-3 70x200	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-012A	55197-3-200	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-013A	55197-4 1/4x4	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-014A	55197-4 4x701	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-015A	55197-4 70x200	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-016A	55197-4-200	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-017A	55197-5 1/4x4	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-018A	55197-5 4x701	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-019A	55197-5 70x200	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-020A	55197-5-200	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-021A	55197-6 1/4x4	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-022A	55197-6 4x701	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-023A	55197-6 70x200	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-024A	55197-6-200	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-025A	55197-7 1/4x4	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-026A	55197-7 4x701	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-027A	55197-7 70x200	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019
N036051-028A	55197-7-200	Soil	6/7/2019 10:00:00 AM	6/14/2019	7/5/2019

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-1, -1/4x4M
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-001		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190618A**	QC Batch: **74234**			PrepDate **6/17/2019**			Analyst: **RAB**
Hexavalent Chromium	8.0	0.058	0.20		mg/Kg-dry	1	6/19/2019 12:44 AM

Qualifiers:

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference
- DO Surrogate Diluted Out
- E Value above quantitation range
- ND Not Detected at the Reporting Limit
- Results are wet unless otherwise specified

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-1, -4Mx70M
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-002		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
	EPA 3060A			**EPA 7199**			
RunID: **NV00922-IC6_190618A**	QC Batch: **74234**			PrepDate **6/17/2019**			Analyst: **RAB**
Hexavalent Chromium	17	0.29	1.0		mg/Kg-dry	5	6/19/2019 01:33 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-1 70x200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-003		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190618A**	QC Batch: **74234**			PrepDate **6/17/2019**			Analyst: **RAB**
Hexavalent Chromium	19	0.29	1.0		mg/Kg-dry	5	6/19/2019 02:38 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-1-200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-004		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190618A**	QC Batch: **74234**			PrepDate **6/17/2019**			Analyst: **RAB**
Hexavalent Chromium	21	0.29	1.0		mg/Kg-dry	5	6/19/2019 02:59 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-2 1/4X4
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-005		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190618A**	QC Batch: **74234**			PrepDate **6/17/2019**			Analyst: **RAB**
Hexavalent Chromium	0.66	0.058	0.20		mg/Kg-dry	1	6/19/2019 12:53 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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ELAP Cert 2676 | NV Cert NV00922
ORELAP/NELAP Cert 4046

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-2 4x701
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-006		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190618A**	QC Batch: **74234**		PrepDate **6/17/2019**				Analyst: **RAB**
Hexavalent Chromium	3.9	0.058	0.20		mg/Kg-dry	1	6/19/2019 01:03 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

ASSET Laboratories

ANALYTICAL RESULTS

Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-2 70x200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-007		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190618A** QC Batch: **74234**				PrepDate **6/17/2019**			Analyst: **RAB**
Hexavalent Chromium	5.2	0.058	0.20		mg/Kg-dry	1	6/18/2019 11:34 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-2-200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-008		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190618A**	QC Batch: **74234**			PrepDate **6/17/2019**			Analyst: **RAB**
Hexavalent Chromium	4.6	0.059	0.20		mg/Kg-dry	1	6/18/2019 10:34 PM

Qualifiers:

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference
- DO Surrogate Diluted Out
- E Value above quantitation range
- ND Not Detected at the Reporting Limit
- Results are wet unless otherwise specified

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CLIENT:	CH2M HILL	**Client Sample ID:**	55197-3 1/4x4
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-009		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190618A**	QC Batch: **74234**			PrepDate **6/17/2019**			Analyst: **RAB**
Hexavalent Chromium	8.1	0.058	0.20		mg/Kg-dry	1	6/18/2019 11:44 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-3 4x701
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-010		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190618A**	QC Batch: **74234**			PrepDate **6/17/2019**			Analyst: **RAB**
Hexavalent Chromium	17	0.29	1.0		mg/Kg-dry	5	6/19/2019 04:39 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-3 70x200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-011		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190618A**	QC Batch: **74234**			PrepDate **6/17/2019**			Analyst: **RAB**
Hexavalent Chromium	25	0.29	1.0		mg/Kg-dry	5	6/19/2019 03:39 AM

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ANALYTICAL RESULTS

Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-3-200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-012		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A / **EPA 7199**							
RunID: **NV00922-IC6_190618A** QC Batch: **74234** PrepDate **6/17/2019** Analyst: **RAB**							
Hexavalent Chromium	57	0.29	1.0		mg/Kg-dry	5	6/19/2019 03:59 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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CLIENT:	CH2M HILL	**Client Sample ID:**	55197-4 1/4x4
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-013		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190618A**	QC Batch: **74234**			PrepDate **6/17/2019**			Analyst: **RAB**
Hexavalent Chromium	6.7	0.059	0.20		mg/Kg-dry	1	6/19/2019 12:04 AM

ANALYTICAL RESULTS

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Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-4 4x701
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-014		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190618A**	QC Batch: **74234**			PrepDate **6/17/2019**			Analyst: **RAB**
Hexavalent Chromium	10	0.058	0.20		mg/Kg-dry	1	6/19/2019 12:14 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-4 70x200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-015		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190618A**	QC Batch: **74234**			PrepDate **6/17/2019**			Analyst: **RAB**
Hexavalent Chromium	13	0.058	0.20		mg/Kg-dry	1	6/19/2019 12:24 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

ANALYTICAL RESULTS

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Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-4-200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-016		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A				**EPA 7199**			
RunID: **NV00922-IC6_190618A**	QC Batch: **74234**			PrepDate **6/17/2019**			Analyst: **RAB**
Hexavalent Chromium	27	0.30	1.0		mg/Kg-dry	5	6/19/2019 04:19 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

ANALYTICAL RESULTS

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Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-5 1/4x4
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-017		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190618A** QC Batch: **74234** PrepDate **6/17/2019** Analyst: **RAB**							
Hexavalent Chromium	3.8	0.058	0.20		mg/Kg-dry	1	6/19/2019 12:34 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-5 4x701
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-018		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A				**EPA 7199**			
RunID: **NV00922-IC6_190621A**	QC Batch: **74283**			PrepDate **6/20/2019**			Analyst: **RAB**
Hexavalent Chromium	16	0.29	1.0		mg/Kg-dry	5	6/21/2019 12:15 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-5 70x200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-019		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190621A** QC Batch: **74283**				PrepDate **6/20/2019**			Analyst: **RAB**
Hexavalent Chromium	17	0.29	1.0		mg/Kg-dry	5	6/21/2019 12:25 PM

Qualifiers:

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference
- DO Surrogate Diluted Out
- E Value above quantitation range
- ND Not Detected at the Reporting Limit
- Results are wet unless otherwise specified

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-5-200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-020		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190621A**	QC Batch: **74283**			PrepDate **6/20/2019**			Analyst: **RAB**
Hexavalent Chromium	29	0.29	1.0		mg/Kg-dry	5	6/21/2019 12:35 PM

Qualifiers:

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference
- DO Surrogate Diluted Out
- E Value above quantitation range
- ND Not Detected at the Reporting Limit
- Results are wet unless otherwise specified

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ANALYTICAL RESULTS

Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-6 1/4x4
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-021		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190621A**	QC Batch: **74283**			PrepDate **6/20/2019**			Analyst: **RAB**
Hexavalent Chromium	7.4	0.058	0.20		mg/Kg-dry	1	6/21/2019 05:01 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-6 4x701
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-022		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A / **EPA 7199**							
RunID: **NV00922-IC6_190621A** QC Batch: **74283** PrepDate **6/20/2019** Analyst: **RAB**							
Hexavalent Chromium	17	0.29	1.0		mg/Kg-dry	5	6/21/2019 12:55 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-6 70x200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-023		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190621A**	QC Batch: **74283**			PrepDate **6/20/2019**			Analyst: **RAB**
Hexavalent Chromium	20	0.29	1.0		mg/Kg-dry	5	6/21/2019 02:14 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-6-200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-024		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190621A**	QC Batch: **74283**			PrepDate **6/20/2019**			Analyst: **RAB**
Hexavalent Chromium	42	0.29	1.0		mg/Kg-dry	5	6/21/2019 02:04 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *05-Jul-19*

CLIENT: CH2M HILL
Lab Order: N036051
Project:
Lab ID: N036051-025

Client Sample ID: 55197-7 1/4x4
Collection Date: 6/7/2019 10:00:00 AM
Matrix: SOIL

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A / **EPA 7199**							
RunID: **NV00922-IC6_190621A** QC Batch: **74283** PrepDate **6/20/2019** Analyst: **RAB**							
Hexavalent Chromium	5.3	0.058	0.20		mg/Kg-dry	1	6/21/2019 05:21 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-7 4x701
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-026		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190621A**	QC Batch: **74283**			PrepDate **6/20/2019**			Analyst: **RAB**
Hexavalent Chromium	22	0.29	1.0		mg/Kg-dry	5	6/21/2019 01:45 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-7 70x200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-027		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
EPA 3060A			**EPA 7199**				
RunID: **NV00922-IC6_190621A**	QC Batch: **74283**			PrepDate **6/20/2019**			Analyst: **RAB**
Hexavalent Chromium	28	0.29	1.0		mg/Kg-dry	5	6/21/2019 12:03 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

ANALYTICAL RESULTS

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Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-7-200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-028		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
HEXAVALENT CHROMIUM BY IC							
	EPA 3060A			**EPA 7199**			
RunID: **NV00922-IC6_190621A**	QC Batch: **74283**			PrepDate **6/20/2019**			Analyst: **RAB**
Hexavalent Chromium	49	0.29	1.0		mg/Kg-dry	5	6/21/2019 01:15 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT: CH2M HILL
Work Order: N036051
Project:

ANALYTICAL QC SUMMARY REPORT

TestCode: 7199_S_PGE

Sample ID **MB-74234**	SampType: **MBLK**	TestCode: **7199_S_PGE**	Units: **mg/Kg**	Prep Date: **6/17/2019**	RunNo: **134606**
Client ID: **PBS**	Batch ID: **74234**	TestNo: **EPA 7199**	**EPA 3060A**	Analysis Date: **6/18/2019**	SeqNo: **3415700**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	ND	0.20									

Sample ID **LCS-74234**	SampType: **LCS**	TestCode: **7199_S_PGE**	Units: **mg/Kg**	Prep Date: **6/17/2019**	RunNo: **134606**
Client ID: **LCSS**	Batch ID: **74234**	TestNo: **EPA 7199**	**EPA 3060A**	Analysis Date: **6/18/2019**	SeqNo: **3415701**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	4.029	0.20	3.989	0	101	80	120				

Sample ID **N036051-002A-REP**	SampType: **DUP**	TestCode: **7199_S_PGE**	Units: **mg/Kg-dry**	Prep Date: **6/17/2019**	RunNo: **134606**
Client ID: **ZZZZZZ**	Batch ID: **74234**	TestNo: **EPA 7199**	**EPA 3060A**	Analysis Date: **6/19/2019**	SeqNo: **3415717**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	17.667	1.0						17.46	1.20	20	

Sample ID **N036051-002A-DUP**	SampType: **DUP**	TestCode: **7199_S_PGE**	Units: **mg/Kg-dry**	Prep Date: **6/17/2019**	RunNo: **134606**
Client ID: **ZZZZZZ**	Batch ID: **74234**	TestNo: **EPA 7199**	**EPA 3060A**	Analysis Date: **6/19/2019**	SeqNo: **3415718**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	17.538	1.0						17.46	0.459	20	

Sample ID **N036051-002A-MS**	SampType: **MS**	TestCode: **7199_S_PGE**	Units: **mg/Kg-dry**	Prep Date: **6/17/2019**	RunNo: **134606**
Client ID: **ZZZZZZ**	Batch ID: **74234**	TestNo: **EPA 7199**	**EPA 3060A**	Analysis Date: **6/19/2019**	SeqNo: **3415719**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	21.267	1.0	4.008	17.46	95.1	75	125				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: CH2M HILL
Work Order: N036051
Project:

ANALYTICAL QC SUMMARY REPORT

TestCode: 7199_S_PGE

Sample ID **N036051-002A-MSD** SampType: **MSD** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/17/2019** RunNo: **134606**
Client ID: **ZZZZZZ** Batch ID: **74234** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/19/2019** SeqNo: **3415720**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	21.142	1.0	4.008	17.46	91.9	75	125	21.27	0.588	20	

Sample ID **N036051-002A-MS I** SampType: **MS** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/17/2019** RunNo: **134606**
Client ID: **ZZZZZZ** Batch ID: **74234** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/19/2019** SeqNo: **3415721**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	667.891	10	663.1	17.46	98.1	75	125				

Sample ID **N036051-003A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/17/2019** RunNo: **134606**
Client ID: **ZZZZZZ** Batch ID: **74234** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/19/2019** SeqNo: **3415723**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	19.084	1.0						19.14	0.317	20	

Sample ID **N036051-004A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/17/2019** RunNo: **134606**
Client ID: **ZZZZZZ** Batch ID: **74234** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/19/2019** SeqNo: **3415725**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	21.600	1.0						21.39	0.955	20	

Sample ID **N036051-011A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/17/2019** RunNo: **134606**
Client ID: **ZZZZZZ** Batch ID: **74234** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/19/2019** SeqNo: **3415729**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	25.439	1.0						25.45	0.0552	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: CH2M HILL
Work Order: N036051
Project:

ANALYTICAL QC SUMMARY REPORT

TestCode: 7199_S_PGE

Sample ID **N036051-012A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/17/2019** RunNo: **134606**
Client ID: **ZZZZZZ** Batch ID: **74234** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/19/2019** SeqNo: **3415731**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	57.113	1.0						56.50	1.07	20	

Sample ID **N036051-016A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/17/2019** RunNo: **134606**
Client ID: **ZZZZZZ** Batch ID: **74234** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/19/2019** SeqNo: **3415733**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	27.538	1.0						27.39	0.526	20	

Sample ID **N036051-010A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/17/2019** RunNo: **134606**
Client ID: **ZZZZZZ** Batch ID: **74234** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/19/2019** SeqNo: **3415735**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	17.259	1.0						17.47	1.23	20	

Sample ID **N036051-007A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/17/2019** RunNo: **134606**
Client ID: **ZZZZZZ** Batch ID: **74234** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/19/2019** SeqNo: **3415736**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	5.231	0.20						5.218	0.255	20	

Sample ID **N036051-008A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/17/2019** RunNo: **134606**
Client ID: **ZZZZZZ** Batch ID: **74234** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/19/2019** SeqNo: **3415737**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	4.629	0.20						4.554	1.63	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: CH2M HILL
Work Order: N036051
Project:

ANALYTICAL QC SUMMARY REPORT

TestCode: 7199_S_PGE

Sample ID **N036051-009A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/17/2019** RunNo: **134606**
Client ID: **ZZZZZZ** Batch ID: **74234** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/19/2019** SeqNo: **3415740**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	8.070	0.20						8.084	0.180	20	

Sample ID **N036051-013A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/17/2019** RunNo: **134606**
Client ID: **ZZZZZZ** Batch ID: **74234** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/19/2019** SeqNo: **3415741**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	6.626	0.20						6.710	1.26	20	

Sample ID **N036051-014A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/17/2019** RunNo: **134606**
Client ID: **ZZZZZZ** Batch ID: **74234** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/19/2019** SeqNo: **3415742**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	10.338	0.20						10.46	1.20	20	

Sample ID **N036051-015A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/17/2019** RunNo: **134606**
Client ID: **ZZZZZZ** Batch ID: **74234** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/19/2019** SeqNo: **3415743**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	12.885	0.20						12.84	0.349	20	

Sample ID **N036051-017A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/17/2019** RunNo: **134606**
Client ID: **ZZZZZZ** Batch ID: **74234** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/19/2019** SeqNo: **3415744**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	3.809	0.20						3.771	0.999	20	

Qualifiers:

- B Analyte detected in the associated Method Blank
- ND Not Detected at the Reporting Limit
- DO Surrogate Diluted Out
- E Value above quantitation range
- R RPD outside accepted recovery limits
- Calculations are based on raw values
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference

CLIENT: CH2M HILL
Work Order: N036051
Project:

ANALYTICAL QC SUMMARY REPORT

TestCode: 7199_S_PGE

Sample ID N036051-001A-REP	SampType: DUP	TestCode: 7199_S_PGE	Units: mg/Kg-dry	Prep Date: 6/17/2019	RunNo: 134606					
Client ID: ZZZZZZ	Batch ID: 74234	TestNo: EPA 7199	EPA 3060A	Analysis Date: 6/19/2019	SeqNo: 3415745					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	7.994	0.20						8.034	0.492	20	

Sample ID N036051-005A-REP	SampType: DUP	TestCode: 7199_S_PGE	Units: mg/Kg-dry	Prep Date: 6/17/2019	RunNo: 134606						
Client ID: ZZZZZZ	Batch ID: 74234	TestNo: EPA 7199	EPA 3060A	Analysis Date: 6/19/2019	SeqNo: 3415746						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	0.670	0.20						0.6636	0.904	20	

Sample ID N036051-006A-REP	SampType: DUP	TestCode: 7199_S_PGE	Units: mg/Kg-dry	Prep Date: 6/17/2019	RunNo: 134606						
Client ID: ZZZZZZ	Batch ID: 74234	TestNo: EPA 7199	EPA 3060A	Analysis Date: 6/19/2019	SeqNo: 3415747						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	3.934	0.20						3.909	0.616	20	

Sample ID N036051-002A-PS	SampType: MS	TestCode: 7199_S_PGE	Units: mg/Kg-dry	Prep Date:	RunNo: 134606						
Client ID: ZZZZZZ	Batch ID: 74234	TestNo: EPA 7199	EPA 3060A	Analysis Date: 6/19/2019	SeqNo: 3415748						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	37.711	1.0	20.08	17.46	101	75	125				

Sample ID N036072-001C-REP	SampType: DUP	TestCode: 7199_S_PGE	Units: mg/Kg-dry	Prep Date: 6/17/2019	RunNo: 134606						
Client ID: ZZZZZZ	Batch ID: 74234	TestNo: EPA 7199	EPA 3060A	Analysis Date: 6/19/2019	SeqNo: 3415752						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	0.073	0.23						0.06918	0	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: CH2M HILL
Work Order: N036051
Project:

ANALYTICAL QC SUMMARY REPORT

TestCode: 7199_S_PGE

Sample ID **N036073-001C-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/17/2019** RunNo: **134606**
Client ID: **ZZZZZZ** Batch ID: **74234** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/19/2019** SeqNo: **3415754**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	0.209	0.23						0.2339	0	20	

Sample ID **N036074-001C-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/17/2019** RunNo: **134606**
Client ID: **ZZZZZZ** Batch ID: **74234** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/19/2019** SeqNo: **3415756**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	0.107	0.20						0.1047	0	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: CH2M HILL
Work Order: N036051
Project:

ANALYTICAL QC SUMMARY REPORT

TestCode: 7199_S_PGE

Sample ID **MB-74283** SampType: **MBLK** TestCode: **7199_S_PGE** Units: **mg/Kg** Prep Date: **6/20/2019** RunNo: **134699**
Client ID: **PBS** Batch ID: **74283** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/21/2019** SeqNo: **3419471**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	ND	0.20									

Sample ID **LCS-74283** SampType: **LCS** TestCode: **7199_S_PGE** Units: **mg/Kg** Prep Date: **6/20/2019** RunNo: **134699**
Client ID: **LCSS** Batch ID: **74283** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/21/2019** SeqNo: **3419472**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	4.023	0.20	3.996	0	101	80	120				

Sample ID **N036051-027A-DUP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/20/2019** RunNo: **134699**
Client ID: **ZZZZZZ** Batch ID: **74283** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/21/2019** SeqNo: **3419478**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	28.322	1.0						28.35	0.106	20	

Sample ID **N036051-027A-MS** SampType: **MS** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/20/2019** RunNo: **134699**
Client ID: **ZZZZZZ** Batch ID: **74283** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/21/2019** SeqNo: **3419485**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	30.938	1.0	4.010	28.35	64.5	75	125				S

Sample ID **N036051-027A-MSD** SampType: **MSD** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/20/2019** RunNo: **134699**
Client ID: **ZZZZZZ** Batch ID: **74283** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/21/2019** SeqNo: **3419486**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	31.200	1.0	4.008	28.35	71.1	75	125	30.94	0.844	20	S

Qualifiers:

- B Analyte detected in the associated Method Blank
- ND Not Detected at the Reporting Limit
- DO Surrogate Diluted Out
- E Value above quantitation range
- R RPD outside accepted recovery limits
- Calculations are based on raw values
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference

CLIENT: CH2M HILL
Work Order: N036051
Project:

ANALYTICAL QC SUMMARY REPORT

TestCode: 7199_S_PGE

Sample ID **N036051-027A-MS I** SampType: **MS** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/20/2019** RunNo: **134699**
Client ID: **ZZZZZZ** Batch ID: **74283** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/21/2019** SeqNo: **3419487**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	658.931	10	658.3	28.35	95.8	75	125				

Sample ID **N036051-027A-PS** SampType: **MS** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: RunNo: **134699**
Client ID: **ZZZZZZ** Batch ID: **74283** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/21/2019** SeqNo: **3419488**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	48.446	1.0	20.07	28.35	100	75	125				

Sample ID **N036051-027A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/20/2019** RunNo: **134699**
Client ID: **ZZZZZZ** Batch ID: **74283** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/21/2019** SeqNo: **3419489**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	28.352	1.0						28.35	0	20	

Sample ID **N036051-018A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/20/2019** RunNo: **134699**
Client ID: **ZZZZZZ** Batch ID: **74283** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/21/2019** SeqNo: **3419490**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	15.997	1.0						15.64	2.29	20	

Sample ID **N036051-019A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/20/2019** RunNo: **134699**
Client ID: **ZZZZZZ** Batch ID: **74283** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/21/2019** SeqNo: **3419493**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	17.072	1.0						16.98	0.522	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: CH2M HILL
Work Order: N036051
Project:

ANALYTICAL QC SUMMARY REPORT

TestCode: 7199_S_PGE

Sample ID **N036051-020A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/20/2019** RunNo: **134699**
Client ID: **ZZZZZZ** Batch ID: **74283** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/21/2019** SeqNo: **3419494**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	29.725	1.0						28.95	2.65	20	

Sample ID **N036051-022A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/20/2019** RunNo: **134699**
Client ID: **ZZZZZZ** Batch ID: **74283** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/21/2019** SeqNo: **3419495**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	16.618	1.0						16.73	0.693	20	

Sample ID **N036051-028A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/20/2019** RunNo: **134699**
Client ID: **ZZZZZZ** Batch ID: **74283** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/21/2019** SeqNo: **3419496**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	49.439	1.0						49.18	0.520	20	

Sample ID **N036051-026A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/20/2019** RunNo: **134699**
Client ID: **ZZZZZZ** Batch ID: **74283** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/21/2019** SeqNo: **3419497**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	21.740	1.0						21.67	0.311	20	

Sample ID **N036051-024A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/20/2019** RunNo: **134699**
Client ID: **ZZZZZZ** Batch ID: **74283** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/21/2019** SeqNo: **3419498**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	41.874	1.0						42.24	0.874	20	

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT:	CH2M HILL		
Work Order:	N036051		
Project:			

ANALYTICAL QC SUMMARY REPORT

TestCode: 7199_S_PGE

Sample ID **N036051-023A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/20/2019** RunNo: **134699**
Client ID: **ZZZZZZ** Batch ID: **74283** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/21/2019** SeqNo: **3419499**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	19.988	1.0						20.25	1.28	20	

Sample ID **N036051-021A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/20/2019** RunNo: **134699**
Client ID: **ZZZZZZ** Batch ID: **74283** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/21/2019** SeqNo: **3419501**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	7.342	0.20						7.408	0.903	20	

Sample ID **N036051-025A-REP** SampType: **DUP** TestCode: **7199_S_PGE** Units: **mg/Kg-dry** Prep Date: **6/20/2019** RunNo: **134699**
Client ID: **ZZZZZZ** Batch ID: **74283** TestNo: **EPA 7199** **EPA 3060A** Analysis Date: **6/21/2019** SeqNo: **3419505**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Hexavalent Chromium	5.360	0.20						5.335	0.482	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

ASSET Laboratories

ANALYTICAL RESULTS

Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-1, -1/4x4M
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-001		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	0.4217	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-1, -4Mx70M
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-002		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	0.4305	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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CLIENT:	CH2M HILL	**Client Sample ID:**	55197-1 70x200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-003		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
			D2216				
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	0.6342	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT: CH2M HILL
Lab Order: N036051
Project:
Lab ID: N036051-004

Client Sample ID: 55197-1-200
Collection Date: 6/7/2019 10:00:00 AM
Matrix: SOIL

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626A** QC Batch: **R134741**				PrepDate			Analyst: **LR**
Percent Moisture	1.055	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference
- DO Surrogate Diluted Out
- E Value above quantitation range
- ND Not Detected at the Reporting Limit
- Results are wet unless otherwise specified

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CLIENT:	CH2M HILL	**Client Sample ID:**	55197-2 1/4X4
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-005		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	0.4310	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-2 4x701
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-006		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	0.1562	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

ASSET Laboratories

ANALYTICAL RESULTS

Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-2 70x200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-007		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	0.3026	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-2-200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-008		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	0.6065	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

ANALYTICAL RESULTS

ASSET Laboratories

Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-3 1/4x4
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-009		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	0.3533	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-3 4x701
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-010		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
			D2216				
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	0.0881	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

ANALYTICAL RESULTS

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Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-3 70x200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-011		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	0.4797	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-3-200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-012		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
D2216							
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	1.115	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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CLIENT:	CH2M HILL	**Client Sample ID:**	55197-4 1/4x4
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-013		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
			D2216				
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	1.076	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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CLIENT: CH2M HILL

Lab Order: N036051

Project:

Lab ID: N036051-014

Client Sample ID: 55197-4 4x701

Collection Date: 6/7/2019 10:00:00 AM

Matrix: SOIL

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	0.3032	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT: CH2M HILL
Lab Order: N036051
Project:
Lab ID: N036051-015

Client Sample ID: 55197-4 70x200
Collection Date: 6/7/2019 10:00:00 AM
Matrix: SOIL

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	0.7133	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference
- DO Surrogate Diluted Out
- E Value above quantitation range
- ND Not Detected at the Reporting Limit
- Results are wet unless otherwise specified

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-4-200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-016		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	1.808	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-5 1/4x4
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-017		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	0.0567	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-5 4x701
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-018		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	0.1271	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-5 70x200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-019		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
			D2216				
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	0.1861	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-5-200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-020		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626A**	QC Batch: **R134741**			PrepDate			Analyst: **LR**
Percent Moisture	0.4601	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

ANALYTICAL RESULTS

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Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-6 1/4x4
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-021		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
			D2216				
RunID: **NV00922-WC_190626B**	QC Batch: **R134742**			PrepDate			Analyst: **LR**
Percent Moisture	0.3845	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-6 4x701
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-022		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626B**	QC Batch: **R134742**			PrepDate			Analyst: **LR**
Percent Moisture	0.2439	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

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ANALYTICAL RESULTS

Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-6 70x200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-023		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626B**	QC Batch: **R134742**			PrepDate			Analyst: **LR**
Percent Moisture	0.1076	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

ASSET Laboratories

ANALYTICAL RESULTS

Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-6-200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-024		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
D2216							
RunID: **NV00922-WC_190626B**	QC Batch: **R134742**			PrepDate			Analyst: **LR**
Percent Moisture	0.5383	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

ASSET Laboratories

ANALYTICAL RESULTS

Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-7 1/4x4
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-025		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626B**	QC Batch: **R134742**			PrepDate			Analyst: **LR**
Percent Moisture	0.4170	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

ASSET Laboratories

ANALYTICAL RESULTS

Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-7 4x701
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-026		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626B**	QC Batch: **R134742**			PrepDate			Analyst: **LR**
Percent Moisture	0.4485	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

ASSET Laboratories

ANALYTICAL RESULTS

Print Date: *05-Jul-19*

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-7 70x200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-027		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
			D2216				
RunID: **NV00922-WC_190626B**	QC Batch: **R134742**			PrepDate			Analyst: **LR**
Percent Moisture	0.3910	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	CH2M HILL	**Client Sample ID:**	55197-7-200
Lab Order:	N036051	**Collection Date:**	6/7/2019 10:00:00 AM
Project:		**Matrix:**	SOIL
Lab ID:	N036051-028		

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed
PERCENT MOISTURE							
				D2216			
RunID: **NV00922-WC_190626B**	QC Batch: **R134742**			PrepDate			Analyst: **LR**
Percent Moisture	0.5774	0.1000	0.1000		wt%	1	6/26/2019 09:30 AM

CLIENT: CH2M HILL
Work Order: N036051
Project:

ANALYTICAL QC SUMMARY REPORT

TestCode: PMOIST

Sample ID **MB-R134741**	SampType: **MBLK**	TestCode: **PMOIST**	Units: **wt%**	Prep Date:		RunNo: **134741**					
Client ID: **PBS**	Batch ID: **R134741**	TestNo: **D2216**		Analysis Date: **6/26/2019**		SeqNo: **3421641**					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Percent Moisture	ND	0.1000									

Sample ID **N036051-001ADUP**	SampType: **DUP**	TestCode: **PMOIST**	Units: **wt%**	Prep Date:		RunNo: **134741**					
Client ID: **ZZZZZZ**	Batch ID: **R134741**	TestNo: **D2216**		Analysis Date: **6/26/2019**		SeqNo: **3421643**					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Percent Moisture	0.368	0.1000						0.4217	13.6	30	

Sample ID **N036051-015ADUP**	SampType: **DUP**	TestCode: **PMOIST**	Units: **wt%**	Prep Date:		RunNo: **134741**					
Client ID: **ZZZZZZ**	Batch ID: **R134741**	TestNo: **D2216**		Analysis Date: **6/26/2019**		SeqNo: **3421658**					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Percent Moisture	0.792	0.1000						0.7133	10.5	30	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: CH2M HILL
Work Order: N036051
Project:

ANALYTICAL QC SUMMARY REPORT

TestCode: PMOIST

Sample ID **MB-R134742**	SampType: **MBLK**	TestCode: **PMOIST**	Units: **wt%**	Prep Date:		RunNo: **134742**					
Client ID: **PBS**	Batch ID: **R134742**	TestNo: **D2216**		Analysis Date: **6/26/2019**		SeqNo: **3421714**					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Percent Moisture	ND	0.1000									

Sample ID **N036051-025ADUP**	SampType: **DUP**	TestCode: **PMOIST**	Units: **wt%**	Prep Date:		RunNo: **134742**					
Client ID: **ZZZZZZ**	Batch ID: **R134742**	TestNo: **D2216**		Analysis Date: **6/26/2019**		SeqNo: **3421720**					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Percent Moisture	0.365	0.1000						0.4170	13.4	30	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

HAZEN

HAZEN RESEARCH, INC.
4601 INDIANA STREET
GOLDEN, CO 80403
Phone - (303) 279 4501 Fax - (303) 278 1528

CHAIN OF CUSTODY RECORD

Customer Information	Billing Information (If different)
Client Name: HAZEN RESEARCH, INC	Billing Name: JACOBS/CH2M HILL
Contact: R. LEE SCHWARTZ	Billing Contact: KEITH SHEETS
Address: 4601 INDIANA STREET GOLDEN, CO 80403	Billing Address: 2020 SW 4th AVENUE PORTLAND OR 97201
Phone: 303-279-4501 Fax:	PO #: Project #: 12661

Sampler's Name(s) (Print) GARY BENTON (Signature) Gary Benton

Sample Identification	Sample Date and Time	Grab	Composite	Samp Type(1)	No. of Containers	Cont. Type(2)	Preservative(3)	Analyses Required
55197-1 1/4x4m, 4x70, 70x200, -200	6-7-19 10AM	x		SO	4	G	U	CHROMIUM N036051-01-04
-2	↓	↓		↓	↓	↓	↓	↓ -05-08
-3								-09-12
-4								-13-16
-5								-17-20
-6								-21-24
-7								-25-28

(1) DW=Drinking Water WW=Wastewater SW=Surface Water SO=Soil GW=Ground Water SL=Sludge HZ=Hazardous O=Other
(2) P=Plastic G=Glass O=Other
(3) N=Nitric Acid U=Unpreserved C=Cooled S=Sulfuric Acid B=Sodium Hydroxide T=Sodium Thiosulfate Z=Zinc Acetate O=Other

Relinquished by	Date/ Time	Received by	Date/ Time
[signature]	6-11-19 / 13:00	Yoandra Rodriguez	6/14/19 10:00am
Relinquished by	Date/ Time /	Received by	Date/ Time /
Relinquished by	Date/ Time /	Received by	Date/ Time /
Shipped by	Date/ Time /	Received for Lab by	Date/ Time /

Method of Shipment: FEDEX OVERNIGHT # 3661

Requested Turnaround Time
Standard Rush (Must be approved, additional charges apply)

Lab use only
5.3°C JR # 2

Distribution: White Copy - ship with sample; Canary Copy - Laboratory Copy; Pink Copy - Originator's Copy

ASSET Laboratories

Please review the checklist below. Any NO signifies non-compliance. Any non-compliance will be noted and must be understood as having an impact on the quality of the data. All tests will be performed as requested regardless of any compliance issues.

If you have any questions or further instruction, please contact our Project Coordinator at (702) 307-2659.

Cooler Received/Opened On: 6/14/2019 — Workorder: N036051

Rep sample Temp (Deg C): 5.3 — IR Gun ID: 2

Temp Blank: ☐ Yes ☑ No

Carrier name: FedEx

Last 4 digits of Tracking No.: 3661 — Packing Material Used: Bubble Wrap

Cooling process: ☑ Ice ☐ Ice Pack ☐ Dry Ice ☐ Other ☐ None

Sample Receipt Checklist

	Yes	No	Not Present / NA
1. Shipping container/cooler in good condition?	☑	☐	Not Present ☐
2. Custody seals intact, signed, dated on shippping container/cooler?	☑	☐	Not Present ☐
3. Custody seals intact on sample bottles?	☐	☐	Not Present ☑
4. Chain of custody present?	☑	☐	
5. Sampler's name present in COC?	☑	☐	
6. Chain of custody signed when relinquished and received?	☑	☐	
7. Chain of custody agrees with sample labels?	☑	☐	
8. Samples in proper container/bottle?	☑	☐	
9. Sample containers intact?	☑	☐	
10. Sufficient sample volume for indicated test?	☑	☐	
11. All samples received within holding time?	☑	☐	
12. Temperature of rep sample or Temp Blank within acceptable limit?	☑	☐	NA ☐
13. Water - VOA vials have zero headspace?	☐	☐	NA ☑
14. Water - pH acceptable upon receipt? Example: pH > 12 for (CN,S); pH<2 for Metals	☐	☐	NA ☑
15. Did the bottle labels indicate correct preservatives used?	☐	☐	NA ☑
16. Were there Non-Conformance issues at login?	☐	☐	NA ☑
Was Client notified?	☐	☐	NA ☑

Comments:

Checklist Completed By: YR YRJ 6/18/2019

Reviewed By: LG 061819

Sample Control

From:	Sheets, Keith/PDX <Keith.Sheets@jacobs.com>
Sent:	Friday, June 14, 2019 1:08 PM
To:	Marlon Cartin
Cc:	Schwartz, Lee; Yoandra Rodriguez; Sample Control
Subject:	RE: [EXTERNAL] RE: Sample shipment (12661)

Standard should be fine -

From: Marlon Cartin <marlon@assetlaboratories.com>
Sent: Friday, June 14, 2019 1:07 PM
To: Sheets, Keith/PDX <Keith.Sheets@jacobs.com>
Cc: Schwartz, Lee <SchwartzRL@hazenresearch.com>; Yoandra Rodriguez <yoandra@assetlaboratories.com>; Sample Control <samplecontrol.lv@assetlaboratories.com>
Subject: Re: [EXTERNAL] RE: Sample shipment (12661)

Hi Keith,

I forgot to ask the TAT needed.

Thanks,

Marlon

Sent from my iPhone

On Jun 14, 2019, at 11:00 AM, Sheets, Keith/PDX <Keith.Sheets@jacobs.com> wrote:

> Please run CrT, CrVI and Zn,
>
> ---
>
> **From:** Marlon Cartin <marlon@assetlaboratories.com>
> **Sent:** Friday, June 14, 2019 11:01 AM
> **To:** 'Schwartz, Lee' <SchwartzRL@hazenresearch.com>
> **Cc:** Sheets, Keith/PDX <Keith.Sheets@jacobs.com>; 'Yoandra Rodriguez' <yoandra@assetlaboratories.com>; 'Sample Control' <samplecontrol.lv@assetlaboratories.com>
> **Subject:** [EXTERNAL] RE: Sample shipment (12661)
>
> Hi Lee and Keith,
>
> I received the samples today and we will log-in individual samples as stated on the e-mail below and use the sample ID noted on the Jars.
> Do you need me to run Total Cr. and Cr+6 or just T. Cr?
>
> Thanks,
>
> **Marlon Cartin**
> Sr. Project Manager
> California: 11110 Artesia Blvd., Ste. B, Cerritos, CA 90703 **I** **P:** 562.219.7435 **I** **F:** 562.219.7436

Nevada: 3151 W. Post Road, Las Vegas, NV 89118 **I** **P:** 702.307.2659 Ext. 410 **I** **F:** 702.307.2691 **I** **M:** 702.439.0421
www.assetlaboratories.com

From: Schwartz, Lee <SchwartzRL@hazenresearch.com>
Sent: Thursday, June 13, 2019 8:22 AM
To: Marlon Cartin <marlon@assetlaboratories.com>
Cc: 'Sheets, Keith/PDX' <Keith.Sheets@jacobs.com>
Subject: RE: Sample shipment (12661)

Marlon,

Fedex rejected our shipment yesterday due to a labeling (hazard) issue, so the package did not go out. We will try again this afternoon…

Best,
Lee

From: Marlon Cartin [mailto:marlon@assetlaboratories.com]
Sent: Tuesday, June 11, 2019 4:28 PM
To: Schwartz, Lee
Cc: 'Sheets, Keith/PDX'
Subject: RE: Sample shipment (12661)

No worries. Thank you for heads-up Lee.

Marlon Cartin
Sr. Project Manager
California: 11110 Artesia Blvd., Ste. B, Cerritos, CA 90703 **I** **P:** 562.219.7435 **I** **F:** 562.219.7436
Nevada: 3151 W. Post Road, Las Vegas, NV 89118 **I** **P:** 702.307.2659 Ext. 410 **I** **F:** 702.307.2691 **I** **M:** 702.439.0421
www.assetlaboratories.com

From: Schwartz, Lee <SchwartzRL@hazenresearch.com>
Sent: Tuesday, June 11, 2019 2:55 PM
To: Marlon Cartin (marlon@assetlaboratories.com) <marlon@assetlaboratories.com>
Cc: Sheets, Keith/PDX (Keith.Sheets@jacobs.com) <Keith.Sheets@jacobs.com>
Subject: Sample shipment (12661)

Hi Marlon,

Just a quick heads-up: I ran into some internal difficulties getting this shipment ready for today's pickup and rather than rush it, I've delayed shipping until tomorrow. Yopu'll receive the samples on Thursday morning.

Apologies for the miscue.

Lee

R. Lee Schwartz
Hazen Research, Inc.

4601 Indiana Street
Golden, CO 80403
303-279-4501 X269
www.hazenresearch.com

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ASSET Laboratories

WORK ORDER Summary

05-Jul-19

WorkOrder: N036051

Client ID: CH2HI01

Project: **QC Level:** Level IV **Date Received:** 6/14/2019

Comments:

Sample ID	Client Sample ID	Date Collected	Date Due	Matrix	Test No	Test Name	Hld	MS	Sub	Storage
N036051-001A	55197-1, -1/4x4M	6/7/2019 10:00:00 AM	6/28/2019	Soil	EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-002A	55197-1, -4Mx70M		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-003A	55197-1 70x200		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-004A	55197-1-200		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-005A	55197-2 1/4X4		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS

ASSET Laboratories

WORK ORDER Summary

05-Jul-19

WorkOrder: N036051

Client ID: CH2HI01

Project:

QC Level: Level IV

Date Received: 6/14/2019

Comments:

Sample ID	Client Sample ID	Date Collected	Date Due	Matrix	Test No	Test Name	Hld	MS	Sub	Storage
N036051-005A	55197-2 1/4X4	6/7/2019 10:00:00 AM	6/28/2019	Soil	EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-006A	55197-2 4x701		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-007A	55197-2 70x200		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-008A	55197-2-200		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-009A	55197-3 1/4x4		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS

ASSET Laboratories

WORK ORDER Summary

05-Jul-19

WorkOrder: N036051

Client ID: CH2HI01

Project: **QC Level:** Level IV **Date Received:** 6/14/2019

Comments:

Sample ID	Client Sample ID	Date Collected	Date Due	Matrix	Test No	Test Name	Hld	MS	Sub	Storage
N036051-009A	55197-3 1/4x4	6/7/2019 10:00:00 AM	6/28/2019	Soil	D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-010A	55197-3 4x701		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-011A	55197-3 70x200		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-012A	55197-3-200		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-013A	55197-4 1/4x4		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-014A	55197-4 4x701		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS

ASSET Laboratories

WORK ORDER Summary

05-Jul-19

WorkOrder: N036051

Client ID: CH2HI01

Project:

QC Level: Level IV

Date Received: 6/14/2019

Comments:

Sample ID	Client Sample ID	Date Collected	Date Due	Matrix	Test No	Test Name	Hld	MS	Sub	Storage
N036051-014A	55197-4 4x701	6/7/2019 10:00:00 AM	6/28/2019	Soil	EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-015A	55197-4 70x200		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-016A	55197-4-200		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-017A	55197-5 1/4x4		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-018A	55197-5 4x701		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS

ASSET Laboratories

WORK ORDER Summary

05-Jul-19

WorkOrder: N036051

Client ID: CH2HI01

Project:

QC Level: Level IV

Date Received: 6/14/2019

Comments:

Sample ID	Client Sample ID	Date Collected	Date Due	Matrix	Test No	Test Name	Hld	MS	Sub	Storage
N036051-018A	55197-5 4x701	6/7/2019 10:00:00 AM	6/28/2019	Soil	EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-019A	55197-5 70x200		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-020A	55197-5-200		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-021A	55197-6 1/4x4		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-022A	55197-6 4x701		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS

ASSET Laboratories

WORK ORDER Summary

05-Jul-19

WorkOrder: N036051

Client ID: CH2HI01

Project:

QC Level: Level IV

Date Received: 6/14/2019

Comments:

Sample ID	Client Sample ID	Date Collected	Date Due	Matrix	Test No	Test Name	Hld	MS	Sub	Storage
N036051-023A	55197-6 70x200	6/7/2019 10:00:00 AM	6/28/2019	Soil	EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-024A	55197-6-200		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-025A	55197-7 1/4x4		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-026A	55197-7 4x701		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-027A	55197-7 70x200		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS

ASSET Laboratories

WORK ORDER Summary

05-Jul-19

WorkOrder: N036051

Client ID: CH2HI01

Project: **QC Level:** Level IV **Date Received:** 6/14/2019

Comments:

Sample ID	Client Sample ID	Date Collected	Date Due	Matrix	Test No	Test Name	Hld	MS	Sub	Storage
N036051-027A	55197-7 70x200	6/7/2019 10:00:00 AM	6/28/2019	Soil	EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-028A	55197-7-200		6/28/2019		EPA 3050B	SOPREP TOTAL METALS	☐	☐	☐	WS
			6/28/2019		EPA 3060A	Prep for Hexavalend Chromium	☐	☐	☐	WS
			6/28/2019		EPA 6010B	TOTAL METALS BY ICP	☐	☐	☑	WS
			6/28/2019		EPA 7199	Hexavalent Chromium by IC	☐	☐	☐	WS
			6/28/2019		D2216	PERCENT MOISTURE	☐	☐	☐	WS
N036051-029A	FOLDER	6/28/2019	6/28/2019		Folder	Folder	☐	☐	☐	LAB
			6/28/2019		Folder	Folder	☐	☐	☐	LAB

ASSET Laboratories
3151-3153 W Post Rd., Las Vegas, NV 89118
www.atl-labs.com
TEL: 7023072659 FAX: 7023072691

CHAIN-OF-CUSTODY RECORD

QC Level: Level IV

Subcontractor:

BC Labs
4100 Atlas Court
Bakersfield, CA 93308

TEL: (661) 327-4911
FAX: (661) 327-1918
Acct #:

Field Sampler: SIGNED

02-Jul-19

				Requested Tests		
Sample ID	**Matrix**	**Date Collected**	**Bottle Type**	**EPA 6010B**	(Cr and Zn)	
N036051-001A / 55197-1, -1/4x4M	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-002A / 55197-1, -4Mx70M	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-003A / 55197-1 70x200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-004A / 55197-1-200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-005A / 55197-2 1/4X4	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-006A / 55197-2 4x701	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-007A / 55197-2 70x200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-008A / 55197-2-200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-009A / 55197-3 1/4x4	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-010A / 55197-3 4x701	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-011A / 55197-3 70x200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-012A / 55197-3-200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-013A / 55197-4 1/4x4	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-014A / 55197-4 4x701	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-015A / 55197-4 70x200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-016A / 55197-4-200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-017A / 55197-5 1/4x4	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-018A / 55197-5 4x701	Soil	6/7/2019 10:00:00 AM	8OZG	1		

General Comments: Please email sample receipt acknowledgement to the PM. Please cc andrea.gallardo@assetlaboratories.com

Please use PO#:N36051A Please email Invoices and Account Receivable Statements to elvira@assetlaboratories.com. For questions, call Marlon at (702)-307-2659. Please e-mail results to reports.lv@assetlaboratories.com by: 3-day TAT.

Please analyze for Cr and Zn by 6010. EDD Requirement labspec7 edata.

Please cc Report to Lucille Golosinda at lucille.golosinda@assetlaboratories.com

GSO #: 545347981

	Date/Time		Date/Time
Relinquished by: YRJ	7/1/2019 17:00	**Received by:**	
Relinquished by:		**Received by:**	

ASSET Laboratories
3151-3153 W Post Rd., Las Vegas, NV 89118
www.atl-labs.com
TEL: 7023072659 FAX: 7023072691

CHAIN-OF-CUSTODY RECORD

QC Level: Level IV

Subcontractor:

BC Labs
4100 Atlas Court
Bakersfield, CA 93308

TEL: (661) 327-4911
FAX: (661) 327-1918
Acct #:

Field Sampler: SIGNED

02-Jul-19

				Requested Tests		
Sample ID	**Matrix**	**Date Collected**	**Bottle Type**	**EPA 6010B**	(Cr and Zn)	
N036051-019A / 55197-5 70x200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-020A / 55197-5-200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-021A / 55197-6 1/4x4	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-022A / 55197-6 4x701	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-023A / 55197-6 70x200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-024A / 55197-6-200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-025A / 55197-7 1/4x4	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-026A / 55197-7 4x701	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-027A / 55197-7 70x200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
N036051-028A / 55197-7-200	Soil	6/7/2019 10:00:00 AM	8OZG	1		

Please cc Report to Lucille Golosinda at lucille.golosinda@assetlaboratories.com

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Please analyze for Cr and Zn by 6010. EDD Requirement labspec7 edata.

GSO #: 545347981

	Date/Time		Date/Time
Relinquished by: YRJ	7/1/2019 17:00	**Received by:**	
Relinquished by:		**Received by:**	

TRCK: 4154 6713 3661

ORIGIN ID:WHHA (303) 279-4501
DENNIS BLEWITT
HAZEN RESEARCH
4601 INDIANA STREET

GOLDEN, CO 80403
UNITED STATES US

SHIP DATE: 13JUN19
ACTWGT: 43.00 LB MAN
CAD: 0283228/CAFE3211
DIMS: 24x15x14 IN

BILL SENDER

TO **MARLON CARTIN**
ASSET LABORATORIES
3151 W. POST ROAD

LAS VEGAS NV 89118
(562) 219-7435
REF: 12661

FedEx
Express

E

Dangerous Goods as per attached DGD

FRI - 14 JUN 10:30A
PRIORITY OVERNIGHT

TRK# 0201 **4154 6713 3661**

IDG
89118
NV-US **LAS**

XX LASA

CUSTODY SEAL

CUSTODY SEAL

Date of Report: 07/08/2019

Marlon B. Cartin

ASSET Laboratories- Las Vegas
3151-3153 W. Post Rd
Las Vegas, NV 89118

Client Project:	N036051
BCL Project:	Level IV (MDL)
BCL Work Order:	1921417
Invoice ID:	B346305

Enclosed are the results of analyses for samples received by the laboratory on 7/2/2019. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Contact Person: Vanessa Sandoval
Client Service Rep

Authorized Signature

Table of Contents

Table of Contents

ASSET Laboratories
3151-3153 W Post Rd., Las Vegas, NV 89118
www.atl-labs.com
TEL: 7023072659 FAX: 7023072691

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

QC Level: Level IV

Subcontractor:
BC Labs
4100 Atlas Court
Bakersfield, CA 93308

TEL: (661) 327-4911
FAX: (661) 327-1918
Acct #: 19-21417

Field Sampler: SIGNED

02-Jul-19

	Sample ID	Matrix	Date Collected	Bottle Type	Requested Tests: EPA 6010B	(Cr and Zn)	
-1	N036051-001A / 55197-1, -1/4x4M	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-2	N036051-002A / 55197-1, -4Mx70M	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-3	N036051-003A / 55197-1 70x200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-4	N036051-004A / 55197-1-200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-5	N036051-005A / 55197-2 1/4X4	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-6	N036051-006A / 55197-2 4x701	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-7	N036051-007A / 55197-2 70x200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-8	N036051-008A / 55197-2-200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-9	N036051-009A / 55197-3 1/4x4	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-10	N036051-010A / 55197-3 4x701	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-11	N036051-011A / 55197-3 70x200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
12	N036051-012A / 55197-3-200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
13	N036051-013A / 55197-4 1/4x4	Soil	6/7/2019 10:00:00 AM	8OZG	1		
14	N036051-014A / 55197-4 4x701	Soil	6/7/2019 10:00:00 AM	8OZG	1		
15	N036051-015A / 55197-4 70x200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
16	N036051-016A / 55197-4-200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
17	N036051-017A / 55197-5 1/4x4	Soil	6/7/2019 10:00:00 AM	8OZG	1		
18	N036051-018A / 55197-5 4x701	Soil	6/7/2019 10:00:00 AM	8OZG	1		

General Comments: Please email sample receipt acknowledgement to the PM. Please cc andrea.gallardo@assetlaboratories.com

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Please analyze for Cr and Zn by 6010. EDD Requirement labspec7 edata.

Please cc Report to Lucille Golosinda at lucille.golosinda@assetlaboratories.com

GSO #: 545347981

		Date/Time			Date/Time
Relinquished by:	YRJ	7/1/2019 17:00	Received by:		7/2/19 8:20
Relinquished by:			Received by:		

ASSET Laboratories
3151-3153 W Post Rd., Las Vegas, NV 89118
www.atl-labs.com
TEL: 7023072659 *FAX: 7023072691*

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

19-21417

QC Level: Level IV

Subcontractor:
BC Labs
4100 Atlas Court
Bakersfield, CA 93308

TEL: (661) 327-4911
FAX: (661) 327-1918
Acct #:

Field Sampler: SIGNED

02-Jul-19

	Sample ID	Matrix	Date Collected	Bottle Type	Requested Tests: EPA 6010B	(Cr and Zn)	
-19	N036051-019A / 55197-5 70x200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-20	N036051-020A / 55197-5-200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-21	N036051-021A / 55197-6 1/4x4	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-22	N036051-022A / 55197-6 4x701	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-23	N036051-023A / 55197-6 70x200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-24	N036051-024A / 55197-6-200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-25	N036051-025A / 55197-7 1/4x4	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-26	N036051-026A / 55197-7 4x701	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-27	N036051-027A / 55197-7 70x200	Soil	6/7/2019 10:00:00 AM	8OZG	1		
-28	N036051-028A / 55197-7-200	Soil	6/7/2019 10:00:00 AM	8OZG	1		

Please cc Report to Lucille Golosinda at lucille.golosinda@assetlaboratories.com

CHK BY DISTRIBUTION
SUB OUT

General Comments: Please email sample receipt acknowledgement to the PM. Please cc andrea.gallardo@assetlaboratories.com

Please use PO#:N36051A Please email Invoices and Account Receivable Statements to elvira@assetlaboratories.com. For questions, call Marlon at (702)-307-2659. Please e-mail results to reports.lv@assetlaboratories.com by: 3-day TAT.

Please analyze for Cr and Zn by 6010. EDD Requirement labspec7 edata.

GSO #: 545347981

		Date/Time			Date/Time
Relinquished by:	YLJ	7/1/2019 17:00	Received by:		7/2/19 08:20
Relinquished by:			Received by:		

BC LABORATORIES INC. — COOLER RECEIPT FORM — Page 1 Of 3

Submission #: 19-21417

SHIPPING INFORMATION	SHIPPING CONTAINER	FREE LIQUID
Fed Ex ☐ UPS ☐ Ontrac ☐ Hand Delivery ☐ BC Lab Field Service ☐ Other ☒ (Specify) GSO	Ice Chest ☒ None ☐ Box ☐ Other ☐ (Specify)	YES ☐ NO ☐ W / S

Refrigerant: Ice ☒ Blue Ice ☐ None ☐ Other ☐ Comments:

Custody Seals: Ice Chest ☐ Intact? Yes ☐ No ☐ Containers ☐ Intact? Yes ☐ No ☐ None ☒ Comments:

All samples received? Yes ☒ No ☐ All samples containers intact? Yes ☒ No ☐ Description(s) match COC? Yes ☒ No ☐

COC Received		
☒ YES ☐ NO	Emissivity: 97 Container: Pre Thermometer ID: 274 Temperature: (A) 0.0 °C / (C) 0.0 °C	Date/Time 7-2-19 08:20 Analyst Init JS

SAMPLE CONTAINERS	1	2	3	4	5	6	7	8	9	10
QT PE UNPRES										
4oz / 8oz / 16oz PE UNPRES										
2oz Cr^{+6}										
QT INORGANIC CHEMICAL METALS										
INORGANIC CHEMICAL METALS 4oz / 8oz / 16oz										
PT CYANIDE										
PT NITROGEN FORMS										
PT TOTAL SULFIDE										
2oz. NITRATE / NITRITE										
PT TOTAL ORGANIC CARBON										
PT CHEMICAL OXYGEN DEMAND										
PtA PHENOLICS										
40ml VOA VIAL TRAVEL BLANK										
40ml VOA VIAL										
QT EPA 1664										
PT ODOR										
RADIOLOGICAL										
BACTERIOLOGICAL										
40 ml VOA VIAL- 504										
QT EPA 508/608/8080										
QT EPA 515.1/8150										
QT EPA 525										
QT EPA 525 TRAVEL BLANK										
40ml EPA 547										
40ml EPA 531.1										
8oz EPA 548										
QT EPA 549										
QT EPA 8015M										
QT EPA 8270										
8oz / 16oz / 32oz AMBER										
8oz / 16oz / 32oz JAR V10	A	A	A	A	A	A	A	A	A	A
SOIL SLEEVE										
PCB VIAL										
PLASTIC BAG										
TEDLAR BAG										
FERROUS IRON										
ENCORE										
SMART KIT										
SUMMA CANISTER										

Comments:
Sample Numbering Completed By: JHM Date/Time: 7-2-19 13:30
A = Actual / C = Corrected

Rev 21 05/23/2016
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BC LABORATORIES INC. COOLER RECEIPT FORM Page 2 Of 3

Submission #: 19-21417

SHIPPING INFORMATION
Fed Ex ☐ UPS ☐ Ontrac ☐ Hand Delivery ☐
BC Lab Field Service ☐ Other ☑ (Specify) GSO

SHIPPING CONTAINER
Ice Chest ☑ None ☐ Box ☐
Other ☐ (Specify)

FREE LIQUID
YES ☐ NO ☐
W / S

Refrigerant: Ice ☐ Blue Ice ☐ None ☑ Other ☐ Comments: No Ice!

Custody Seals Ice Chest ☐ Intact? Yes ☐ No ☐ Containers ☐ Intact? Yes ☐ No ☐ None ☑ Comments:

All samples received? Yes ☐ No ☐ All samples containers intact? Yes ☑ No ☐ Description(s) match COC? Yes ☐ No ☐

COC Received ☑ YES ☐ NO

Emissivity: 98 Container: Glass Thermometer ID: 279 Date/Time 7-2-19
Temperature: (A) 21.5 °C / (C) 21.2 °C VMB 7/2 Analyst Init 08:20

SAMPLE CONTAINERS	1	2	3	4	5	6	7	8	9	10
QT PE UNPRES										
4oz / 8oz / 16oz PE UNPRES										
2oz Cr+6										
QT INORGANIC CHEMICAL METALS										
INORGANIC CHEMICAL METALS 4oz / 8oz / 16oz										
PT CYANIDE										
PT NITROGEN FORMS										
PT TOTAL SULFIDE										
2oz. NITRATE / NITRITE										
PT TOTAL ORGANIC CARBON										
PT CHEMICAL OXYGEN DEMAND										
PtA PHENOLICS										
40ml VOA VIAL TRAVEL BLANK										
40ml VOA VIAL										
QT EPA 1664										
PT ODOR										
RADIOLOGICAL										
BACTERIOLOGICAL										
40 ml VOA VIAL- 504										
QT EPA 508/608/8080										
QT EPA 515.1/8150										
QT EPA 525										
QT EPA 525 TRAVEL BLANK										
40ml EPA 547										
40ml EPA 531.1										
8oz EPA 548										
QT EPA 549										
QT EPA 8015M										
QT EPA 8270										
8oz / 16oz / 32oz AMBER										
8oz / 16oz / 32oz JAR x10	A	A	A	A	A	A	A	A	A	A
SOIL SLEEVE										
PCB VIAL										
PLASTIC BAG										
TEDLAR BAG										
FERROUS IRON										
ENCORE										
SMART KIT										
SUMMA CANISTER										

Comments:
Sample Numbering Completed By: JHM Date/Time: 7-2-19 13:30
A = Actual / C = Corrected

Rev 21 05/23/2016
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Chain of Custody and Cooler Receipt Form for 1921417 Page 5 of 5

BC LABORATORIES INC. COOLER RECEIPT FORM Page 3 Of 3

Submission #: 19-21417

SHIPPING INFORMATION	SHIPPING CONTAINER	FREE LIQUID
Fed Ex ☐ UPS ☐ Ontrac ☐ Hand Delivery ☐ BC Lab Field Service ☐ Other ☒ (Specify) GSO	Ice Chest ☒ None ☐ Box ☐ Other ☐ (Specify)	YES ☐ NO ☐ W / S

Refrigerant: Ice ☐ Blue Ice ☐ None ☒ Other ☐ Comments: No Ice!

Custody Seals Ice Chest ☐ Intact? Yes ☐ No ☐ Containers ☐ Intact? Yes ☐ No ☐ None ☒ Comments:

All samples received? Yes ☒ No ☐ All samples containers intact? Yes ☐ No ☐ Description(s) match COC? Yes ☐ No ☐

COC Received ☒ YES ☐ NO

Emissivity: 98 Container: Glass Thermometer ID: 274 Date/Time 7-2-19

Temperature: (A) 21.5 °C / (C) 21.2 °C VMB 7/2 Analyst Init 08:20

SAMPLE CONTAINERS	21	22	23	24	25	26	27	28	9	10
QT PE UNPRES										
4oz / 8oz / 16oz PE UNPRES										
2oz Cr+6										
QT INORGANIC CHEMICAL METALS										
INORGANIC CHEMICAL METALS 4oz / 8oz / 16oz										
PT CYANIDE										
PT NITROGEN FORMS										
PT TOTAL SULFIDE										
2oz. NITRATE / NITRITE										
PT TOTAL ORGANIC CARBON										
PT CHEMICAL OXYGEN DEMAND										
PtA PHENOLICS										
40ml VOA VIAL TRAVEL BLANK										
40ml VOA VIAL										
QT EPA 1664										
PT ODOR										
RADIOLOGICAL										
BACTERIOLOGICAL										
40 ml VOA VIAL- 504										
QT EPA 508/608/8080										
QT EPA 515.1/8150										
QT EPA 525										
QT EPA 525 TRAVEL BLANK										
40ml EPA 547										
40ml EPA 531.1										
8oz EPA 548										
QT EPA 549										
QT EPA 8015M										
QT EPA 8270										
8oz / 16oz / 32oz AMBER										
8oz / 16oz / 32oz JAR X(1)	A	A	A	A	A	A	A	A		
SOIL SLEEVE										
PCB VIAL										
PLASTIC BAG										
TEDLAR BAG										
FERROUS IRON										
ENCORE										
SMART KIT										
SUMMA CANISTER										

Comments:

Sample Numbering Completed By: JHM Date/Time: 7-2-19 13:30

A = Actual / C = Corrected

Rev 21 05/23/2016 [S:\WPDoc\WordPerfect\LAB_DOCS\FORMS\SAMREC rev 20]

ASSET Laboratories- Las Vegas		Reported:	07/08/2019 13:29
3151-3153 W. Post Rd		Project:	Level IV (MDL)
Las Vegas, NV 89118		Project Number:	N036051
		Project Manager:	Marlon B. Cartin

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Information			
1921417-01	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-001A / 55197-1,-1/4x4M	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-02	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-002A / 55197-1,-4Mx70M	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-03	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-003A / 55197-1 70x200	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-04	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-004A / 55197-1-200	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-05	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-005A / 55197-21/4x4	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-06	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-006A / 55197-2 4x701	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-07	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-007A / 55197-2 70x200	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil

ASSET Laboratories- Las Vegas		Reported:	07/08/2019 13:29
3151-3153 W. Post Rd		Project:	Level IV (MDL)
Las Vegas, NV 89118		Project Number:	N036051
		Project Manager:	Marlon B. Cartin

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Information			
1921417-08	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-008A / 55197-2-200	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-09	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-009A / 55197-31/4x4	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-10	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-010A / 55197-3 4x701	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-11	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-011A / 55197-3 70x200	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-12	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-012A / 55197-3 -200	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-13	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-013A / 55197 -4 1/4x4	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-14	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-014A / 55197 -4 4x701	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil

ASSET Laboratories- Las Vegas
3151-3153 W. Post Rd
Las Vegas, NV 89118

Reported: 07/08/2019 13:29
Project: Level IV (MDL)
Project Number: N036051
Project Manager: Marlon B. Cartin

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Information			
1921417-15	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-015A / 55197 -4 70x200	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-16	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-016A / 55197 -4 -200	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-17	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-017A / 55197 -5 1/4x4	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-18	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-018A / 55197 -5 4x701	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-19	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-019A / 55197 -5 70x200	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-20	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-020A / 55197 -5 -200	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-21	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-021A / 55197 -6 1/4x4	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil

ASSET Laboratories- Las Vegas		**Reported:**	07/08/2019 13:29
3151-3153 W. Post Rd		Project:	Level IV (MDL)
Las Vegas, NV 89118		Project Number:	N036051
		Project Manager:	Marlon B. Cartin

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Information			
1921417-22	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-022A / 55197 -6 4x701	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-23	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-023A / 55197 -6 70x200	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-24	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-024A / 55197 -6 -200	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-25	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-025A / 55197 -7 1/4x4	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-26	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-026A / 55197 -7 4x701	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-27	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-027A / 55197 -7 70x200	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil
1921417-28	**COC Number:**	---	**Receive Date:**	07/02/2019 08:20
	Project Number:	---	**Sampling Date:**	06/07/2019 10:00
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	N036051-028A / 55197-7-70-200	**Lab Matrix:**	Solids
	Sampled By:	---	**Sample Type:**	Soil

ASSET Laboratories- Las Vegas		**Reported:**	07/08/2019 13:29
3151-3153 W. Post Rd		Project:	Level IV (MDL)
Las Vegas, NV 89118		Project Number:	N036051
		Project Manager:	Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-01 | **Client Sample Name:** N036051-001A / 55197-1,-1/4x4M, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**500**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	0.55	**B,S11**	1
Zinc	**54**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.85		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 13:45	07/05/19 11:54	KDF	PE-OP3	0.943	B050212

ASSET Laboratories- Las Vegas		**Reported:**	07/08/2019 13:29
3151-3153 W. Post Rd		Project:	Level IV (MDL)
Las Vegas, NV 89118		Project Number:	N036051
		Project Manager:	Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-02 | **Client Sample Name:** N036051-002A / 55197-1,-4Mx70M, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**2100**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	0.53	**B,S11**	1
Zinc	**110**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.82		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 13:45	07/05/19 13:57	KDF	PE-OP3	0.909	B050212

ASSET Laboratories- Las Vegas		**Reported:**	07/08/2019 13:29
3151-3153 W. Post Rd		Project:	Level IV (MDL)
Las Vegas, NV 89118		Project Number:	N036051
		Project Manager:	Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-03 **Client Sample Name:** N036051-003A / 55197-1 70x200, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**3200**	**mg/kg dry wt.**	**1.0**	**0.10**	**EPA-6010B**	1.2	**B,D,A07,S11**	1
Zinc	**160**	**mg/kg dry wt.**	**5.0**	**0.18**	**EPA-6010B**	1.8	**D,A07**	1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 13:45	07/05/19 11:45	KDF	PE-OP3	2	B050212

ASSET Laboratories- Las Vegas
3151-3153 W. Post Rd
Las Vegas, NV 89118

Reported: 07/08/2019 13:29
Project: Level IV (MDL)
Project Number: N036051
Project Manager: Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-04 | **Client Sample Name:** N036051-004A / 55197-1-200, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**4700**	**mg/kg dry wt.**	**1.0**	**0.10**	**EPA-6010B**	1.1	**B,D,A07,S11**	1
Zinc	**170**	**mg/kg dry wt.**	**5.1**	**0.18**	**EPA-6010B**	1.7	**D,A07**	1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 13:45	07/05/19 13:59	KDF	PE-OP3	1.923	B050212

ASSET Laboratories- Las Vegas		**Reported:**	07/08/2019 13:29
3151-3153 W. Post Rd		Project:	Level IV (MDL)
Las Vegas, NV 89118		Project Number:	N036051
		Project Manager:	Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-05 **Client Sample Name:** N036051-005A / 55197-21/4x4, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**110**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	0.56	**B,S11**	1
Zinc	**42**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.88		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 13:45	07/05/19 14:00	KDF	PE-OP3	0.971	B050212

ASSET Laboratories- Las Vegas		**Reported:**	07/08/2019 13:29
3151-3153 W. Post Rd		Project:	Level IV (MDL)
Las Vegas, NV 89118		Project Number:	N036051
		Project Manager:	Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-06 **Client Sample Name:** N036051-006A / 55197-2 4x701, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**140**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	0.58	**B,S11**	1
Zinc	**41**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.91		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 13:45	07/05/19 14:02	KDF	PE-OP3	1	B050212

ASSET Laboratories- Las Vegas
3151-3153 W. Post Rd
Las Vegas, NV 89118

Reported: 07/08/2019 13:29
Project: Level IV (MDL)
Project Number: N036051
Project Manager: Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-07 | **Client Sample Name:** N036051-007A / 55197-2 70x200, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**190**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	0.55	**B,S11**	1
Zinc	**44**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.86		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 13:45	07/05/19 14:03	KDF	PE-OP3	0.952	B050212

ASSET Laboratories- Las Vegas
3151-3153 W. Post Rd
Las Vegas, NV 89118

Reported: 07/08/2019 13:29
Project: Level IV (MDL)
Project Number: N036051
Project Manager: Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-08 | **Client Sample Name:** N036051-008A / 55197-2-200, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**330**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	0.56	**B,S11**	1
Zinc	**59**	**mg/kg dry wt.**	**2.5**	**0.088**	**EPA-6010B**	0.88		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 13:45	07/05/19 14:05	KDF	PE-OP3	0.971	B050212

ASSET Laboratories- Las Vegas		**Reported:**	07/08/2019 13:29
3151-3153 W. Post Rd		Project:	Level IV (MDL)
Las Vegas, NV 89118		Project Number:	N036051
		Project Manager:	Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-09 **Client Sample Name:** N036051-009A / 55197-31/4x4, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**1000**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	0.53	**B,S11**	1
Zinc	**90**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.82		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 13:45	07/05/19 14:06	KDF	PE-OP3	0.909	B050212

ASSET Laboratories- Las Vegas		**Reported:**	07/08/2019 13:29
3151-3153 W. Post Rd		Project:	Level IV (MDL)
Las Vegas, NV 89118		Project Number:	N036051
		Project Manager:	Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-10 **Client Sample Name:** N036051-010A / 55197-3 4x701, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**1600**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	0.57	**B,S11**	1
Zinc	**110**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.89		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 13:45	07/05/19 14:08	KDF	PE-OP3	0.980	B050212

ASSET Laboratories- Las Vegas	**Reported:** 07/08/2019 13:29
3151-3153 W. Post Rd	Project: Level IV (MDL)
Las Vegas, NV 89118	Project Number: N036051
	Project Manager: Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-11 | **Client Sample Name:** N036051-011A / 55197-3 70x200, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**2600**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	0.56	**B,S11**	1
Zinc	**150**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.88		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 13:45	07/05/19 14:12	KDF	PE-OP3	0.971	B050212

ASSET Laboratories- Las Vegas	**Reported:** 07/08/2019 13:29
3151-3153 W. Post Rd	Project: Level IV (MDL)
Las Vegas, NV 89118	Project Number: N036051
	Project Manager: Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-12 | **Client Sample Name:** N036051-012A / 55197-3 -200, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	7400	mg/kg dry wt.	1.0	0.10	EPA-6010B	1.1	B,D,A07,S11	1
Zinc	330	mg/kg dry wt.	5.1	0.18	EPA-6010B	1.8	D,A07	1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 13:45	07/05/19 14:26	KDF	PE-OP3	1.980	B050212

ASSET Laboratories- Las Vegas
3151-3153 W. Post Rd
Las Vegas, NV 89118

Reported: 07/08/2019 13:29
Project: Level IV (MDL)
Project Number: N036051
Project Manager: Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-13 | **Client Sample Name:** N036051-013A / 55197 -4 1/4x4, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**700**	**mg/kg dry wt.**	**0.51**	**0.051**	**EPA-6010B**	0.57	**B,S11**	1
Zinc	**110**	**mg/kg dry wt.**	**2.5**	**0.088**	**EPA-6010B**	0.89		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/05/19 13:45	07/05/19 14:28	KDF	PE-OP3	0.980	B050212

ASSET Laboratories- Las Vegas	**Reported:** 07/08/2019 13:29
3151-3153 W. Post Rd	Project: Level IV (MDL)
Las Vegas, NV 89118	Project Number: N036051
	Project Manager: Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-14 | **Client Sample Name:** N036051-014A / 55197 -4 4x701, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**710**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	0.56	**B,S11**	1
Zinc	**99**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.87		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/05/19 13:45	07/05/19 14:29	KDF	PE-OP3	0.962	B050212

ASSET Laboratories- Las Vegas
3151-3153 W. Post Rd
Las Vegas, NV 89118

Reported: 07/08/2019 13:29
Project: Level IV (MDL)
Project Number: N036051
Project Manager: Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-15 **Client Sample Name:** N036051-015A / 55197 -4 70x200, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**1600**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	0.55	**B,S11**	1
Zinc	**220**	**mg/kg dry wt.**	**2.5**	**0.088**	**EPA-6010B**	0.86		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/05/19 13:45	07/05/19 14:31	KDF	PE-OP3	0.952	B050212

ASSET Laboratories- Las Vegas		**Reported:**	07/08/2019 13:29
3151-3153 W. Post Rd		Project:	Level IV (MDL)
Las Vegas, NV 89118		Project Number:	N036051
		Project Manager:	Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-16 **Client Sample Name:** N036051-016A / 55197 -4 -200, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**3100**	**mg/kg dry wt.**	**0.51**	**0.051**	**EPA-6010B**	0.58	**B,S11**	1
Zinc	**290**	**mg/kg dry wt.**	**2.5**	**0.089**	**EPA-6010B**	0.91		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/05/19 13:45	07/05/19 14:42	KDF	PE-OP3	1	B050212

ASSET Laboratories- Las Vegas	**Reported:** 07/08/2019 13:29
3151-3153 W. Post Rd	Project: Level IV (MDL)
Las Vegas, NV 89118	Project Number: N036051
	Project Manager: Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-17 **Client Sample Name:** N036051-017A / 55197 -5 1/4x4, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**340**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	0.57	**B,S11**	1
Zinc	**59**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.90		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/05/19 13:45	07/05/19 14:44	KDF	PE-OP3	0.990	B050212

ASSET Laboratories- Las Vegas	**Reported:** 07/08/2019 13:29
3151-3153 W. Post Rd	Project: Level IV (MDL)
Las Vegas, NV 89118	Project Number: N036051
	Project Manager: Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-18 **Client Sample Name:** N036051-018A / 55197 -5 4x701, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**1300**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	0.56	**B,S11**	1
Zinc	**100**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.87		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/05/19 13:45	07/05/19 14:45	KDF	PE-OP3	0.962	B050212

ASSET Laboratories- Las Vegas	**Reported:**	07/08/2019 13:29
3151-3153 W. Post Rd	Project:	Level IV (MDL)
Las Vegas, NV 89118	Project Number:	N036051
	Project Manager:	Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-19 **Client Sample Name:** N036051-019A / 55197 -5 70x200, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**1300**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	0.54	**B,S11**	1
Zinc	**110**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.85		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/05/19 13:45	07/05/19 14:47	KDF	PE-OP3	0.935	B050212

ASSET Laboratories- Las Vegas		**Reported:**	07/08/2019 13:29
3151-3153 W. Post Rd		Project:	Level IV (MDL)
Las Vegas, NV 89118		Project Number:	N036051
		Project Manager:	Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-20 | **Client Sample Name:** N036051-020A / 55197 -5 -200, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**2500**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	0.56	**B,S11**	1
Zinc	**150**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.87		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/05/19 13:45	07/05/19 14:48	KDF	PE-OP3	0.962	B050212

ASSET Laboratories- Las Vegas	**Reported:** 07/08/2019 13:29
3151-3153 W. Post Rd	Project: Level IV (MDL)
Las Vegas, NV 89118	Project Number: N036051
	Project Manager: Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-21 | **Client Sample Name:** N036051-021A / 55197 -6 1/4x4, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**410**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	ND		1
Zinc	**71**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.82		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 17:00	07/05/19 08:37	KDF	PE-OP3	0.962	B050217

ASSET Laboratories- Las Vegas	Reported:	07/08/2019 13:29
3151-3153 W. Post Rd	Project:	Level IV (MDL)
Las Vegas, NV 89118	Project Number:	N036051
	Project Manager:	Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-22 **Client Sample Name:** N036051-022A / 55197 -6 4x701, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**790**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	ND		1
Zinc	**95**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.83		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 17:00	07/05/19 08:43	KDF	PE-OP3	0.971	B050217

ASSET Laboratories- Las Vegas	**Reported:** 07/08/2019 13:29
3151-3153 W. Post Rd	Project: Level IV (MDL)
Las Vegas, NV 89118	Project Number: N036051
	Project Manager: Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-23 **Client Sample Name:** N036051-023A / 55197 -6 70x200, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**1100**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	ND		1
Zinc	**120**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.85		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 17:00	07/05/19 08:28	KDF	PE-OP3	1	B050217

ASSET Laboratories- Las Vegas	**Reported:** 07/08/2019 13:29
3151-3153 W. Post Rd	Project: Level IV (MDL)
Las Vegas, NV 89118	Project Number: N036051
	Project Manager: Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-24 | **Client Sample Name:** N036051-024A / 55197 -6 -200, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**3300**	**mg/kg dry wt.**	**1.0**	**0.10**	**EPA-6010B**	ND	**D,A07**	1
Zinc	**280**	**mg/kg dry wt.**	**5.0**	**0.17**	**EPA-6010B**	1.7	**D,A07**	1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 17:00	07/05/19 08:44	KDF	PE-OP3	1.980	B050217

ASSET Laboratories- Las Vegas	**Reported:**	07/08/2019 13:29
3151-3153 W. Post Rd	Project:	Level IV (MDL)
Las Vegas, NV 89118	Project Number:	N036051
	Project Manager:	Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-25 **Client Sample Name:** N036051-025A / 55197 -7 1/4x4, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**210**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	ND		1
Zinc	**59**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.80		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 17:00	07/05/19 08:46	KDF	PE-OP3	0.943	B050217

ASSET Laboratories- Las Vegas		**Reported:**	07/08/2019 13:29
3151-3153 W. Post Rd		Project:	Level IV (MDL)
Las Vegas, NV 89118		Project Number:	N036051
		Project Manager:	Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-26 **Client Sample Name:** N036051-026A / 55197 -7 4x701, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**1800**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	ND		1
Zinc	**190**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.83		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 17:00	07/05/19 08:48	KDF	PE-OP3	0.971	B050217

ASSET Laboratories- Las Vegas		**Reported:**	07/08/2019 13:29
3151-3153 W. Post Rd		Project:	Level IV (MDL)
Las Vegas, NV 89118		Project Number:	N036051
		Project Manager:	Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-27 **Client Sample Name:** N036051-027A / 55197 -7 70x200, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**2500**	**mg/kg dry wt.**	**0.50**	**0.050**	**EPA-6010B**	ND		1
Zinc	**240**	**mg/kg dry wt.**	**2.5**	**0.087**	**EPA-6010B**	0.80		1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 17:00	07/05/19 08:50	KDF	PE-OP3	0.935	B050217

ASSET Laboratories- Las Vegas	**Reported:** 07/08/2019 13:29
3151-3153 W. Post Rd	Project: Level IV (MDL)
Las Vegas, NV 89118	Project Number: N036051
	Project Manager: Marlon B. Cartin

Total Concentrations (TTLC)

BCL Sample ID: 1921417-28 | **Client Sample Name:** N036051-028A / 55197-7-70-200, 6/7/2019 10:00:00AM

Constituent	Dry Basis Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Chromium	**4600**	**mg/kg dry wt.**	**1.0**	**0.10**	**EPA-6010B**	ND	**D,A07**	1
Zinc	**410**	**mg/kg dry wt.**	**5.0**	**0.18**	**EPA-6010B**	1.7	**D,A07**	1

Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID
1	EPA-6010B	07/03/19 17:00	07/05/19 08:51	KDF	PE-OP3	1.980	B050217

ASSET Laboratories- Las Vegas	**Reported:** 07/08/2019 13:29
3151-3153 W. Post Rd	Project: Level IV (MDL)
Las Vegas, NV 89118	Project Number: N036051
	Project Manager: Marlon B. Cartin

Total Concentrations (TTLC)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B050212						
Chromium	**B050212-BLK1**	**0.58026**	**mg/kg dry wt.**	**0.50**	**0.050**	**M01**
Zinc	**B050212-BLK1**	**0.90515**	**mg/kg dry wt.**	**2.5**	**0.087**	**J**
QC Batch ID: B050217						
Chromium	B050217-BLK1	ND	mg/kg dry wt.	0.50	0.050	U
Zinc	**B050217-BLK1**	**0.85215**	**mg/kg dry wt.**	**2.5**	**0.087**	**J**

ASSET Laboratories- Las Vegas
3151-3153 W. Post Rd
Las Vegas, NV 89118

Reported: 07/08/2019 13:29
Project: Level IV (MDL)
Project Number: N036051
Project Manager: Marlon B. Cartin

Total Concentrations (TTLC)

Quality Control Report - Laboratory Control Sample

Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
QC Batch ID: B050212										
Chromium	B050212-BS1	LCS	107.42	100.00	mg/kg dry wt.	107		75 - 125		B
Zinc	B050212-BS1	LCS	110.59	100.00	mg/kg dry wt.	111		75 - 125		
QC Batch ID: B050217										
Chromium	B050217-BS1	LCS	112.31	100.00	mg/kg dry wt.	112		75 - 125		
Zinc	B050217-BS1	LCS	112.27	100.00	mg/kg dry wt.	112		75 - 125		

ASSET Laboratories- Las Vegas
3151-3153 W. Post Rd
Las Vegas, NV 89118

Reported: 07/08/2019 13:29
Project: Level IV (MDL)
Project Number: N036051
Project Manager: Marlon B. Cartin

Total Concentrations (TTLC)

Quality Control Report - Precision & Accuracy

Constituent	Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
QC Batch ID: B050212	Used client sample: Y - Description: N036051-003A / 55197-1 70x200, 06/07/2019 10:00										
Chromium	DUP	**1921417-03**	**3174.6**	**3077.9**		**mg/kg dry wt.**	**3.1**		**20**		**B,D**
	MS	**1921417-03**	**3174.6**	**3106.3**	**100.00**	**mg/kg dry wt.**		**-68.3**		**75 - 125**	**B,D,A03**
	MSD	**1921417-03**	**3174.6**	**3168.7**	**100.00**	**mg/kg dry wt.**	**2.0**	**-5.8**	**20**	**75 - 125**	**B,D,A03**
Zinc	DUP	1921417-03	162.66	161.62		mg/kg dry wt.	0.6		20		D
	MS	1921417-03	162.66	251.72	100.00	mg/kg dry wt.		89.1		75 - 125	D
	MSD	1921417-03	162.66	250.41	100.00	mg/kg dry wt.	0.5	87.7	20	75 - 125	D
QC Batch ID: B050217	Used client sample: Y - Description: N036051-023A / 55197 -6 70x200, 06/07/2019 10:00										
Chromium	DUP	**1921417-23**	**1133.3**	**1120.5**		**mg/kg dry wt.**	**1.1**		**20**		
	MS	**1921417-23**	**1133.3**	**1177.1**	**100.00**	**mg/kg dry wt.**		**43.8**		**75 - 125**	**A03**
	MSD	**1921417-23**	**1133.3**	**1129.9**	**100.00**	**mg/kg dry wt.**	**4.1**	**-3.3**	**20**	**75 - 125**	**A03**
Zinc	DUP	1921417-23	121.66	122.34		mg/kg dry wt.	0.6		20		
	MS	1921417-23	121.66	198.46	100.00	mg/kg dry wt.		76.8		75 - 125	
	MSD	1921417-23	121.66	199.40	100.00	mg/kg dry wt.	0.5	77.7	20	75 - 125	

ASSET Laboratories- Las Vegas		**Reported:**	07/08/2019 13:29
3151-3153 W. Post Rd		Project:	Level IV (MDL)
Las Vegas, NV 89118		Project Number:	N036051
		Project Manager:	Marlon B. Cartin

Notes And Definitions

B	Analyte found in blank sample(CLP Flag)
D	Dilution Used(CLP Flag)
J	Estimated Value (CLP Flag)
MDL	Method Detection Limit
ND	Analyte Not Detected
PQL	Practical Quantitation Limit
U	Analyte Not Detected at or above the reporting limit (CLP Flag)
A03	The sample concentration was more than 4 times the spike level.
A07	Detection and quantitation limits were raised due to sample dilution caused by high analyte concentration or matrix interference.
M01	Analyte detected in the Method Blank at or above the PQL.
S11	The analyte in the Method Blank is greater than the laboratory PQL but the sample result is greater than 10 times the Method Blank.

APPENDIX E

Dioxin Analysis: Minus $^1/_4$ in. Samples Provided by Jacobs

Sample ID	Analyte	Final Result	Final Validation Flag	Units
55197-1	Total HpCDD	18000	J	ng/Kg
55197-1	Total HpCDF	4000	J	ng/Kg
55197-1	Total HxCDD	1200		ng/Kg
55197-1	Total HxCDF	1700		ng/Kg
55197-1	Total PeCDD	84		ng/Kg
55197-1	Total PeCDF	490		ng/Kg
55197-1	Total TCDD	7.4		ng/Kg
55197-1	Total TCDF	45		ng/Kg
55197-2	Total HpCDD	990		ng/Kg
55197-2	Total HpCDF	97		ng/Kg
55197-2	Total HxCDD	58		ng/Kg
55197-2	Total HxCDF	45		ng/Kg
55197-2	Total PeCDD	1.2	J	ng/Kg
55197-2	Total PeCDF	15		ng/Kg
55197-2	Total TCDD	0.27	U	ng/Kg
55197-2	Total TCDF	0.96		ng/Kg
55197-3	Total HpCDD	120000		ng/Kg
55197-3	Total HpCDF	21000		ng/Kg
55197-3	Total HxCDD	7000		ng/Kg
55197-3	Total HxCDF	9400		ng/Kg
55197-3	Total PeCDD	430		ng/Kg
55197-3	Total PeCDF	3400		ng/Kg
55197-3	Total TCDD	20		ng/Kg
55197-3	Total TCDF	220		ng/Kg
55197-4	Total HpCDD	9600	J	ng/Kg
55197-4	Total HpCDF	1100		ng/Kg
55197-4	Total HxCDD	760		ng/Kg
55197-4	Total HxCDF	840		ng/Kg
55197-4	Total PeCDD	63		ng/Kg
55197-4	Total PeCDF	360		ng/Kg
55197-4	Total TCDD	3.8		ng/Kg
55197-4	Total TCDF	36		ng/Kg
55197-5	Total HpCDD	16000	J	ng/Kg
55197-5	Total HpCDF	4700	J	ng/Kg
55197-5	Total HxCDD	1200		ng/Kg
55197-5	Total HxCDF	2200		ng/Kg
55197-5	Total PeCDD	66		ng/Kg
55197-5	Total PeCDF	700		ng/Kg
55197-5	Total TCDD	3.2		ng/Kg
55197-5	Total TCDF	66		ng/Kg
55197-6	Total HpCDD	23000	J	ng/Kg
55197-6	Total HpCDF	9000	J	ng/Kg
55197-6	Total HxCDD	1300		ng/Kg
55197-6	Total HxCDF	1800		ng/Kg

55197-6	Total PeCDD	56		ng/Kg
55197-6	Total PeCDF	280		ng/Kg
55197-6	Total TCDD	3		ng/Kg
55197-6	Total TCDF	14		ng/Kg
55197-7	Total HpCDD	70000		ng/Kg
55197-7	Total HpCDF	31000		ng/Kg
55197-7	Total HxCDD	2900		ng/Kg
55197-7	Total HxCDF	3900		ng/Kg
55197-7	Total PeCDD	95		ng/Kg
55197-7	Total PeCDF	500		ng/Kg
55197-7	Total TCDD	4.1		ng/Kg
55197-7	Total TCDF	26		ng/Kg

Pace Analytical Services, LLC.
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Minneapolis, MN 55414
Phone: 612.607.1700
Fax: 612.607.6444

www.pacelabs.com

Report Prepared for:

Marlon Cartin
Asset Laboratories
3151 West Post Road
Las Vegas NV 89118

REPORT OF LABORATORY ANALYSIS FOR PCDD/PCDF

Report Prepared Date:

June 11, 2019

Report Information:

Pace Project #: 10476387
Sample Receipt Date: 05/24/2019
Client Project #: N035749
Client Sub PO #: N35749A
State Cert #: 2929

Invoicing & Reporting Options:

The report provided has been invoiced as a Level 2 PCDD/PCDF Report. If an upgrade of this report package is requested, an additional charge may be applied.

Please review the attached invoice for accuracy and forward any questions to Joanne Richardson, your Pace Project Manager.

This report has been reviewed by:

Joanne Richardson

June 11, 2019
Joanne Richardson,
(612) 607-6453
(612) 607-6444 (fax)

NELAP ACCREDITED TNI LABORATORY

Report of Laboratory Analysis

Pace Analytical Services, LLC.
1700 Elm Street
Minneapolis, MN 55414
Phone: 612.607.1700
Fax: 612.607.6444

DISCUSSION

This report presents the results from the analyses performed on seven samples submitted by a representative of Asset Laboratories. The samples were analyzed for the presence or absence of polychlorodibenzo-p-dioxins (PCDDs) and polychlorodibenzofurans (PCDFs) using a modified version of USEPA Method 8290. The reporting limits were based on signal-to-noise measurements. Estimated Maximum Possible Concentration (EMPC) values were treated as positives in the toxic equivalence calculations.

Second column confirmation analyses of 2,3,7,8-TCDF values obtained from the primary (DB5-MS) column are performed only when specifically requested for a project and only when the values are above the concentration of the lowest calibration standard. Typical resolution for this isomer using the DB5-MS column ranges from 25-30%.

The recoveries of the isotopically-labeled PCDD/PCDF internal standards in the sample extracts ranged from 49-90%. All of the labeled internal standard recoveries obtained for this project were within the 40-135% target range specified in Method 8290. Also, since the quantification of the native 2,3,7,8-substituted congeners was based on isotope dilution, the data were automatically corrected for variation in recovery and accurate values were obtained.

Values were flagged "I" where incorrect isotope ratios were obtained or "P" where polychorinated diphenyl ethers were present. Concentrations below the calibration range were flagged "J" and should be regarded as estimates. Concentrations above the calibration range were flagged "E" and should also be regarded as estimates. Values obtained from analyses of diluted extracts were flagged "D" and "N2".

A laboratory method blank was prepared and analyzed with the sample batch as part of our routine quality control procedures. The results show the blank to contain trace levels of selected congeners. These levels were below the calibration range of the method. The concentrations reported for the affected congeners in the field samples were higher than the corresponding blank levels by one or more orders of magnitude. These results indicate that the sample processing steps did not contribute significantly to the levels reported for the field samples.

A laboratory spike sample was also prepared using clean reference matrix that had been fortified with native standard materials. The recoveries of the native compounds ranged from 94-115%. These results were within the target range for the method. Matrix spikes were prepared with the sample batch using sample material from a separate project; results from these analyses will be provided upon request.

Pace Analytical™

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Minnesota Laboratory Certifications

Authority	Certificate #	Authority	Certificate #
A2LA	2926.01	Minnesota - Pet	1240
Alabama	40770	Mississippi	MN00064
Alaska - DW	MN00064	Missouri - DW	10100
Alaska - UST	17-009	Montana	CERT0092
Arizona	AZ0014	Nebraska	NE-OS-18-06
Arkansas - DW	MN00064	Nevada	MN00064
Arkansas - WW	88-0680	New Hampshire	2081
CNMI Saipan	MP0003	New Jersey (NE	MN002
California	2929	New York	11647
Colorado	MN00064	North Carolina	27700
Connecticut	PH-0256	North Carolina -	27700
EPA Region 8+	via MN 027-053	North Carolina -	530
Florida (NELAP	E87605	North Dakota	R-036
Georgia	959	Ohio - DW	41244
Guam	17-001r	Ohio - VAP	CL101
Hawaii	MN00064	Oklahoma	9507
Idaho	MN00064	Oregon - Primar	MN300001
Illinois	200011	Oregon - Secon	MN200001
Indiana	C-MN-01	Pennsylvania	68-00563
Iowa	368	Puerto Rico	MN00064
Kansas	E-10167	South Carolina	74003
Kentucky - DW	90062	South Dakota	NA
Kentucky - WW	90062	Tennessee	TN02818
Louisiana - DE	03086	Texas	T104704192
Louisiana - DW	MN00064	Utah (NELAP)	MN00064
Maine	MN00064	Virginia	460163
Maryland	322	Washington	C486
Massachusetts	M-MN064	West Virginia -	382
Michigan	9909	West Virginia -	9952C
Minnesota	027-053-137	Wisconsin	999407970
Minnesota - De	via MN 027-053	Wyoming - UST	2926.01

REPORT OF LABORATORY ANALYSIS

Appendix A

Sample Management

ASSET Laboratories
3151-3153 W Post Rd., Las Vegas, NV 89118
www.atl-labs.com
TEL: 7023072659 *FAX: 7023072691*

CHAIN-OF-CUSTODY RECORD

WO#: 10476387
10476387

C Level: **Level IV**

Subcontractor:
Pace Analytical Services, Inc.
1700 Elm Street, Suite 200
Minneapolis, MN 55414

TEL: (612) 607-1700
FAX: (612) 607-6444
Acct #:

Field Sampler: Signed

23-May-19

Sample ID	Matrix	Date Collected	Bottle Type	Requested Tests: EPA 8290		
N035749-001A / 55197-1	Soil	5/21/2019 11:00:00 AM	8OZG	1		W1
N035749-002A / 55197-2	Soil	5/21/2019 11:00:00 AM	8OZG	1		W2
N035749-003A / 55197-3	Soil	5/21/2019 11:00:00 AM	8OZG	1		W3
N035749-004A / 55197-4	Soil	5/21/2019 11:00:00 AM	8OZG	1		W4
N035749-005A / 55197-5	Soil	5/21/2019 11:00:00 AM	8OZG	1		W5
N035749-006A / 55197-6	Soil	5/21/2019 11:00:00 AM	8OZG	1		W6
N035749-007A / 55197-7	Soil	5/21/2019 11:00:00 AM	8OZG	1		W7

Please cc Report to Lucille Golosinda at lucille.golosinda@assetlaboratories.com

General Comments: Please email sample receipt acknowledgement to the PM. Please cc andrea.gallardo@assetlaboratories.com

Please use PO#:N35749A Please email Invoices and Account Receivable Statements to elvira@assetlaboratories.com. For questions, call Marlon at (702)-307-2659. Please e-mail results to reports.lv@assetlaboratories.com by: Normal TAT.

Please analyze for Dioxins and Furans. EDD Requirement Labspec7 edata.

Fedex #: 775296943350

		Date/Time			Date/Time
Relinquished by:	YRJ	5/23/2019 16:00	**Received by:**	Michael K Pace	5/24/19 8:50
Relinquished by:			**Received by:**		

Pace Analytical®	Document Name: **Sample Condition Upon Receipt Form**	Document Revised: 09May2019 Page 1 of 1
	Document No.: **F-MN-L-213-rev.28**	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: Asset Laboratories

Project #: WO# : 10476387

Courier: [x] Fed Ex [ ] UPS [ ] USPS [ ] Client [ ] Pace [ ] SpeeDee [ ] Commercial See Exception [ ]

Tracking Number: 7752 9694 3350

Custody Seal on Cooler/Box Present? [ ] Yes [x] No **Seals Intact?** [ ] Yes [x] No **Biological Tissue Frozen?** [ ] Yes [ ] No [x] N/A

Packing Material: [x] Bubble Wrap [x] Bubble Bags [ ] None [ ] Other:______ **Temp Blank?** [ ] Yes [x] No

Thermometer: [ ] T1(0461) [ ] T2(1336) [ ] T3(0459) [x] T4(0254) [ ] T5(0489) **Type of Ice:** [x] Wet [ ] Blue [ ] None [ ] Dry [ ] Melted

Note: Each West Virginia Sample must have temp taken (no temp blanks)

Temp should be above freezing to 6°C **Cooler Temp Read w/temp blank:** ______ °C	**Average Corrected Temp (no temp blank only):** 1.9° °C See Exceptions [x]
Correction Factor: TNE **Cooler Temp Corrected w/temp blank:** ______ °C	

USDA Regulated Soil: ([ ] N/A, water sample/Other:______) **Date/Initials of Person Examining Contents:** MKZ 5-24-19

Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA, MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? [ ] Yes [x] No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? [ ] Yes [x] No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

	Yes	No	N/A	**COMMENTS:**
Chain of Custody Present and Filled Out?	[x]	[ ]		1.
Chain of Custody Relinquished?	[x]	[ ]		2.
Sampler Name and/or Signature on COC?	[ ]	[ ]	[x]	3.
Samples Arrived within Hold Time?	[x]	[ ]		4.
Short Hold Time Analysis (<72 hr)?	[ ]	[x]		5. [ ] Fecal Coliform [ ] HPC [ ] Total Coliform/E coli [ ] BOD/cBOD [ ] Hex Chrome [ ] Turbidity [ ] Nitrate [ ] Nitrite [ ] Orthophos [ ] Other______
Rush Turn Around Time Requested?	[ ]	[x]		6.
Sufficient Volume?	[x]	[ ]		7.
Correct Containers Used?	[x]	[ ]		8.
-Pace Containers Used?	[ ]	[x]		
Containers Intact?	[x]	[ ]		9.
Field Filtered Volume Received for Dissolved Tests?	[ ]	[ ]	[x]	10. Is sediment visible in the dissolved container? [ ] Yes [ ] No
Is sufficient information available to reconcile the samples to the COC? Matrix: [ ] Water [x] Soil [ ] Oil [ ] Other______	[x]	[ ]		11. **If no, write ID/ Date/Time on Container Below:** See Exception [ ]
All containers needing acid/base preservation have been checked?	[ ]	[ ]	[x]	12. Sample #
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, <2pH, NaOH >9 Sulfide, NaOH>12 Cyanide)	[ ]	[ ]	[x]	[ ] NaOH [ ] HNO_3 [ ] H_2SO_4 [ ] Zinc Acetate
Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFAS	[ ]	[ ]	[x]	Positive for Res. Chlorine? [ ] Yes [ ] No **pH Paper Lot#** See Exception [ ] Res. Chlorine / 0-6 Roll / 0-6 Strip / 0-14 Strip
Headspace in VOA Vials (greater than 6mm)?	[ ]	[ ]	[x]	13. See Exception [ ]
Trip Blank Present?	[ ]	[ ]	[x]	14.
Trip Blank Custody Seals Present?	[ ]	[ ]	[x]	Pace Trip Blank Lot # (if purchased):______

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** [ ] Yes [ ] No

Person Contacted: ______ Date/Time: ______

Comments/Resolution: ______

Project Manager Review: Joanne Richardson **Date:** 5-24-19

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers).

Labeled by: FL

Pace Analytical	Document Name: **SCUR Exception Form – Coolers Above 6°C**	Document Revised: 08Apr2019 Page 1 of 1
	Document No.: **F-MN-C-298-Rev.02**	Issuing Authority: Pace Minnesota Quality Office

During sample triage, this form is to be placed in each cooler that arrives above 6.0 degrees Celsius

SCUR Exceptions: **Workorder #:**

Out of Temp Sample IDs	Container Type	# of Containers

PM Notified? ☐Yes ☐No

If yes, indicate who was contacted/date/time.
If no, indicate reason why.

Multiple Cooler Project? ☐Yes ☐No
If you answered yes, fill out information to the left.

No Temp Blank		
Read Temp	Corrected Temp	Average Temp
1.4	1.4	1.9
0.8	0.8	
1.6	1.6	
3.8	3.8	

Tracking Number/Temperature	

Other Issues		
Issue Type: Sample ID	Container Type	# of Containers

pH Adjustment Log for Preserved Samples

Sample ID	Type of Preserv.	pH Upon Receipt	Date Adjusted	Time Adjusted	Amount Added (mL)	Lot # Added	pH After	In Compliance after addition?	Initials
								☐Yes ☐No	
								☐Yes ☐No	
								☐Yes ☐No	
								☐Yes ☐No	

Pace Analytical Services, LLC
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Reporting Flags

A = Reporting Limit based on signal to noise

B = Less than 10x higher than method blank level

C = Result obtained from confirmation analysis

D = Result obtained from analysis of diluted sample

E = Exceeds calibration range

I = Interferencepresent

J = Estimated value

L = Suppressive interference, analyte may be biased low

Nn = Value obtained from additional analysis

P = PCDEInterference

R = Recovery outside target range

S = Peak saturated

U = Analyte not detected

V = Result verified by confirmation analysis

X = %D Exceeds limits

Y = Calculated using average of daily RFs

* = SeeDiscussion

Appendix B

Sample Analysis Summary

Pace Analytical™

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Sample Analysis Results

Client - Asset Laboratories

Client's Sample ID	N035749-001A / 55197-1			
Lab Sample ID	10476387001			
Filename	U190606B_13			
Injected By	ZMS			
Total Amount Extracted	11.6 g		Matrix	Solid
% Moisture	3.2		Dilution	NA
Dry Weight Extracted	11.2 g		Collected	05/21/2019 11:00
ICAL ID	U190606		Received	05/24/2019 09:55
CCal Filename(s)	U190606B_03 & U190606B_14		Extracted	06/04/2019 15:25
Method Blank ID	BLANK-70902		Analyzed	06/06/2019 22:36

Native Isomers	Conc ng/Kg	EMPC ng/Kg	EDL ng/Kg		Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	1.4	----	0.34		2,3,7,8-TCDF-13C	2.00	68
Total TCDF	45	----	0.34		2,3,7,8-TCDD-13C	2.00	72
					1,2,3,7,8-PeCDF-13C	2.00	65
2,3,7,8-TCDD	1.2	----	0.15		2,3,4,7,8-PeCDF-13C	2.00	67
Total TCDD	7.4	----	0.15		1,2,3,7,8-PeCDD-13C	2.00	77
					1,2,3,4,7,8-HxCDF-13C	2.00	59
1,2,3,7,8-PeCDF	5.0	----	0.29		1,2,3,6,7,8-HxCDF-13C	2.00	62
2,3,4,7,8-PeCDF	11	----	0.21		2,3,4,6,7,8-HxCDF-13C	2.00	63
Total PeCDF	490	----	0.25		1,2,3,7,8,9-HxCDF-13C	2.00	62
					1,2,3,4,7,8-HxCDD-13C	2.00	64
1,2,3,7,8-PeCDD	20	----	0.21		1,2,3,6,7,8-HxCDD-13C	2.00	59
Total PeCDD	84	----	0.21		1,2,3,4,6,7,8-HpCDF-13C	2.00	64
					1,2,3,4,7,8,9-HpCDF-13C	2.00	66
1,2,3,4,7,8-HxCDF	60	----	0.74		1,2,3,4,6,7,8-HpCDD-13C	2.00	77
1,2,3,6,7,8-HxCDF	22	----	0.74		OCDD-13C	4.00	65
2,3,4,6,7,8-HxCDF	66	----	1.0				
1,2,3,7,8,9-HxCDF	11	----	0.87		1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	1700	----	0.84		1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	40	----	2.0		2,3,7,8-TCDD-37Cl4	0.20	71
1,2,3,6,7,8-HxCDD	280	----	1.6				
1,2,3,7,8,9-HxCDD	100	----	1.1				
Total HxCDD	1200	----	1.6				
1,2,3,4,6,7,8-HpCDF	----	1300	1.7	P	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	100	----	4.1		Equivalence: 390 ng/Kg		
Total HpCDF	4000	----	2.9	E	(Lower-bound - Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	9800	----	0.23	E			
Total HpCDD	18000	----	0.23	E			
OCDF	3200	----	0.35				
OCDD	200000	----	0.55	E			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
EDL = Estimated Detection Limit

ND = Not Detected
NA = Not Applicable
NC = Not Calculated

Results reported on a dry weight basis and are valid to no more than 2 significant figures.
P = PCDE Interference
E = Exceeds calibration range

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Sample Analysis Results

Client - Asset Laboratories

Client's Sample ID	N035749-002A / 55197-2		
Lab Sample ID	10476387002		
Filename	U190606C_02		
Injected By	ZMS		
Total Amount Extracted	11.8 g	Matrix	Solid
% Moisture	3.0	Dilution	NA
Dry Weight Extracted	11.4 g	Collected	05/21/2019 11:00
ICAL ID	U190606	Received	05/24/2019 09:55
CCal Filename(s)	U190606B_14 & U190606C_14	Extracted	06/04/2019 15:25
Method Blank ID	BLANK-70902	Analyzed	06/07/2019 00:50

Native Isomers	Conc ng/Kg	EMPC ng/Kg	EDL ng/Kg		Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	ND	----	0.23		2,3,7,8-TCDF-13C	2.00	62
Total TCDF	0.96	----	0.23		2,3,7,8-TCDD-13C	2.00	64
					1,2,3,7,8-PeCDF-13C	2.00	60
2,3,7,8-TCDD	ND	----	0.30		2,3,4,7,8-PeCDF-13C	2.00	60
Total TCDD	ND	----	0.30		1,2,3,7,8-PeCDD-13C	2.00	69
					1,2,3,4,7,8-HxCDF-13C	2.00	52
1,2,3,7,8-PeCDF	0.33	----	0.24	J	1,2,3,6,7,8-HxCDF-13C	2.00	55
2,3,4,7,8-PeCDF	0.67	----	0.14	J	2,3,4,6,7,8-HxCDF-13C	2.00	57
Total PeCDF	15	----	0.19		1,2,3,7,8,9-HxCDF-13C	2.00	54
					1,2,3,4,7,8-HxCDD-13C	2.00	55
1,2,3,7,8-PeCDD	----	0.58	0.21	IJ	1,2,3,6,7,8-HxCDD-13C	2.00	55
Total PeCDD	1.2	----	0.21	J	1,2,3,4,6,7,8-HpCDF-13C	2.00	54
					1,2,3,4,7,8,9-HpCDF-13C	2.00	55
1,2,3,4,7,8-HxCDF	2.4	----	0.51	J	1,2,3,4,6,7,8-HpCDD-13C	2.00	63
1,2,3,6,7,8-HxCDF	1.3	----	0.51	J	OCDD-13C	4.00	52
2,3,4,6,7,8-HxCDF	----	1.4	0.32	IJ			
1,2,3,7,8,9-HxCDF	----	0.61	0.51	IJ	1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	45	----	0.46		1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	1.7	----	0.64	J	2,3,7,8-TCDD-37Cl4	0.20	67
1,2,3,6,7,8-HxCDD	9.9	----	0.24				
1,2,3,7,8,9-HxCDD	----	2.5	0.38	IJ			
Total HxCDD	58	----	0.42				
1,2,3,4,6,7,8-HpCDF	----	36	0.62	P	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	----	2.2	0.93	IJ	Equivalence: 15 ng/Kg		
Total HpCDF	97	----	0.78		(Lower-bound - Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	470	----	0.26				
Total HpCDD	990	----	0.26				
OCDF	95	----	0.35				
OCDD	7400	----	0.77	E			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
EDL = Estimated Detection Limit

ND = Not Detected
NA = Not Applicable
NC = Not Calculated

Results reported on a dry weight basis and are valid to no more than 2 significant figures.
J = Estimated value
P = PCDE Interference
E = Exceeds calibration range
I = Interference present

REPORT OF LABORATORY ANALYSIS

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Method 8290 Sample Analysis Results

Client - Asset Laboratories

Client's Sample ID	N035749-003A / 55197-3		
Lab Sample ID	10476387003		
Filename	U190606C_03		
Injected By	ZMS		
Total Amount Extracted	11.9 g	Matrix	Solid
% Moisture	3.9	Dilution	NA
Dry Weight Extracted	11.4 g	Collected	05/21/2019 11:00
ICAL ID	U190606	Received	05/24/2019 09:55
CCal Filename(s)	U190606B_14 & U190606C_14	Extracted	06/04/2019 15:25
Method Blank ID	BLANK-70902	Analyzed	06/07/2019 01:35

Native Isomers	**Conc** ng/Kg	**EMPC** ng/Kg	**EDL** ng/Kg		**Internal Standards**	**ng's Added**	**Percent Recovery**	
2,3,7,8-TCDF	6.8	----	0.25		2,3,7,8-TCDF-13C	2.00	60	
Total TCDF	220	----	0.25		2,3,7,8-TCDD-13C	2.00	65	
					1,2,3,7,8-PeCDF-13C	2.00	59	
2,3,7,8-TCDD	6.1	----	0.14		2,3,4,7,8-PeCDF-13C	2.00	61	
Total TCDD	20	----	0.14		1,2,3,7,8-PeCDD-13C	2.00	69	
					1,2,3,4,7,8-HxCDF-13C	2.00	50	
1,2,3,7,8-PeCDF	43	----	1.1		1,2,3,6,7,8-HxCDF-13C	2.00	52	
2,3,4,7,8-PeCDF	150	----	0.72		2,3,4,6,7,8-HxCDF-13C	2.00	53	
Total PeCDF	3400	----	0.93		1,2,3,7,8,9-HxCDF-13C	2.00	53	
					1,2,3,4,7,8-HxCDD-13C	2.00	49	
1,2,3,7,8-PeCDD	110	----	0.74		1,2,3,6,7,8-HxCDD-13C	2.00	55	
Total PeCDD	430	----	0.74		1,2,3,4,6,7,8-HpCDF-13C	2.00	59	DN2
					1,2,3,4,7,8,9-HpCDF-13C	2.00	62	DN2
1,2,3,4,7,8-HxCDF	880	----	2.4		1,2,3,4,6,7,8-HpCDD-13C	2.00	77	DN2
1,2,3,6,7,8-HxCDF	120	----	1.8		OCDD-13C	4.00	90	DN2
2,3,4,6,7,8-HxCDF	370	----	2.2					
1,2,3,7,8,9-HxCDF	110	----	3.8		1,2,3,4-TCDD-13C	2.00	NA	
Total HxCDF	9400	----	2.6		1,2,3,7,8,9-HxCDD-13C	2.00	NA	
1,2,3,4,7,8-HxCDD	300	----	5.6		2,3,7,8-TCDD-37Cl4	0.20	67	
1,2,3,6,7,8-HxCDD	1600	----	2.9					
1,2,3,7,8,9-HxCDD	630	----	4.7					
Total HxCDD	7000	----	4.4					
1,2,3,4,6,7,8-HpCDF	5800	----	14	DN2	Total 2,3,7,8-TCDD			
1,2,3,4,7,8,9-HpCDF	440	----	8.1	DN2	Equivalence: 2200 ng/Kg			
Total HpCDF	21000	----	11	DN2	(Lower-bound - Using ITE Factors)			
1,2,3,4,6,7,8-HpCDD	64000	----	8.7	DN2				
Total HpCDD	120000	----	8.7	DN2				
OCDF	10000	----	4.3	DN2				
OCDD	910000	----	7.9	EDN2				

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EMPC = Estimated Maximum Possible Concentration
EDL = Estimated Detection Limit

ND = Not Detected
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NC = Not Calculated

Results reported on a dry weight basis and are valid to no more than 2 significant figures.
E = Exceeds calibration range
D = Result obtained from analysis of diluted sample
Nn = Value obtained from additional analysis

REPORT OF LABORATORY ANALYSIS

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Method 8290 Sample Analysis Results

Client - Asset Laboratories

Client's Sample ID	N035749-004A / 55197-4		
Lab Sample ID	10476387004		
Filename	U190606C_04		
Injected By	ZMS		
Total Amount Extracted	11.9 g	Matrix	Solid
% Moisture	5.8	Dilution	NA
Dry Weight Extracted	11.2 g	Collected	05/21/2019 11:00
ICAL ID	U190606	Received	05/24/2019 09:55
CCal Filename(s)	U190606B_14 & U190606C_14	Extracted	06/04/2019 15:25
Method Blank ID	BLANK-70902	Analyzed	06/07/2019 02:20

Native Isomers	Conc ng/Kg	EMPC ng/Kg	EDL ng/Kg		Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	-----	0.91	0.30	I	2,3,7,8-TCDF-13C	2.00	67
Total TCDF	36	-----	0.30		2,3,7,8-TCDD-13C	2.00	70
					1,2,3,7,8-PeCDF-13C	2.00	63
2,3,7,8-TCDD	1.4	-----	0.42		2,3,4,7,8-PeCDF-13C	2.00	66
Total TCDD	3.8	-----	0.42		1,2,3,7,8-PeCDD-13C	2.00	73
					1,2,3,4,7,8-HxCDF-13C	2.00	60
1,2,3,7,8-PeCDF	4.5	-----	0.23		1,2,3,6,7,8-HxCDF-13C	2.00	61
2,3,4,7,8-PeCDF	12	-----	0.68		2,3,4,6,7,8-HxCDF-13C	2.00	62
Total PeCDF	360	-----	0.46		1,2,3,7,8,9-HxCDF-13C	2.00	57
					1,2,3,4,7,8-HxCDD-13C	2.00	63
1,2,3,7,8-PeCDD	15	-----	0.60		1,2,3,6,7,8-HxCDD-13C	2.00	58
Total PeCDD	63	-----	0.60		1,2,3,4,6,7,8-HpCDF-13C	2.00	63
					1,2,3,4,7,8,9-HpCDF-13C	2.00	65
1,2,3,4,7,8-HxCDF	54	-----	1.3		1,2,3,4,6,7,8-HpCDD-13C	2.00	76
1,2,3,6,7,8-HxCDF	14	-----	0.76		OCDD-13C	4.00	67
2,3,4,6,7,8-HxCDF	33	-----	0.88				
1,2,3,7,8,9-HxCDF	10	-----	0.53		1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	840	-----	0.87		1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	29	-----	1.4		2,3,7,8-TCDD-37Cl4	0.20	73
1,2,3,6,7,8-HxCDD	150	-----	2.0				
1,2,3,7,8,9-HxCDD	78	-----	2.0				
Total HxCDD	760	-----	1.8				
1,2,3,4,6,7,8-HpCDF	-----	470	1.0	P	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	37	-----	1.8		Equivalence: 200 ng/Kg		
Total HpCDF	1100	-----	1.4		(Lower-bound - Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	5000	-----	1.3	E			
Total HpCDD	9600	-----	1.3	E			
OCDF	890	-----	0.48				
OCDD	97000	-----	3.2	E			

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E = Exceeds calibration range
I = Interference present

REPORT OF LABORATORY ANALYSIS

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Method 8290 Sample Analysis Results

Client - Asset Laboratories

Client's Sample ID	N035749-005A / 55197-5		
Lab Sample ID	10476387005		
Filename	U190606C_05		
Injected By	ZMS		
Total Amount Extracted	11.3 g	Matrix	Solid
% Moisture	2.3	Dilution	NA
Dry Weight Extracted	11.0 g	Collected	05/21/2019 11:00
ICAL ID	U190606	Received	05/24/2019 09:55
CCal Filename(s)	U190606B_14 & U190606C_14	Extracted	06/04/2019 15:25
Method Blank ID	BLANK-70902	Analyzed	06/07/2019 03:04

Native Isomers	Conc ng/Kg	EMPC ng/Kg	EDL ng/Kg		Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	1.7	----	0.20		2,3,7,8-TCDF-13C	2.00	60
Total TCDF	66	----	0.20		2,3,7,8-TCDD-13C	2.00	64
					1,2,3,7,8-PeCDF-13C	2.00	57
2,3,7,8-TCDD	1.5	----	0.49		2,3,4,7,8-PeCDF-13C	2.00	59
Total TCDD	3.2	----	0.49		1,2,3,7,8-PeCDD-13C	2.00	68
					1,2,3,4,7,8-HxCDF-13C	2.00	52
1,2,3,7,8-PeCDF	10	----	0.74		1,2,3,6,7,8-HxCDF-13C	2.00	55
2,3,4,7,8-PeCDF	24	----	0.62		2,3,4,6,7,8-HxCDF-13C	2.00	57
Total PeCDF	700	----	0.68		1,2,3,7,8,9-HxCDF-13C	2.00	53
					1,2,3,4,7,8-HxCDD-13C	2.00	54
1,2,3,7,8-PeCDD	16	----	0.56		1,2,3,6,7,8-HxCDD-13C	2.00	57
Total PeCDD	66	----	0.56		1,2,3,4,6,7,8-HpCDF-13C	2.00	58
					1,2,3,4,7,8,9-HpCDF-13C	2.00	59
1,2,3,4,7,8-HxCDF	71	----	1.4		1,2,3,4,6,7,8-HpCDD-13C	2.00	70
1,2,3,6,7,8-HxCDF	41	----	1.5		OCDD-13C	4.00	58
2,3,4,6,7,8-HxCDF	130	----	1.8				
1,2,3,7,8,9-HxCDF	30	----	1.5		1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	2200	----	1.5		1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	46	----	1.2		2,3,7,8-TCDD-37Cl4	0.20	74
1,2,3,6,7,8-HxCDD	270	----	0.92				
1,2,3,7,8,9-HxCDD	74	----	1.0				
Total HxCDD	1200	----	1.0				
1,2,3,4,6,7,8-HpCDF	840	----	1.7		Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	110	----	1.4		Equivalence: 350 ng/Kg		
Total HpCDF	4700	----	1.6	E	(Lower-bound - Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	8800	----	1.5	E			
Total HpCDD	16000	----	1.5	E			
OCDF	2700	----	0.79				
OCDD	160000	----	2.3	E			

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E = Exceeds calibration range

REPORT OF LABORATORY ANALYSIS

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Method 8290 Sample Analysis Results

Client - Asset Laboratories

Client's Sample ID	N035749-006A / 55197-6		
Lab Sample ID	10476387006		
Filename	U190606C_06		
Injected By	ZMS		
Total Amount Extracted	11.6 g	Matrix	Solid
% Moisture	3.3	Dilution	NA
Dry Weight Extracted	11.2 g	Collected	05/21/2019 11:00
ICAL ID	U190606	Received	05/24/2019 09:55
CCal Filename(s)	U190606B_14 & U190606C_14	Extracted	06/04/2019 15:25
Method Blank ID	BLANK-70902	Analyzed	06/07/2019 03:49

Native Isomers	Conc ng/Kg	EMPC ng/Kg	EDL ng/Kg		Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	----	0.42	0.19	IJ	2,3,7,8-TCDF-13C	2.00	61
Total TCDF	14	----	0.19		2,3,7,8-TCDD-13C	2.00	63
					1,2,3,7,8-PeCDF-13C	2.00	58
2,3,7,8-TCDD	1.6	----	0.39		2,3,4,7,8-PeCDF-13C	2.00	59
Total TCDD	3.0	----	0.39		1,2,3,7,8-PeCDD-13C	2.00	64
					1,2,3,4,7,8-HxCDF-13C	2.00	54
1,2,3,7,8-PeCDF	2.1	----	0.62	J	1,2,3,6,7,8-HxCDF-13C	2.00	55
2,3,4,7,8-PeCDF	4.5	----	0.44		2,3,4,6,7,8-HxCDF-13C	2.00	56
Total PeCDF	280	----	0.53		1,2,3,7,8,9-HxCDF-13C	2.00	54
					1,2,3,4,7,8-HxCDD-13C	2.00	52
1,2,3,7,8-PeCDD	11	----	0.34		1,2,3,6,7,8-HxCDD-13C	2.00	52
Total PeCDD	56	----	0.34		1,2,3,4,6,7,8-HpCDF-13C	2.00	59
					1,2,3,4,7,8,9-HpCDF-13C	2.00	61
1,2,3,4,7,8-HxCDF	44	----	1.4		1,2,3,4,6,7,8-HpCDD-13C	2.00	67
1,2,3,6,7,8-HxCDF	18	----	1.4		OCDD-13C	4.00	55
2,3,4,6,7,8-HxCDF	46	----	0.93				
1,2,3,7,8,9-HxCDF	10	----	1.8		1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	1800	----	1.4		1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	29	----	1.9		2,3,7,8-TCDD-37Cl4	0.20	72
1,2,3,6,7,8-HxCDD	230	----	1.5				
1,2,3,7,8,9-HxCDD	68	----	0.97				
Total HxCDD	1300	----	1.5				
1,2,3,4,6,7,8-HpCDF	1300	----	0.80		Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	160	----	4.1		Equivalence: 340 ng/Kg		
Total HpCDF	9000	----	2.4	E	(Lower-bound - Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	10000	----	0.76	E			
Total HpCDD	23000	----	0.76	E			
OCDF	11000	----	1.2	E			
OCDD	160000	----	2.0	E			

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REPORT OF LABORATORY ANALYSIS

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Method 8290 Sample Analysis Results

Client - Asset Laboratories

Client's Sample ID	N035749-007A / 55197-7			
Lab Sample ID	10476387007			
Filename	U190606C_07			
Injected By	ZMS			
Total Amount Extracted	11.7 g		Matrix	Solid
% Moisture	3.4		Dilution	NA
Dry Weight Extracted	11.3 g		Collected	05/21/2019 11:00
ICAL ID	U190606		Received	05/24/2019 09:55
CCal Filename(s)	U190606B_14 & U190606C_14		Extracted	06/04/2019 15:25
Method Blank ID	BLANK-70902		Analyzed	06/07/2019 04:34

Native Isomers	Conc ng/Kg	EMPC ng/Kg	EDL ng/Kg		Internal Standards	ng's Added	Percent Recovery	
2,3,7,8-TCDF	0.98	----	0.11		2,3,7,8-TCDF-13C	2.00	71	
Total TCDF	26	----	0.11		2,3,7,8-TCDD-13C	2.00	76	
					1,2,3,7,8-PeCDF-13C	2.00	68	
2,3,7,8-TCDD	2.5	----	0.40		2,3,4,7,8-PeCDF-13C	2.00	68	
Total TCDD	4.1	----	0.40		1,2,3,7,8-PeCDD-13C	2.00	79	
					1,2,3,4,7,8-HxCDF-13C	2.00	58	
1,2,3,7,8-PeCDF	3.3	----	0.76	J	1,2,3,6,7,8-HxCDF-13C	2.00	62	
2,3,4,7,8-PeCDF	6.9	----	0.24		2,3,4,6,7,8-HxCDF-13C	2.00	63	
Total PeCDF	500	----	0.50		1,2,3,7,8,9-HxCDF-13C	2.00	63	
					1,2,3,4,7,8-HxCDD-13C	2.00	62	
1,2,3,7,8-PeCDD	16	----	0.30		1,2,3,6,7,8-HxCDD-13C	2.00	60	
Total PeCDD	95	----	0.30		1,2,3,4,6,7,8-HpCDF-13C	2.00	61	DN2
					1,2,3,4,7,8,9-HpCDF-13C	2.00	61	DN2
1,2,3,4,7,8-HxCDF	86	----	2.2		1,2,3,4,6,7,8-HpCDD-13C	2.00	67	DN2
1,2,3,6,7,8-HxCDF	22	----	2.3		OCDD-13C	4.00	74	DN2
2,3,4,6,7,8-HxCDF	87	----	2.7					
1,2,3,7,8,9-HxCDF	17	----	2.7		1,2,3,4-TCDD-13C	2.00	NA	
Total HxCDF	3900	----	2.5		1,2,3,7,8,9-HxCDD-13C	2.00	NA	
1,2,3,4,7,8-HxCDD	52	----	2.3		2,3,7,8-TCDD-37Cl4	0.20	77	
1,2,3,6,7,8-HxCDD	550	----	2.1					
1,2,3,7,8,9-HxCDD	130	----	2.5					
Total HxCDD	2900	----	2.3					
1,2,3,4,6,7,8-HpCDF	6700	----	2.8	DN2	Total 2,3,7,8-TCDD			
1,2,3,4,7,8,9-HpCDF	420	----	5.0	DN2	Equivalence: 940 ng/Kg			
Total HpCDF	31000	----	3.9	DN2	(Lower-bound - Using ITE Factors)			
1,2,3,4,6,7,8-HpCDD	30000	----	21	DN2				
Total HpCDD	70000	----	21	DN2				
OCDF	32000	----	5.7	DN2				
OCDD	430000	----	78	EDN2				

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E = Exceeds calibration range
D = Result obtained from analysis of diluted sample
Nn = Value obtained from additional analysis

REPORT OF LABORATORY ANALYSIS

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Method 8290 Blank Analysis Results

Lab Sample Name	DFBLKAC		
Lab Sample ID	BLANK-70902	Matrix	Solid
Filename	Y190606A_15	Dilution	NA
Total Amount Extracted	30.6 g	Extracted	06/04/2019 15:25
ICAL ID	Y190424	Analyzed	06/06/2019 19:23
CCal Filename(s)	Y190606A_02 & Y190606A_17	Injected By	ZMS

Native Isomers	Conc ng/Kg	EMPC ng/Kg	EDL ng/Kg		Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	ND	----	0.056		2,3,7,8-TCDF-13C	2.00	67
Total TCDF	ND	----	0.056		2,3,7,8-TCDD-13C	2.00	69
					1,2,3,7,8-PeCDF-13C	2.00	70
2,3,7,8-TCDD	ND	----	0.068		2,3,4,7,8-PeCDF-13C	2.00	70
Total TCDD	ND	----	0.068		1,2,3,7,8-PeCDD-13C	2.00	81
					1,2,3,4,7,8-HxCDF-13C	2.00	71
1,2,3,7,8-PeCDF	ND	----	0.086		1,2,3,6,7,8-HxCDF-13C	2.00	75
2,3,4,7,8-PeCDF	ND	----	0.096		2,3,4,6,7,8-HxCDF-13C	2.00	68
Total PeCDF	ND	----	0.091		1,2,3,7,8,9-HxCDF-13C	2.00	60
					1,2,3,4,7,8-HxCDD-13C	2.00	69
1,2,3,7,8-PeCDD	ND	----	0.13		1,2,3,6,7,8-HxCDD-13C	2.00	64
Total PeCDD	ND	----	0.13		1,2,3,4,6,7,8-HpCDF-13C	2.00	58
					1,2,3,4,7,8,9-HpCDF-13C	2.00	49
1,2,3,4,7,8-HxCDF	ND	----	0.18		1,2,3,4,6,7,8-HpCDD-13C	2.00	53
1,2,3,6,7,8-HxCDF	ND	----	0.14		OCDD-13C	4.00	43
2,3,4,6,7,8-HxCDF	ND	----	0.17				
1,2,3,7,8,9-HxCDF	ND	----	0.14		1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	ND	----	0.16		1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	ND	----	0.20		2,3,7,8-TCDD-37Cl4	0.20	76
1,2,3,6,7,8-HxCDD	ND	----	0.18				
1,2,3,7,8,9-HxCDD	ND	----	0.23				
Total HxCDD	ND	----	0.20				
1,2,3,4,6,7,8-HpCDF	ND	----	0.11		Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	ND	----	0.087		Equivalence: 0.0016 ng/Kg		
Total HpCDF	ND	----	0.098		(Lower-bound - Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	0.12	----	0.12	J			
Total HpCDD	0.26	----	0.12	J			
OCDF	ND	----	0.25				
OCDD	----	0.41	0.37	IJ			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
EDL = Estimated Detection Limit

Results reported on a total weight basis and are valid to no more than 2 significant figures.
J = Estimated value
I = Interference present

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Laboratory Control Spike Results

Lab Sample ID	LCS-70903		
Filename	Y190606A_16	Matrix	Solid
Total Amount Extracted	30.1 g	Dilution	NA
ICAL ID	Y190424	Extracted	06/04/2019 15:25
CCal Filename(s)	Y190606A_02 & Y190606A_17	Analyzed	06/06/2019 20:07
Method Blank ID	BLANK-70902	Injected By	ZMS

Native Isomers	Qs (ng)	Qm (ng)	% Rec.
2,3,7,8-TCDF	0.20	0.20	102
Total TCDF			
2,3,7,8-TCDD	0.20	0.23	114
Total TCDD			
1,2,3,7,8-PeCDF	1.0	1.0	103
2,3,4,7,8-PeCDF	1.0	1.0	102
Total PeCDF			
1,2,3,7,8-PeCDD	1.0	0.94	94
Total PeCDD			
1,2,3,4,7,8-HxCDF	1.0	1.0	104
1,2,3,6,7,8-HxCDF	1.0	1.0	101
2,3,4,6,7,8-HxCDF	1.0	1.0	103
1,2,3,7,8,9-HxCDF	1.0	1.0	101
Total HxCDF			
1,2,3,4,7,8-HxCDD	1.0	1.1	107
1,2,3,6,7,8-HxCDD	1.0	1.1	110
1,2,3,7,8,9-HxCDD	1.0	1.1	107
Total HxCDD			
1,2,3,4,6,7,8-HpCDF	1.0	1.1	110
1,2,3,4,7,8,9-HpCDF	1.0	1.0	101
Total HpCDF			
1,2,3,4,6,7,8-HpCDD	1.0	1.0	100
Total HpCDD			
OCDF	2.0	2.2	111
OCDD	2.0	2.3	115

Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF-13C	2.0	68
2,3,7,8-TCDD-13C	2.0	72
1,2,3,7,8-PeCDF-13C	2.0	74
2,3,4,7,8-PeCDF-13C	2.0	73
1,2,3,7,8-PeCDD-13C	2.0	85
1,2,3,4,7,8-HxCDF-13C	2.0	71
1,2,3,6,7,8-HxCDF-13C	2.0	74
2,3,4,6,7,8-HxCDF-13C	2.0	69
1,2,3,7,8,9-HxCDF-13C	2.0	66
1,2,3,4,7,8-HxCDD-13C	2.0	70
1,2,3,6,7,8-HxCDD-13C	2.0	65
1,2,3,4,6,7,8-HpCDF-13C	2.0	67
1,2,3,4,7,8,9-HpCDF-13C	2.0	60
1,2,3,4,6,7,8-HpCDD-13C	2.0	67
OCDD-13C	4.0	44
1,2,3,4-TCDD-13C	2.0	NA
1,2,3,7,8,9-HxCDD-13C	2.0	NA
2,3,7,8-TCDD-37Cl4	0.20	74

Qs = Quantity Spiked
Qm = Quantity Measured
Rec. = Recovery (Expressed as Percent)
R = Recovery outside of target range

Y = RF averaging used in calculations
Nn = Value obtained from additional analysis
NA = Not Applicable
* = See Discussion

REPORT OF LABORATORY ANALYSIS

APPENDIX F

Soil Washing Experiments: Data Reports

12661 **Batch Trommel Soil Washing Experiment Data** Date: 7/16/19

NB & page 3973-51 **Triton X-100 35m Cut** By: KM, RLS

Objective: To evaluate soil washing using a trommel as a means of removing contaminants from soil.

Procedure

1. Obtain 400 g splits of minus 1/4" soil sample from Sample Prep.
2. Make up 10% Triton X-100 surfactant.
3. Weigh out 2 splits and record the weights and identification on 2 leach sheets.
4. Add DI H2O and (optionally) Triton X-100 mixture in quantities specified to trommel vessel.
5. Cap vessel and place on rolls, agitate for 15 minutes.
6. Wet screen the slurry at **35 mesh**; dry plus size material at 50°C.
7. Flocculate and filter the minus fraction; wash filter cake with warm water 3X.
8. Containerize dried samples, ship all samples to contract laboratory.

				Targets		
399.56	g,	HRI#55197-03 -1/4"			30	% Solids
3.71	% moisture		933	886	886	g DI H2O
384.74	g dry solids (calculated)		0	47	47.07	g 10% Trition X-100

Products / **Metals Analysis, mg/kg**

NB-page-#	Time, min	Description	Mass, g	Wt %	Cr	Zn	Cr^{VI}
55197-3		Feed Solids	384.74		*1644*	*112*	*17*
3973-51-2	15	Oversize	317.85	82.9	540	71	3.8
3973-51-3	15	Undersize	65.70	17.1	4000	210	21
		Total:	383.55				
		Accountability, %:	99.7				

					Analyte Mass, mg			Analyte Mass Dist'n, %		
					Cr^{T}	Zn	Cr^{VI}	Cr^{T}	Zn	Cr^{VI}
55197-3		Feed Solids			632.51	43.09	6.54	100	100	100
	15	Aqueous			*198.1*	*6.7*	*4.0*	31.3	15.6	60.4
3973-51-2	15	Oversize			171.64	22.57	1.21	27.1	52.4	18.5
3973-51-3	15	Undersize			262.80	13.80	1.38	41.5	32.0	21.1
Values in italics are calculated.			Size fraction solids total:		434.44	36.36	2.59			

Dioxin Analysis, ng/kg

	TCDF	TCDD	PeCDF	PeCDD	HxCDF	HxCDD	HpCDF	HpCDD	OCDF	OCDD
55197-3	220	20	3,400	430	9,400	7,000	21,000	120,000	10,000	910,000
3973-51-2 O'S	17	ND	210	33	710	630	1,600	7,700	1,200	70,000
3973-51-3 U'S	640	68	8,400	1,400	32,000	26,000	79,000	550,000	140,000	5,300,000

Analyte Mass, ng

55197-3	85	8	1,308	165	3,617	2,693	8,079	46,168	3,847	350,110
Aqueous (calc'd)	37	3	689	63	1,288	785	2,381	7,586	-5,732	-20,349
3973-51-2 O'S	5	0	67	10	226	200	509	2,447	381	22,250
3973-51-3 U'S	42	4	552	92	2,102	1,708	5,190	36,135	9,198	348,210
Total, solids:	47	4	619	102	2,328	1,908	5,699	38,582	9,579	370,460

Analyte Mass Distribution, %

Aqueous	44	42	53	38	36	29	29	16	-149	-6
3973-51-2 O'S	6	0	5	6	6	7	6	5	10	6
3973-51-3 U'S	50	58	42	56	58	63	64	78	239	99

Notes Triton caused foaming. Sieving was rapid, efficient.

12661 — **Batch Trommel Soil Washing Experiment Data** — Date: 7/16/19

NB & page 3973-52 — **Water 35m Cut** — By: KM, RLS

Objective: To evaluate soil washing using a trommel as a means of removing contaminants from soil.

Procedure

1. Obtain 400 g splits of minus 1/4" soil sample from Sample Prep.
2. Make up 10% Triton X-100 surfactant.
3. Weigh out 2 splits and record the weights and identification on 2 leach sheets.
4. Add DI H2O and (optionally) Triton X-100 mixture in quantities specified to trommel vessel.
5. Cap vessel and place on rolls, agitate for 15 minutes.
6. Wet screen the slurry at **35 mesh**; dry plus size material at 50°C.
7. Flocculate and filter the minus fraction; wash filter cake with warm water 3X.
8. Containerize dried samples, ship all samples to contract laboratory.

398.93	g,	HRI#: 55197-03 -1/4"		Targets	30	% Solids
3.71	% moisture		933	933	933	g DI H2O
384.13	g dry solids (calculated)		0	0	0	g 10% Trition X-100

Products — **Metals Analysis, mg/kg**

NB-page-#	Time, min	Description	Mass, g	Wt %	Cr	Zn	Cr^{VI}
55197-3		Feed Solids	384.13		*1644*	*112*	*17*
3973-52-2	15	Oversize	313.99	82.4	540	63	4.1
3973-52-3	15	Undersize	67.02	17.6	2900	160	21
		Total:	381.01				
		Accountability, %:	99.2				

					Analyte Mass, mg			Analyte Mass Dist'n, %		
					Cr^T	Zn	Cr^{VI}	Cr^T	Zn	Cr^{VI}
55197-3		Feed Solids			631.51	43.02	6.53	100	100	100
	15	Aqueous			*267.6*	*12.5*	*3.8*	42.4	29.1	58.7
3973-52-2	15	Oversize			169.55	19.78	1.29	26.8	46.0	47.8
3973-52-3	15	Undersize			194.36	10.72	1.41	30.8	24.9	52.2

Values shown in italics are calculated. Size fraction solids total: 363.91 30.50 2.69

Dioxin Analysis, ng/kg

	TCDF	TCDD	PeCDF	PeCDD	HxCDF	HxCDD	HpCDF	HpCDD	OCDF	OCDD
55197-3	220	20	3,400	430	9,400	7,000	21,000	120,000	10,000	910,000
3973-52-2 O'S	69	5	680	82	1,500	960	2,000	9,100	1,100	77,000
3973-52-3 U'S	1,200	140	16,000	2,400	53,000	44,000	120,000	550,000	130,000	5,800,000

Analyte Mass, ng

55197-3	85	8	1,306	165	3,611	2,689	8,067	46,096	3,841	349,558
Aqueous (calc'd)	-18	-3	20	-21	-412	-561	-604	6,377	-5,217	-63,335
3973-52-2 O'S	22	1	214	26	471	301	628	2,857	345	24,177
3973-52-3 U'S	80	9	1,072	161	3,552	2,949	8,042	36,861	8,713	388,716
Total, solids:	102	11	1,286	187	4,023	3,250	8,670	39,718	9,058	412,893

Analyte Mass Distribution, %

Aqueous	-21	-41	2	-13	-11	-21	-7	14	-136	-18
3973-52-2 O'S	26	18	16	16	13	11	8	6	9	7
3973-52-3 U'S	95	122	82	97	98	110	100	80	227	111

Notes: Sieving was rapid, efficient

12661 | **Batch Trommel Soil Washing Experiment Data** | Date: 7/16/19

NB & page 3973-53 | **Triton X-100 70m Cut** | By: KM, RLS

Objective: To evaluate soil washing using a trommel as a means of removing contaminants from soil.

Procedure

1. Obtain 400 g splits of minus 1/4" soil sample from Sample Prep.
2. Make up 10% Triton X-100 surfactant.
3. Weigh out 2 splits and record the weights and identification on 2 leach sheets.
4. Add DI H2O and (optionally) Triton X-100 mixture in quantities specified to trommel vessel.
5. Cap vessel and place on rolls, agitate for 15 minutes.
6. Wet screen the slurry at **70 mesh**; dry plus size material at 50°C.
7. Flocculate and filter the minus fraction; wash filter cake with warm water 3X.
8. Containerize dried samples, ship all samples to contract laboratory.

399.79	g, HRI#:	55197-03 -1/4"		Targets	30	% Solids
3.71	% moisture		933	886	886	g DI H2O
384.96	g dry solids (calculated)		0	47	47.05	g 10% Trition X-100

Products

NB-page-#	Time, min	Description	Mass, g	Wt %	Metals Analysis, mg/kg Cr	Zn	Cr^{VI}
55197-3		Feed Solids	384.96		*1644*	*112*	*17*
3973-53-2	15	Oversize	354.01	91.3	630	70	5.2
3973-53-3	15	Undersize	33.60	8.7	5900	260	28
		Total:	387.61				
		Accountability, %:	100.7				

					Analyte Mass, mg			Analyte Mass Dist'n, %		
					Cr^T	Zn	Cr^{VI}	Cr^T	Zn	Cr^{VI}
55197-3		Feed Solids			632.87	43.12	6.54	100	100	100
	15	Aqueous			*211.6*	*9.6*	*3.8*	33.4	22.3	57.5
3973-53-2	15	Oversize			223.03	24.78	1.84	35.2	73.9	66.2
3973-53-3	15	Undersize			198.24	8.74	0.94	31.3	26.1	33.8
Values in italics are calculated.			Size fraction solids total:		421.27	33.52	2.78			

Dioxin Analysis, ng/kg

	TCDF	TCDD	PeCDF	PeCDD	HxCDF	HxCDD	HpCDF	HpCDD	OCDF	OCDD
55197-3	220	20	3,400	430	9,400	7,000	21,000	120,000	10,000	910,000
3973-53-2 O'S	25	1	320	62	1,000	970	2,200	12,000	1,400	120,000
3973-53-3 U'S	1,300	160	17,000	2,800	66,000	54,000	190,000	950,000	290,000	7,800,000

Analyte Mass, ng

55197-3	85	8	1,309	166	3,619	2,695	8,084	46,195	3,850	350,312
Aqueous (calc'd)	32	2	624	50	1,047	537	921	10,027	-6,390	45,750
3973-53-2 O'S	9	0	113	22	354	343	779	4,248	496	42,481
3973-53-3 U'S	44	5	571	94	2,218	1,814	6,384	31,920	9,744	262,080
Total, solids:	53	6	684	116	2,572	2,158	7,163	36,168	10,240	304,561

Analyte Mass Distribution, %

Aqueous	38	27	48	30	29	20	11	22	-166	13
3973-53-2 O'S	10	4	9	13	10	13	10	9	13	12
3973-53-3 U'S	52	70	44	57	61	67	79	69	253	75

Notes Triton caused foaming

12661 | **Batch Trommel Soil Washing Experiment Data** | Date: 7/16/19

NB & page 3973-54 | **Water 70m Cut** | By: KM, RLS

Objective: To evaluate soil washing using a trommel as a means of removing contaminants from soil.

Procedure

1. Obtain 400 g splits of minus 1/4" soil sample from Sample Prep.
2. Make up 10% Triton X-100 surfactant.
3. Weigh out 2 splits and record the weights and identification on 2 leach sheets.
4. Add DI H2O and (optionally) Triton X-100 mixture in quantities specified to trommel vessel.
5. Cap vessel and place on rolls, agitate for 15 minutes.
6. Wet screen the slurry at **70 mesh**; dry plus size material at 50°C.
7. Flocculate and filter the minus fraction; wash filter cake with warm water 3X.
8. Containerize dried samples, ship all samples to contract laboratory.

399.67	g, HRI#: 55197-03 -1/4"		Targets		30	% Solids
3.71	% moisture		933	933	933	g DI H2O
384.84	g dry solids (calculated)		0	0	0	g 10% Trition X-100

Products — **Metals Analysis, mg/kg**

NB-page-#	Time, min	Description	Mass, g	Wt %	Cr	Zn	Cr^{VI}
55197-3		Feed Solids	384.84		*1644*	*112*	*17*
3973-54-2	15	Oversize	350.69	91.1	720	84	6.4
3973-54-3	15	Undersize	34.07	8.9	5300	240	21
		Total:	384.76				
		Accountability, %:	100.0				

					Analyte Mass, mg			Analyte Mass Dist'n, %		
					Cr^T	Zn	Cr^{VI}	Cr^T	Zn	Cr^{VI}
55197-3		Feed Solids			632.68	*43.10*	*6.54*	100	100	100
	15	Aqueous			*199.6*	*5.5*	*3.6*	31.6	12.7	54.8
3973-54-2	15	Oversize			252.50	29.46	2.24	39.9	78.3	75.8
3973-54-3	15	Undersize			180.57	8.18	0.72	28.5	21.7	24.2
Values in italics are calculated.			Size fraction solids total:		433.07	37.63	2.96			

Dioxin Analysis, ng/kg

	TCDF	TCDD	PeCDF	PeCDD	HxCDF	HxCDD	HpCDF	HpCDD	OCDF	OCDD
55197-3	220	20	3,400	430	9,400	7,000	21,000	120,000	10,000	910,000
3973-54-2 O'S	17	3	230	41	830	700	1,800	8,100	1,200	80,000
3973-54-3 U'S	1,900	210	26,000	4,100	93,000	74,000	230,000	660,000	380,000	7,400,000

Analyte Mass, ng

	TCDF	TCDD	PeCDF	PeCDD	HxCDF	HxCDD	HpCDF	HpCDD	OCDF	OCDD
55197-3	85	8	1,308	165	3,618	2,694	8,082	46,181	3,848	350,206
Aqueous (calc'd)	14	0	342	11	158	-73	-386	20,854	-9,519	70,033
3973-54-2 O'S	6	1	81	14	291	245	631	2,841	421	28,055
3973-54-3 U'S	65	7	886	140	3,169	2,521	7,836	22,486	12,947	252,118
Total, solids:	71	8	966	154	3,460	2,767	8,467	25,327	13,367	280,173

Analyte Mass Distribution, %

	TCDF	TCDD	PeCDF	PeCDD	HxCDF	HxCDD	HpCDF	HpCDD	OCDF	OCDD
Aqueous	17	-6	26	7	4	-3	-5	45	-247	20
3973-54-2 O'S	7	13	6	9	8	9	8	6	11	8
3973-54-3 U'S	76	93	68	84	88	94	97	49	336	72

Notes: Sieving was rapid, efficient

APPENDIX G

Dioxin Analysis: Soil Washing Experiment Products
Pace Laboratories

Pace Analytical

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Report Prepared for:

Marlon Cartin
Asset Laboratories
3151 West Post Road
Las Vegas NV 89118

Report Information:

Pace Project #: 10485144
Sample Receipt Date: 07/30/2019
Client Project #: N036666
Client Sub PO #: N36666A
State Cert #: 2929

REPORT OF LABORATORY ANALYSIS FOR PCDD/PCDF

Invoicing & Reporting Options:

The report provided has been invoiced as a Level 2 PCDD/PCDF Report. If an upgrade of this report package is requested, an additional charge may be applied.

Please review the attached invoice for accuracy and forward any questions to Joanne Richardson, your Pace Project Manager.

This report has been reviewed by:

Joanne Richardson

September 04, 2019
Joanne Richardson,
(612) 607-6453
(612) 607-6444 (fax)

Report Prepared Date:
September 4, 2019

Report of Laboratory Analysis

Pace Analytical™

Pace Analytical Services, LLC.
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Minneapolis, MN 55414
Phone: 612.607.1700
Fax: 612.607.6444

DISCUSSION

This report presents the results from the analyses performed on eight samples submitted by a representative of Asset Laboratories. The samples were analyzed for the presence or absence of polychlorodibenzo-p-dioxins (PCDDs) and polychlorodibenzofurans (PCDFs) using a modified version of USEPA Method 8290. The reporting limits were based on signal-to-noise measurements. Estimated Maximum Possible Concentration (EMPC) values were treated as positives in the toxic equivalence calculations. The samples were extracted outside the 30-day hold time recommended in the method, therefore, the reported values should be regarded as minimum possible concentrations.

Second column confirmation analyses of 2,3,7,8-TCDF values obtained from the primary (DB5-MS) column are performed only when specifically requested for a project and only when the values are above the concentration of the lowest calibration standard. Typical resolution for this isomer using the DB5-MS column ranges from 25-30%.

The recoveries of the isotopically-labeled PCDD/PCDF internal standards in the sample extracts ranged from 11-125%. Except for six low values, which were flagged "R" on the results tables, the labeled internal standard recoveries obtained for this project were within the 40-135% target range specified in Method 8290. Also, since the quantification of the native 2,3,7,8-substituted congeners was based on isotope dilution, the data were automatically corrected for variation in recovery and accurate values were obtained.

Values were flagged "I" where incorrect isotope ratios were obtained or "P" where polychorinated diphenyl ethers were present. Concentrations below the calibration range were flagged "J" and should be regarded as estimates. Concentrations above the calibration range were flagged "E" and should also be regarded as estimates. Values obtained from analyses of diluted extracts were flagged "D" and "N2".

A laboratory method blank was prepared and analyzed with the sample batch as part of our routine quality control procedures. The results show the blank to contain trace levels of selected congeners. These levels were below the calibration range of the method. Sample levels similar to the corresponding blank levels were flagged "B" on the results tables and may be, at least partially, attributed to the background. It should be noted that levels less than ten times the background are not generally considered to be statistically different from the background.

A laboratory spike sample was also prepared using clean reference matrix that had been fortified with native standard materials. The recoveries of the native compounds ranged from 97-120%. These results were within the target range for the method. Matrix spikes were prepared with the sample batch using sample material from a separate project; results from these analyses will be provided upon request.

The response obtained for the native 1,2,3,4,6,7,8-HpCDF in calibration standard analysis U190829B_17 was outside the target range. As specified in our procedures for this method, the average of the daily response factors for this compound was used in the calculations for the samples from this runshift. The affected values were flagged "Y" on the results tables.

REPORT OF LABORATORY ANALYSIS

Pace Analytical™
Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
Tel: 612-607-1700
Fax: 612- 607-6444

Minnesota Laboratory Certifications

Authority	Certificate #	Authority	Certificate #
A2LA	2926.01	Minnesota - Pet	1240
Alabama	40770	Mississippi	MN00064
Alaska - DW	MN00064	Missouri - DW	10100
Alaska - UST	17-009	Montana	CERT0092
Arizona	AZ0014	Nebraska	NE-OS-18-06
Arkansas - DW	MN00064	Nevada	MN00064
Arkansas - WW	88-0680	New Hampshire	2081
CNMI Saipan	MP0003	New Jersey (NE	MN002
California	2929	New York	11647
Colorado	MN00064	North Carolina	27700
Connecticut	PH-0256	North Carolina -	27700
EPA Region 8+	via MN 027-053	North Carolina -	530
Florida (NELAP	E87605	North Dakota	R-036
Georgia	959	Ohio - DW	41244
Guam	17-001r	Ohio - VAP	CL101
Hawaii	MN00064	Oklahoma	9507
Idaho	MN00064	Oregon - Primar	MN300001
Illinois	200011	Oregon - Secon	MN200001
Indiana	C-MN-01	Pennsylvania	68-00563
Iowa	368	Puerto Rico	MN00064
Kansas	E-10167	South Carolina	74003
Kentucky - DW	90062	South Dakota	NA
Kentucky - WW	90062	Tennessee	TN02818
Louisiana - DE	03086	Texas	T104704192
Louisiana - DW	MN00064	Utah (NELAP)	MN00064
Maine	MN00064	Virginia	460163
Maryland	322	Washington	C486
Massachusetts	M-MN064	West Virginia -	382
Michigan	9909	West Virginia -	9952C
Minnesota	027-053-137	Wisconsin	999407970
Minnesota - De	via MN 027-053	Wyoming - UST	2926.01

REPORT OF LABORATORY ANALYSIS

Appendix A

Sample Management

ASSET Laboratories
3151-3153 W Post Rd., Las Vegas, NV 89118
www.etl-labs.com
TEL: 7023072659 FAX: 7023072691

CHAIN-OF-CUSTODY RECORD

QC Level: Level IV

Subcontractor:

Pace Analytical Services, Inc.
1700 Elm Street, Suite 200
Minneapolis, MN 55414

TEL: (612) 607-1700
FAX: (612) 607-6444
Acct #:

Field Sampler: Katherine Meredith

26-Jul-19

Sample ID	Matrix	Date Collected	Bottle Type	Requested Tests: EPA 8290		
N036666-001B / 3973-51-2	Soil	7/19/2019 8:30:00 AM	4OZG	1		001
N036666-002B / 3973-52-2	Soil	7/19/2019 8:30:00 AM	4OZG	1		002
N036666-003B / 3973-53-2	Soil	7/19/2019 8:30:00 AM	4OZG	1		003
N036666-004B / 3973-54-2	Soil	7/19/2019 8:30:00 AM	4OZG	1		004
N036666-005B / 3973-51-3	Soil	7/19/2019 8:30:00 AM	4OZG	1		005
N036666-006B / 3973-52-3	Soil	7/19/2019 8:30:00 AM	4OZG	1		006
N036666-007B / 3973-53-3	Soil	7/19/2019 8:30:00 AM	4OZG	1		007
N036666-008B / 3973-54-3	Soil	7/19/2019 8:30:00 AM	4OZG	1		008

Please cc Report to Lucille Golosinda at lucille. golosinda@assetlaboratories.com

Please report in dry weight, Asset will provide PMOIST values

WO#: 10485144

10485144

General Comments: Please email sample receipt acknowledgement to the PM. Please cc andrea.gallardo@assetlaboratories.com

Please use PO#:N36666A Please email Invoices and Account Receivable Statements to elvira@assetlaboratories.com. For questions, call Marlon at (702)-307-2659. Please e-mail results to reports.lv@assetlaboratories.com by: Normal TAT.

Please analyze for Dioxins and Furans by 8290. EDD Requirement Labspec 7 edata.

FEDEX 7758 6270 4105

	Date/Time		Date/Time
Relinquished by: MBGARTIN	7/29/19 @ 1700	Received by: [signature] PACE	7/30/19 840 5-4
Relinquished by:		Received by:	

Pace Analytical	Document Name: **Sample Condition Upon Receipt Form**	Document Revised: 09May2019 Page 1 of 1
	Document No.: **F-MN-L-213-rev.28**	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: ASSET Labs

Project #: **WO#: 10485144**

PM: JMR **Due Date: 08/20/19**
CLIENT: Asset Labs

Courier: ☑ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Pace ☐ SpeeDee ☐ Commercial **See Exception** ☐

Tracking Number: 7759 6027 0405

Custody Seal on Cooler/Box Present? ☐ Yes ☑ No **Seals Intact?** ☐ Yes ☑ No **Biological Tissue Frozen?** ☐ Yes ☐ No ☑ N/A

Packing Material: ☐ Bubble Wrap ☑ Bubble Bags ☐ None ☐ Other: ________ **Temp Blank?** ☐ Yes ☑ No

Thermometer: ☐ T1(0461) ☐ T2(1336) ☑ T3(0459) ☐ T4(0254) ☐ T5(0489) **Type of Ice:** ☑ Wet ☐ Blue ☐ None ☐ Dry ☐ Melted

Note: Each West Virginia Sample must have temp taken (no temp blanks)

Temp should be above freezing to 6°C **Cooler Temp Read w/temp blank:** ________ °C	**Average Corrected Temp (no temp blank only):** 5.4 °C **See Exceptions** ☑
Correction Factor: ________ **Cooler Temp Corrected w/temp blank:** ________ °C	

USDA Regulated Soil: (☐ N/A, water sample/Other: ________) 14C 8/5/19 **Date/Initials of Person Examining Contents:** SS 7/30/19

Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA, MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? ☑ Yes ☑ No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐ Yes ☑ No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

				COMMENTS:
Chain of Custody Present and Filled Out?	☑ Yes	☐ No		1.
Chain of Custody Relinquished?	☑ Yes	☐ No		2.
Sampler Name and/or Signature on COC?	☑ Yes	☐ No	☐ N/A	3.
Samples Arrived within Hold Time?	☑ Yes	☐ No		4.
Short Hold Time Analysis (<72 hr)?	☐ Yes	☑ No		5. ☐ Fecal Coliform ☐ HPC ☐ Total Coliform/E coli ☐ BOD/cBOD ☐ Hex Chrome ☐ Turbidity ☐ Nitrate ☐ Nitrite ☐ Orthophos ☐ Other
Rush Turn Around Time Requested?	☐ Yes	☑ No		6.
Sufficient Volume?	☑ Yes	☐ No		7.
Correct Containers Used?	☑ Yes	☐ No		8.
-Pace Containers Used?	☑ Yes	☐ No		
Containers Intact?	☑ Yes	☐ No		9.
Field Filtered Volume Received for Dissolved Tests?	☐ Yes	☐ No	☑ N/A	10. Is sediment visible in the dissolved container? ☐ Yes ☐ No
Is sufficient information available to reconcile the samples to the COC? Matrix: ☐ Water ☑ Soil ☐ Oil ☐ Other	☑ Yes	☐ No		11. **If no, write ID/ Date/Time on Container Below:** **See Exception** ☐
All containers needing acid/base preservation have been checked?	☐ Yes	☐ No	☑ N/A	12. Sample #
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, <2pH, NaOH >9 Sulfide, NaOH>12 Cyanide)	☐ Yes	☐ No	☑ N/A	☐ NaOH ☐ HNO_3 ☐ H_2SO_4 ☐ Zinc Acetate
Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFAS	☐ Yes	☐ No	☑ N/A	Positive for Res. Chlorine? ☐ Yes ☐ No pH Paper Lot# **See Exception** ☐ Res. Chlorine | 0-6 Roll | 0-6 Strip | 0-14 Strip
Headspace in VOA Vials (greater than 6mm)?	☐ Yes	☐ No	☑ N/A	13. **See Exception** ☐
Trip Blank Present?	☐ Yes	☐ No	☑ N/A	14.
Trip Blank Custody Seals Present?	☐ Yes	☐ No	☑ N/A	Pace Trip Blank Lot # (if purchased): ________

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐ Yes ☐ No

Person Contacted: ________ Date/Time: ________

Comments/Resolution: ________

Project Manager Review: Joanne Richardson **Date:** 8-5-19

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers).

Labeled by: SS 3

Pace Analytical	Document Name: **SCUR Exception Form – Coolers Above 6°C**	Document Revised: 08Apr2019 Page 1 of 1
	Document No.: **F-MN-C-298-Rev.02**	Issuing Authority: Pace Minnesota Quality Office

During sample triage, this form is to be placed in each cooler that arrives above 6.0 degrees Celsius

SCUR Exceptions:

Workorder #: 10485144

Out of Temp Sample IDs	Container Type	# of Containers

PM Notified? ☐Yes ☐No

If yes, indicate who was contacted/date/time.
If no, indicate reason why.

Multiple Cooler Project? ☐Yes ☐No
If you answered yes, fill out information to the left.

No Temp Blank		
Read Temp	Corrected Temp	Average Temp
5.4	5.5	5.4
4.8	4.9	
5.3	5.4	
5.7	5.8	

Tracking Number/Temperature	

Other Issues		
Issue Type: Sample ID	Container Type	# of Containers

pH Adjustment Log for Preserved Samples

Sample ID	Type of Preserv.	pH Upon Receipt	Date Adjusted	Time Adjusted	Amount Added (mL)	Lot # Added	pH After	In Compliance after addition?	Initials
								☐Yes ☐No	
								☐Yes ☐No	
								☐Yes ☐No	
								☐Yes ☐No	

USDA REGULATED SOIL CHECKLIST

To Be Completed by SR Staff:

WO: 10485144 Date: 7/30/19 Initials: KAC

Sample Origin (circle one): DOMESTIC QUARANTINED FOREIGN

(Note: soil samples from Hawaii, Guam, Puerto Rico and the US Virgin Islands are considered to be of a Foreign Source)

If Domestic, circle State of Origin: AL AR CA FL GA LA MS NC NM NY OK OR SC TN TX VA

(Includes: IFA, SOD, Golden Nematode, Karnal Bunt and Witchweed) List County: San Bernardino

(USDA Permit/Compliance Agreement authorizes movement of samples from these domestic regulated zones)

If Quarantined, circle State of Origin: FL ID TX CA List County:

(Includes Fruit Fly, Giant African Snail and Pale Cyst Nematode)

(Movement is not authorized for Pale Cyst Nematode [ID or Giant African Snail [FL], remaining quarantines require additional paperwork)

If Foreign, list Country of Origin:

(Movement from some Canadian Providences is not allowed. Refer to CS-232 Regulated Soil Flow Chart)

REQUIREMENT	ACTION	COMPLETED
PPQ-530 Paperwork must be included for any samples from counties with a Fruit Fly Quarantine in TX. Refer to **MN-S063** through **MN-S065**	Scan PPQ-530 to the corresponding Project folder on the x drive. If PPQ-530 is not present, contact the Waste Coordinator and do not continue processing samples.	YES NO N/A
Samples from ID may not be moved from the quarantined region. Refer to **MN-S055**	If samples originated in a quarantined zone, contact the Waste Coordinator and do not continue processing samples.	YES NO N/A
Samples from Giant African Snail Quarantine in FL may not be moved from the quarantined region. Refer to **MN-S068**	If samples originated in a quarantined zone, contact the Waste Coordinator and do not continue processing samples.	YES NO N/A

REQUIREMENT	ACTION	COMPLETED
"Special Handling" stickers are to be placed on all samples.	Did "special handling" stickers get placed on all sample containers?	YES NO
Samples must be segregated and stored in designated bins, shelves and coolers.	Were samples placed in a designated cooler, containers and shelves?	YES NO
Samples must be double contained to prevent accidental release.	Were there any signs of breakage or leakage (check for broken glass and/or loose soil in the cooler)?	YES NO
	If NO, ice and melt water can be disposed of by normal process (down the drain).	
	If YES, were ice and melt water separated from the cooler and disposed of properly?	YES NO N/A
	Any broken glass and/or loose soil are to be bagged and placed in a USDA Regulated satellite container or active drum (see Waste Coordinator). **Ice and melt water should be baked at a temperature range of 121-154°F for 2 hours and then cooled before going down the drain.**	
Equipment and supplies that have come into contact samples must be decontaminated.	Was the cooler(s) and/or countertop(s) decontaminated using either a fresh 10% bleach solution or 70% ethanol? *(Gloves and other lab supplies will be bagged and placed in the USDA Regulated satellite container or active drum).*	YES NO

Comments:

To Be Completed by PM and/or PC:

Sample Analysis to be conducted (circle all that apply): MN Subcontract Lab

Name of Subcontract Lab (s): ______

REQUIREMENT	ACTION	COMPLETED
Permission to ship untreated soil must be on file prior to shipping to any subcontract lab, including IR Pace Labs.	Go to: J:\SHARE\PRJ_MGR\10_Client Services Department Documents\Regulated Soils Permits – if permission to ship letter is not there, contact the Waste Coordinator.	YES NO N/A
Shipment must include a valid copy of the receiving lab's permit as well as permission to ship letter.	Is a copy of all needed paperwork included with the COC? Do **NOT** ship samples until all necessary paperwork is compiled.	YES NO N/A

Comments: ______

Project Manager Signature: Joanne Richardson Date: 8-5-19

Pace Analytical™

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Minneapolis, MN 55414

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Reporting Flags

A = Reporting Limit based on signal to noise

B = Less than 10x higher than method blank level

C = Result obtained from confirmation analysis

D = Result obtained from analysis of diluted sample

E = Exceeds calibration range

I = Interferencepresent

J = Estimated value

L = Suppressive interference, analyte may be biased low

Nn = Value obtained from additional analysis

P = PCDEInterference

R = Recovery outside target range

S = Peak saturated

U = Analyte not detected

V = Result verified by confirmation analysis

X = %D Exceeds limits

Y = Calculated using average of daily RFs

* = SeeDiscussion

Appendix B

Sample Analysis Summary

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Sample Analysis Results

Client - Asset Laboratories

Client's Sample ID	N036666-001B / 3973-51-2		
Lab Sample ID	10485144001		
Filename	U190829B_06		
Injected By	SMT		
Total Amount Extracted	11.4 g	Matrix	Soil
% Moisture	0.2	Dilution	NA
Dry Weight Extracted	11.4 g	Collected	07/19/2019 08:30
ICAL ID	U190730	Received	07/30/2019 08:40
CCal Filename(s)	U190829B_01 & U190829B_17	Extracted	08/27/2019 14:50
Method Blank ID	BLANK-72960	Analyzed	08/29/2019 16:30

Native Isomers	Conc ng/Kg	EMPC ng/Kg	EDL ng/Kg		Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	0.48	----	0.11	J	2,3,7,8-TCDF-13C	2.00	90
Total TCDF	17	----	0.11		2,3,7,8-TCDD-13C	2.00	84
					1,2,3,7,8-PeCDF-13C	2.00	86
2,3,7,8-TCDD	----	0.41	0.16	IJ	2,3,4,7,8-PeCDF-13C	2.00	89
Total TCDD	ND	----	0.16		1,2,3,7,8-PeCDD-13C	2.00	91
					1,2,3,4,7,8-HxCDF-13C	2.00	76
1,2,3,7,8-PeCDF	3.7	----	0.19	J	1,2,3,6,7,8-HxCDF-13C	2.00	71
2,3,4,7,8-PeCDF	9.6	----	0.11		2,3,4,6,7,8-HxCDF-13C	2.00	78
Total PeCDF	210	----	0.11		1,2,3,7,8,9-HxCDF-13C	2.00	84
					1,2,3,4,7,8-HxCDD-13C	2.00	74
1,2,3,7,8-PeCDD	9.9	----	0.22		1,2,3,6,7,8-HxCDD-13C	2.00	66
Total PeCDD	33	----	0.22		1,2,3,4,6,7,8-HpCDF-13C	2.00	72
					1,2,3,4,7,8,9-HpCDF-13C	2.00	81
1,2,3,4,7,8-HxCDF	51	----	0.35		1,2,3,4,6,7,8-HpCDD-13C	2.00	91
1,2,3,6,7,8-HxCDF	18	----	0.27		OCDD-13C	4.00	97
2,3,4,6,7,8-HxCDF	23	----	0.25				
1,2,3,7,8,9-HxCDF	7.6	----	0.22		1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	710	----	0.22		1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	27	----	1.1		2,3,7,8-TCDD-37Cl4	0.20	79
1,2,3,6,7,8-HxCDD	180	----	0.80				
1,2,3,7,8,9-HxCDD	64	----	1.1				
Total HxCDD	630	----	0.80				
1,2,3,4,6,7,8-HpCDF	490	----	1.0	Y	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	32	----	0.78		Equivalence: 170 ng/Kg		
Total HpCDF	1600	----	0.78		(Lower-bound - Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	4800	----	0.14	E			
Total HpCDD	7700	----	0.14	E			
OCDF	1200	----	0.11				
OCDD	70000	----	3.8	DN2			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
EDL = Estimated Detection Limit

ND = Not Detected
NA = Not Applicable
NC = Not Calculated

Results reported on a dry weight basis and are valid to no more than 2 significant figures.
J = Estimated value
E = Exceeds calibration range
I = Interference present
D = Result obtained from analysis of diluted sample
Nn = Value obtained from additional analysis
Y = Calculated using average of daily RFs

REPORT OF LABORATORY ANALYSIS

Pace Analytical™

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Sample Analysis Results

Client - Asset Laboratories

Client's Sample ID	N036666-002B / 3973-52-2		
Lab Sample ID	10485144002		
Filename	U190829B_07		
Injected By	SMT		
Total Amount Extracted	12.0 g	Matrix	Soil
% Moisture	0.1	Dilution	NA
Dry Weight Extracted	12.0 g	Collected	07/19/2019 08:30
ICAL ID	U190730	Received	07/30/2019 08:40
CCal Filename(s)	U190829B_01 & U190829B_17	Extracted	08/27/2019 14:50
Method Blank ID	BLANK-72960	Analyzed	08/29/2019 17:13

Native Isomers	Conc ng/Kg	EMPC ng/Kg	EDL ng/Kg		Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	1.1	----	0.10		2,3,7,8-TCDF-13C	2.00	88
Total TCDF	69	----	0.10		2,3,7,8-TCDD-13C	2.00	83
					1,2,3,7,8-PeCDF-13C	2.00	89
2,3,7,8-TCDD	0.77	----	0.23	J	2,3,4,7,8-PeCDF-13C	2.00	88
Total TCDD	4.5	----	0.23		1,2,3,7,8-PeCDD-13C	2.00	90
					1,2,3,4,7,8-HxCDF-13C	2.00	83
1,2,3,7,8-PeCDF	6.6	----	0.40		1,2,3,6,7,8-HxCDF-13C	2.00	78
2,3,4,7,8-PeCDF	18	----	0.25		2,3,4,6,7,8-HxCDF-13C	2.00	83
Total PeCDF	680	----	0.25		1,2,3,7,8,9-HxCDF-13C	2.00	89
					1,2,3,4,7,8-HxCDD-13C	2.00	79
1,2,3,7,8-PeCDD	17	----	0.17		1,2,3,6,7,8-HxCDD-13C	2.00	69
Total PeCDD	82	----	0.17		1,2,3,4,6,7,8-HpCDF-13C	2.00	78
					1,2,3,4,7,8,9-HpCDF-13C	2.00	90
1,2,3,4,7,8-HxCDF	78	----	0.45		1,2,3,4,6,7,8-HpCDD-13C	2.00	101
1,2,3,6,7,8-HxCDF	28	----	0.42		OCDD-13C	4.00	114
2,3,4,6,7,8-HxCDF	33	----	0.42				
1,2,3,7,8,9-HxCDF	11	----	0.37		1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	1500	----	0.37		1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	34	----	0.71		2,3,7,8-TCDD-37Cl4	0.20	79
1,2,3,6,7,8-HxCDD	280	----	1.00				
1,2,3,7,8,9-HxCDD	90	----	0.61				
Total HxCDD	960	----	0.61				
1,2,3,4,6,7,8-HpCDF	570	----	0.17	Y	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	41	----	0.17		Equivalence: 210 ng/Kg		
Total HpCDF	2000	----	0.17		(Lower-bound - Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	5600	----	0.14	E			
Total HpCDD	9100	----	0.14	E			
OCDF	1100	----	0.12				
OCDD	77000	----	4.8	DN2			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
EDL = Estimated Detection Limit

ND = Not Detected
NA = Not Applicable
NC = Not Calculated

Results reported on a dry weight basis and are valid to no more than 2 significant figures.
J = Estimated value
E = Exceeds calibration range
D = Result obtained from analysis of diluted sample
Nn = Value obtained from additional analysis
Y = Calculated using average of daily RFs

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Pace Analytical™

Method 8290 Sample Analysis Results

Client - Asset Laboratories

Client's Sample ID	N036666-003B / 3973-53-2		
Lab Sample ID	10485144003		
Filename	U190829B_08		
Injected By	SMT		
Total Amount Extracted	11.2 g	Matrix	Soil
% Moisture	0.1	Dilution	NA
Dry Weight Extracted	11.2 g	Collected	07/19/2019 08:30
ICAL ID	U190730	Received	07/30/2019 08:40
CCal Filename(s)	U190829B_01 & U190829B_17	Extracted	08/27/2019 14:50
Method Blank ID	BLANK-72960	Analyzed	08/29/2019 17:57

Native Isomers	Conc ng/Kg	EMPC ng/Kg	EDL ng/Kg		Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	----	0.74	0.17	IJ	2,3,7,8-TCDF-13C	2.00	91
Total TCDF	25	----	0.17		2,3,7,8-TCDD-13C	2.00	88
					1,2,3,7,8-PeCDF-13C	2.00	91
2,3,7,8-TCDD	0.79	----	0.31	J	2,3,4,7,8-PeCDF-13C	2.00	91
Total TCDD	0.79	----	0.31	BJ	1,2,3,7,8-PeCDD-13C	2.00	92
					1,2,3,4,7,8-HxCDF-13C	2.00	81
1,2,3,7,8-PeCDF	4.9	----	0.34		1,2,3,6,7,8-HxCDF-13C	2.00	77
2,3,4,7,8-PeCDF	16	----	0.30		2,3,4,6,7,8-HxCDF-13C	2.00	82
Total PeCDF	320	----	0.30		1,2,3,7,8,9-HxCDF-13C	2.00	95
					1,2,3,4,7,8-HxCDD-13C	2.00	78
1,2,3,7,8-PeCDD	15	----	0.40		1,2,3,6,7,8-HxCDD-13C	2.00	65
Total PeCDD	62	----	0.40		1,2,3,4,6,7,8-HpCDF-13C	2.00	82
					1,2,3,4,7,8,9-HpCDF-13C	2.00	87
1,2,3,4,7,8-HxCDF	89	----	0.68		1,2,3,4,6,7,8-HpCDD-13C	2.00	103
1,2,3,6,7,8-HxCDF	25	----	0.24		OCDD-13C	4.00	125
2,3,4,6,7,8-HxCDF	26	----	0.22				
1,2,3,7,8,9-HxCDF	14	----	0.43		1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	1000	----	0.22		1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	36	----	0.36		2,3,7,8-TCDD-37Cl4	0.20	86
1,2,3,6,7,8-HxCDD	270	----	0.30				
1,2,3,7,8,9-HxCDD	110	----	0.33				
Total HxCDD	970	----	0.30				
1,2,3,4,6,7,8-HpCDF	630	----	0.17	Y	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	55	----	0.27		Equivalence: 270 ng/Kg		
Total HpCDF	2200	----	0.17		(Lower-bound - Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	7000	----	0.33	E			
Total HpCDD	12000	----	0.33	E			
OCDF	1400	----	0.13				
OCDD	120000	----	15	DN2			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
EDL = Estimated Detection Limit

ND = Not Detected
NA = Not Applicable
NC = Not Calculated

Results reported on a dry weight basis and are valid to no more than 2 significant figures.
J = Estimated value
B = Less than 10x higher than method blank level
E = Exceeds calibration range
I = Interference present
D = Result obtained from analysis of diluted sample
Nn = Value obtained from additional analysis
Y = Calculated using average of daily RFs

REPORT OF LABORATORY ANALYSIS

Pace Analytical™

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Method 8290 Sample Analysis Results

Client - Asset Laboratories

Client's Sample ID	N036666-004B / 3973-54-2		
Lab Sample ID	10485144004		
Filename	U190829B_09		
Injected By	SMT		
Total Amount Extracted	12.2 g	Matrix	Soil
% Moisture	0.0	Dilution	NA
Dry Weight Extracted	12.2 g	Collected	07/19/2019 08:30
ICAL ID	U190730	Received	07/30/2019 08:40
CCal Filename(s)	U190829B_01 & U190829B_17	Extracted	08/27/2019 14:50
Method Blank ID	BLANK-72960	Analyzed	08/29/2019 18:40

Native Isomers	Conc ng/Kg	EMPC ng/Kg	EDL ng/Kg		Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	0.54	----	0.086	J	2,3,7,8-TCDF-13C	2.00	98
Total TCDF	17	----	0.086		2,3,7,8-TCDD-13C	2.00	94
					1,2,3,7,8-PeCDF-13C	2.00	97
2,3,7,8-TCDD	0.60	----	0.15	J	2,3,4,7,8-PeCDF-13C	2.00	99
Total TCDD	2.8	----	0.15		1,2,3,7,8-PeCDD-13C	2.00	98
					1,2,3,4,7,8-HxCDF-13C	2.00	85
1,2,3,7,8-PeCDF	3.3	----	0.21	J	1,2,3,6,7,8-HxCDF-13C	2.00	85
2,3,4,7,8-PeCDF	10	----	0.12		2,3,4,6,7,8-HxCDF-13C	2.00	89
Total PeCDF	230	----	0.12		1,2,3,7,8,9-HxCDF-13C	2.00	97
					1,2,3,4,7,8-HxCDD-13C	2.00	84
1,2,3,7,8-PeCDD	9.5	----	0.15		1,2,3,6,7,8-HxCDD-13C	2.00	73
Total PeCDD	41	----	0.15		1,2,3,4,6,7,8-HpCDF-13C	2.00	84
					1,2,3,4,7,8,9-HpCDF-13C	2.00	97
1,2,3,4,7,8-HxCDF	64	----	0.37		1,2,3,4,6,7,8-HpCDD-13C	2.00	109
1,2,3,6,7,8-HxCDF	19	----	0.33		OCDD-13C	4.00	118
2,3,4,6,7,8-HxCDF	22	----	0.18				
1,2,3,7,8,9-HxCDF	11	----	0.26		1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	830	----	0.18		1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	27	----	0.50		2,3,7,8-TCDD-37Cl4	0.20	90
1,2,3,6,7,8-HxCDD	200	----	0.13				
1,2,3,7,8,9-HxCDD	81	----	0.15				
Total HxCDD	700	----	0.13				
1,2,3,4,6,7,8-HpCDF	590	----	0.037	Y	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	30	----	0.037		Equivalence: 190 ng/Kg		
Total HpCDF	1800	----	0.037		(Lower-bound - Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	5000	----	0.085	E			
Total HpCDD	8100	----	0.085	E			
OCDF	1200	----	0.096				
OCDD	80000	----	5.3	DN2			

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Results reported on a dry weight basis and are valid to no more than 2 significant figures.
J = Estimated value
E = Exceeds calibration range
D = Result obtained from analysis of diluted sample
Nn = Value obtained from additional analysis
Y = Calculated using average of daily RFs

REPORT OF LABORATORY ANALYSIS

Pace Analytical™

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Method 8290 Sample Analysis Results

Client - Asset Laboratories

Client's Sample ID	N036666-005B / 3973-51-3		
Lab Sample ID	10485144005		
Filename	U190829B_10		
Injected By	SMT		
Total Amount Extracted	11.5 g	Matrix	Soil
% Moisture	0.4	Dilution	NA
Dry Weight Extracted	11.4 g	Collected	07/19/2019 08:30
ICAL ID	U190730	Received	07/30/2019 08:40
CCal Filename(s)	U190829B_01 & U190829B_17	Extracted	08/27/2019 14:50
Method Blank ID	BLANK-72960	Analyzed	08/29/2019 19:23

Native Isomers	Conc ng/Kg	EMPC ng/Kg	EDL ng/Kg		Internal Standards	ng's Added	Percent Recovery	
2,3,7,8-TCDF	24	----	0.11		2,3,7,8-TCDF-13C	2.00	84	
Total TCDF	640	----	0.11		2,3,7,8-TCDD-13C	2.00	80	
					1,2,3,7,8-PeCDF-13C	2.00	75	
2,3,7,8-TCDD	23	----	0.22		2,3,4,7,8-PeCDF-13C	2.00	82	
Total TCDD	68	----	0.22		1,2,3,7,8-PeCDD-13C	2.00	82	
					1,2,3,4,7,8-HxCDF-13C	2.00	60	
1,2,3,7,8-PeCDF	160	----	0.79		1,2,3,6,7,8-HxCDF-13C	2.00	60	
2,3,4,7,8-PeCDF	470	----	0.62		2,3,4,6,7,8-HxCDF-13C	2.00	61	
Total PeCDF	8400	----	0.62		1,2,3,7,8,9-HxCDF-13C	2.00	75	
					1,2,3,4,7,8-HxCDD-13C	2.00	54	
1,2,3,7,8-PeCDD	400	----	0.22		1,2,3,6,7,8-HxCDD-13C	2.00	55	
Total PeCDD	1400	----	0.22		1,2,3,4,6,7,8-HpCDF-13C	2.00	43	DN2
					1,2,3,4,7,8,9-HpCDF-13C	2.00	50	DN2
1,2,3,4,7,8-HxCDF	3100	----	0.61	E	1,2,3,4,6,7,8-HpCDD-13C	2.00	28	RDN2
1,2,3,6,7,8-HxCDF	700	----	0.51		OCDD-13C	4.00	14	RDN2
2,3,4,6,7,8-HxCDF	1200	----	0.51					
1,2,3,7,8,9-HxCDF	370	----	0.62		1,2,3,4-TCDD-13C	2.00	NA	
Total HxCDF	32000	----	0.51	E	1,2,3,7,8,9-HxCDD-13C	2.00	NA	
1,2,3,4,7,8-HxCDD	940	----	0.25		2,3,7,8-TCDD-37Cl4	0.20	76	
1,2,3,6,7,8-HxCDD	6300	----	0.24	E				
1,2,3,7,8,9-HxCDD	1800	----	0.26					
Total HxCDD	26000	----	0.24	E				
1,2,3,4,6,7,8-HpCDF	21000	----	66	DN2				
1,2,3,4,7,8,9-HpCDF	1800	----	76	DN2				
Total HpCDF	79000	----	66	DN2				
1,2,3,4,6,7,8-HpCDD	320000	----	64	DN2				
Total HpCDD	550000	----	64	DN2				
OCDF	140000	----	67	DN2				
OCDD	5300000	----	92	EDN2				

Total 2,3,7,8-TCDD
Equivalence: 11000 ng/Kg
(Lower-bound - Using ITE Factors)

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
EDL = Estimated Detection Limit

ND = Not Detected
NA = Not Applicable
NC = Not Calculated

Results reported on a dry weight basis and are valid to no more than 2 significant figures.
R = Recovery outside target range
E = Exceeds calibration range
D = Result obtained from analysis of diluted sample
Nn = Value obtained from additional analysis

REPORT OF LABORATORY ANALYSIS

Pace Analytical™

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Method 8290 Sample Analysis Results

Client - Asset Laboratories

Client's Sample ID	N036666-006B / 3973-52-3		
Lab Sample ID	10485144006		
Filename	U190829B_11		
Injected By	SMT		
Total Amount Extracted	11.0 g	Matrix	Soil
% Moisture	0.1	Dilution	NA
Dry Weight Extracted	11.0 g	Collected	07/19/2019 08:30
ICAL ID	U190730	Received	07/30/2019 08:40
CCal Filename(s)	U190829B_01 & U190829B_17	Extracted	08/27/2019 14:50
Method Blank ID	BLANK-72960	Analyzed	08/29/2019 20:07

Native Isomers	Conc ng/Kg	EMPC ng/Kg	EDL ng/Kg		Internal Standards	ng's Added	Percent Recovery	
2,3,7,8-TCDF	39	----	0.59		2,3,7,8-TCDF-13C	2.00	81	
Total TCDF	1200	----	0.59		2,3,7,8-TCDD-13C	2.00	76	
					1,2,3,7,8-PeCDF-13C	2.00	73	
2,3,7,8-TCDD	35	----	1.1		2,3,4,7,8-PeCDF-13C	2.00	79	
Total TCDD	140	----	1.1		1,2,3,7,8-PeCDD-13C	2.00	83	
					1,2,3,4,7,8-HxCDF-13C	2.00	61	
1,2,3,7,8-PeCDF	270	----	3.0		1,2,3,6,7,8-HxCDF-13C	2.00	61	
2,3,4,7,8-PeCDF	860	----	1.9		2,3,4,6,7,8-HxCDF-13C	2.00	61	
Total PeCDF	16000	----	1.9	E	1,2,3,7,8,9-HxCDF-13C	2.00	75	
					1,2,3,4,7,8-HxCDD-13C	2.00	58	
1,2,3,7,8-PeCDD	650	----	0.89		1,2,3,6,7,8-HxCDD-13C	2.00	57	
Total PeCDD	2400	----	0.89		1,2,3,4,6,7,8-HpCDF-13C	2.00	50	IDN2
					1,2,3,4,7,8,9-HpCDF-13C	2.00	54	DN2
1,2,3,4,7,8-HxCDF	5000	----	1.4	E	1,2,3,4,6,7,8-HpCDD-13C	2.00	63	DN2
1,2,3,6,7,8-HxCDF	1100	----	1.5		OCDD-13C	4.00	35	IRDN2
2,3,4,6,7,8-HxCDF	1800	----	1.6					
1,2,3,7,8,9-HxCDF	640	----	1.5		1,2,3,4-TCDD-13C	2.00	NA	
Total HxCDF	53000	----	1.4	E	1,2,3,7,8,9-HxCDD-13C	2.00	NA	
1,2,3,4,7,8-HxCDD	1500	----	0.78		2,3,7,8-TCDD-37Cl4	0.20	73	
1,2,3,6,7,8-HxCDD	10000	----	0.85	E				
1,2,3,7,8,9-HxCDD	4200	----	1.1	E				
Total HxCDD	44000	----	0.78	E				
1,2,3,4,6,7,8-HpCDF	32000	----	24	DN2	Total 2,3,7,8-TCDD			
1,2,3,4,7,8,9-HpCDF	2400	----	29	DN2	Equivalence: 13000 ng/Kg			
Total HpCDF	120000	----	24	DN2	(Lower-bound - Using ITE Factors)			
1,2,3,4,6,7,8-HpCDD	300000	----	53	EDN2				
Total HpCDD	550000	----	53	EDN2				
OCDF	130000	----	50	DN2				
OCDD	5800000	----	90	EDN2				

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R = Recovery outside target range
E = Exceeds calibration range
I = Interference present
D = Result obtained from analysis of diluted sample
Nn = Value obtained from additional analysis

REPORT OF LABORATORY ANALYSIS

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Method 8290 Sample Analysis Results

Client - Asset Laboratories

Client's Sample ID	N036666-007B / 3973-53-3		
Lab Sample ID	10485144007		
Filename	U190829B_12		
Injected By	SMT		
Total Amount Extracted	11.0 g	Matrix	Soil
% Moisture	0.7	Dilution	NA
Dry Weight Extracted	11.0 g	Collected	07/19/2019 08:30
ICAL ID	U190730	Received	07/30/2019 08:40
CCal Filename(s)	U190829B_01 & U190829B_17	Extracted	08/27/2019 14:50
Method Blank ID	BLANK-72960	Analyzed	08/29/2019 20:50

Native Isomers	Conc ng/Kg	EMPC ng/Kg	EDL ng/Kg		Internal Standards	ng's Added	Percent Recovery	
2,3,7,8-TCDF	54	----	0.68		2,3,7,8-TCDF-13C	2.00	88	
Total TCDF	1300	----	0.68	E	2,3,7,8-TCDD-13C	2.00	85	
					1,2,3,7,8-PeCDF-13C	2.00	80	
2,3,7,8-TCDD	51	----	1.1		2,3,4,7,8-PeCDF-13C	2.00	88	
Total TCDD	160	----	1.1		1,2,3,7,8-PeCDD-13C	2.00	88	
					1,2,3,4,7,8-HxCDF-13C	2.00	61	
1,2,3,7,8-PeCDF	320	----	2.2		1,2,3,6,7,8-HxCDF-13C	2.00	64	
2,3,4,7,8-PeCDF	950	----	0.92		2,3,4,6,7,8-HxCDF-13C	2.00	67	
Total PeCDF	17000	----	0.92	E	1,2,3,7,8,9-HxCDF-13C	2.00	79	
					1,2,3,4,7,8-HxCDD-13C	2.00	60	
1,2,3,7,8-PeCDD	810	----	1.5		1,2,3,6,7,8-HxCDD-13C	2.00	60	
Total PeCDD	2800	----	1.5		1,2,3,4,6,7,8-HpCDF-13C	2.00	45	IDN2
					1,2,3,4,7,8,9-HpCDF-13C	2.00	40	IDN2
1,2,3,4,7,8-HxCDF	6300	----	3.2	E	1,2,3,4,6,7,8-HpCDD-13C	2.00	35	RDN2
1,2,3,6,7,8-HxCDF	1400	----	3.0		OCDD-13C	4.00	15	RDN2
2,3,4,6,7,8-HxCDF	1700	----	3.2					
1,2,3,7,8,9-HxCDF	1500	----	3.2		1,2,3,4-TCDD-13C	2.00	NA	
Total HxCDF	66000	----	3.0	E	1,2,3,7,8,9-HxCDD-13C	2.00	NA	
1,2,3,4,7,8-HxCDD	2000	----	2.3		2,3,7,8-TCDD-37Cl4	0.20	87	
1,2,3,6,7,8-HxCDD	13000	----	1.8	E				
1,2,3,7,8,9-HxCDD	5000	----	2.4	E				
Total HxCDD	54000	----	1.8	E				
1,2,3,4,6,7,8-HpCDF	49000	----	94	DN2	Total 2,3,7,8-TCDD			
1,2,3,4,7,8,9-HpCDF	4100	----	190	DN2	Equivalence: 19000 ng/Kg			
Total HpCDF	190000	----	94	DN2	(Lower-bound - Using ITE Factors)			
1,2,3,4,6,7,8-HpCDD	590000	----	120	EDN2				
Total HpCDD	950000	----	120	EDN2				
OCDF	290000	----	150	DN2				
OCDD	7800000	----	410	EDN2				

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Nn = Value obtained from additional analysis

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Method 8290 Sample Analysis Results

Client - Asset Laboratories

Client's Sample ID	N036666-008B / 3973-54-3			
Lab Sample ID	10485144008			
Filename	U190829B_13			
Injected By	SMT			
Total Amount Extracted	11.9 g		Matrix	Soil
% Moisture	0.6		Dilution	NA
Dry Weight Extracted	11.8 g		Collected	07/19/2019 08:30
ICAL ID	U190730		Received	07/30/2019 08:40
CCal Filename(s)	U190829B_01 & U190829B_17		Extracted	08/27/2019 14:50
Method Blank ID	BLANK-72960		Analyzed	08/29/2019 21:33

Native Isomers	Conc ng/Kg	EMPC ng/Kg	EDL ng/Kg		Internal Standards	ng's Added	Percent Recovery	
2,3,7,8-TCDF	74	----	0.41		2,3,7,8-TCDF-13C	2.00	89	
Total TCDF	1900	----	0.41	E	2,3,7,8-TCDD-13C	2.00	85	
					1,2,3,7,8-PeCDF-13C	2.00	80	
2,3,7,8-TCDD	56	----	0.53		2,3,4,7,8-PeCDF-13C	2.00	87	
Total TCDD	210	----	0.53		1,2,3,7,8-PeCDD-13C	2.00	91	
					1,2,3,4,7,8-HxCDF-13C	2.00	59	
1,2,3,7,8-PeCDF	450	----	2.3		1,2,3,6,7,8-HxCDF-13C	2.00	60	
2,3,4,7,8-PeCDF	1400	----	1.3		2,3,4,6,7,8-HxCDF-13C	2.00	60	
Total PeCDF	26000	----	1.3	E	1,2,3,7,8,9-HxCDF-13C	2.00	74	
					1,2,3,4,7,8-HxCDD-13C	2.00	57	
1,2,3,7,8-PeCDD	1100	----	0.57		1,2,3,6,7,8-HxCDD-13C	2.00	56	
Total PeCDD	4100	----	0.57		1,2,3,4,6,7,8-HpCDF-13C	2.00	35	IRDN2
					1,2,3,4,7,8,9-HpCDF-13C	2.00	60	IDN2
1,2,3,4,7,8-HxCDF	8400	----	4.2	E	1,2,3,4,6,7,8-HpCDD-13C	2.00	50	DN2
1,2,3,6,7,8-HxCDF	2200	----	3.9		OCDD-13C	4.00	11	IRDN2
2,3,4,6,7,8-HxCDF	3000	----	5.1	E				
1,2,3,7,8,9-HxCDF	1400	----	3.5		1,2,3,4-TCDD-13C	2.00	NA	
Total HxCDF	93000	----	3.5	E	1,2,3,7,8,9-HxCDD-13C	2.00	NA	
1,2,3,4,7,8-HxCDD	2900	----	1.6		2,3,7,8-TCDD-37Cl4	0.20	86	
1,2,3,6,7,8-HxCDD	19000	----	1.0	E				
1,2,3,7,8,9-HxCDD	6600	----	1.8	E				
Total HxCDD	74000	----	1.0	E				
1,2,3,4,6,7,8-HpCDF	68000	----	29	DN2				
1,2,3,4,7,8,9-HpCDF	4000	----	68	DN2				
Total HpCDF	230000	----	29	DN2				
1,2,3,4,6,7,8-HpCDD	410000	----	46	EDN2				
Total HpCDD	660000	----	46	EDN2				
OCDF	380000	----	120	DN2				
OCDD	7400000	----	330	EDN2				

Total 2,3,7,8-TCDD
Equivalence: 18000 ng/Kg
(Lower-bound - Using ITE Factors)

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
EDL = Estimated Detection Limit

ND = Not Detected
NA = Not Applicable
NC = Not Calculated

Results reported on a dry weight basis and are valid to no more than 2 significant figures.
R = Recovery outside target range
E = Exceeds calibration range
I = Interference present
D = Result obtained from analysis of diluted sample
Nn = Value obtained from additional analysis

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
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Method 8290 Blank Analysis Results

Lab Sample Name	DFBLKWT		
Lab Sample ID	BLANK-72960	Matrix	Solid
Filename	Y190829A_08	Dilution	NA
Total Amount Extracted	10.0 g	Extracted	08/27/2019 14:50
ICAL ID	Y190827	Analyzed	08/29/2019 17:08
CCal Filename(s)	Y190829A_02 & Y190829A_18	Injected By	SMT

Native Isomers	Conc ng/Kg	EMPC ng/Kg	EDL ng/Kg		Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	ND	----	0.047		2,3,7,8-TCDF-13C	2.00	70
Total TCDF	ND	----	0.047		2,3,7,8-TCDD-13C	2.00	67
					1,2,3,7,8-PeCDF-13C	2.00	65
2,3,7,8-TCDD	ND	----	0.061		2,3,4,7,8-PeCDF-13C	2.00	64
Total TCDD	0.11	----	0.061	J	1,2,3,7,8-PeCDD-13C	2.00	68
					1,2,3,4,7,8-HxCDF-13C	2.00	73
1,2,3,7,8-PeCDF	ND	----	0.060		1,2,3,6,7,8-HxCDF-13C	2.00	74
2,3,4,7,8-PeCDF	ND	----	0.055		2,3,4,6,7,8-HxCDF-13C	2.00	75
Total PeCDF	0.082	----	0.055	J	1,2,3,7,8,9-HxCDF-13C	2.00	70
					1,2,3,4,7,8-HxCDD-13C	2.00	73
1,2,3,7,8-PeCDD	ND	----	0.11		1,2,3,6,7,8-HxCDD-13C	2.00	69
Total PeCDD	ND	----	0.11		1,2,3,4,6,7,8-HpCDF-13C	2.00	74
					1,2,3,4,7,8,9-HpCDF-13C	2.00	72
1,2,3,4,7,8-HxCDF	ND	----	0.052		1,2,3,4,6,7,8-HpCDD-13C	2.00	75
1,2,3,6,7,8-HxCDF	ND	----	0.042		OCDD-13C	4.00	60
2,3,4,6,7,8-HxCDF	ND	----	0.038				
1,2,3,7,8,9-HxCDF	ND	----	0.049		1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	ND	----	0.038		1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	ND	----	0.056		2,3,7,8-TCDD-37Cl4	0.20	70
1,2,3,6,7,8-HxCDD	ND	----	0.051				
1,2,3,7,8,9-HxCDD	ND	----	0.078				
Total HxCDD	ND	----	0.051				
1,2,3,4,6,7,8-HpCDF	----	0.067	0.058	IJ	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	ND	----	0.078		Equivalence: 0.0069 ng/Kg		
Total HpCDF	ND	----	0.058		(Lower-bound - Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	0.27	----	0.12	J			
Total HpCDD	0.60	----	0.12	J			
OCDF	0.21	----	0.091	J			
OCDD	3.3	----	0.069	J			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
EDL = Estimated Detection Limit

Results reported on a total weight basis and are valid to no more than 2 significant figures.
J = Estimated value
I = Interference present

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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Tel: 612-607-1700
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Method 8290 Laboratory Control Spike Results

Lab Sample ID	LCS-72961		
Filename	F190829A_09	Matrix	Solid
Total Amount Extracted	10.2 g	Dilution	NA
ICAL ID	F190827	Extracted	08/27/2019 14:50
CCal Filename(s)	F190829A_01 & F190829A_16	Analyzed	08/29/2019 14:06
Method Blank ID	BLANK-72960	Injected By	SMT

Native Isomers	Qs (ng)	Qm (ng)	% Rec.
2,3,7,8-TCDF	0.20	0.22	110
Total TCDF			
2,3,7,8-TCDD	0.20	0.22	109
Total TCDD			
1,2,3,7,8-PeCDF	1.0	1.1	107
2,3,4,7,8-PeCDF	1.0	1.1	109
Total PeCDF			
1,2,3,7,8-PeCDD	1.0	0.97	97
Total PeCDD			
1,2,3,4,7,8-HxCDF	1.0	1.1	109
1,2,3,6,7,8-HxCDF	1.0	1.1	106
2,3,4,6,7,8-HxCDF	1.0	1.0	103
1,2,3,7,8,9-HxCDF	1.0	1.1	107
Total HxCDF			
1,2,3,4,7,8-HxCDD	1.0	1.1	107
1,2,3,6,7,8-HxCDD	1.0	1.2	119
1,2,3,7,8,9-HxCDD	1.0	1.2	120
Total HxCDD			
1,2,3,4,6,7,8-HpCDF	1.0	1.0	105
1,2,3,4,7,8,9-HpCDF	1.0	1.0	101
Total HpCDF			
1,2,3,4,6,7,8-HpCDD	1.0	1.0	101
Total HpCDD			
OCDF	2.0	2.1	106
OCDD	2.0	2.2	109

Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF-13C	2.0	100
2,3,7,8-TCDD-13C	2.0	98
1,2,3,7,8-PeCDF-13C	2.0	101
2,3,4,7,8-PeCDF-13C	2.0	105
1,2,3,7,8-PeCDD-13C	2.0	108
1,2,3,4,7,8-HxCDF-13C	2.0	92
1,2,3,6,7,8-HxCDF-13C	2.0	103
2,3,4,6,7,8-HxCDF-13C	2.0	99
1,2,3,7,8,9-HxCDF-13C	2.0	97
1,2,3,4,7,8-HxCDD-13C	2.0	84
1,2,3,6,7,8-HxCDD-13C	2.0	87
1,2,3,4,6,7,8-HpCDF-13C	2.0	92
1,2,3,4,7,8,9-HpCDF-13C	2.0	92
1,2,3,4,6,7,8-HpCDD-13C	2.0	96
OCDD-13C	4.0	73
1,2,3,4-TCDD-13C	2.0	NA
1,2,3,7,8,9-HxCDD-13C	2.0	NA
2,3,7,8-TCDD-37Cl4	0.20	97

Qs = Quantity Spiked
Qm = Quantity Measured
Rec. = Recovery (Expressed as Percent)
R = Recovery outside of target range

Y = RF averaging used in calculations
Nn = Value obtained from additional analysis
NA = Not Applicable
* = See Discussion

REPORT OF LABORATORY ANALYSIS

F3:
Data Quality Evaluation Report

Topock Compressor Station, Needles, California

Data Quality Evaluation Report for the Engineering Evaluation/Cost Analysis

Revision 0

September 24, 2020

Pacific Gas and Electric Company

Contents

1. Introduction

Samples were collected and analyzed in support of the Engineering Evaluation/Cost Analysis (EE/CA) activities at the Pacific Gas & Electric Company (PG&E) Topock Compressor Station near Needles, California, between May 21 and July 19, 2019. This Data Quality Evaluation (DQE) report will summarize the results of the Quality Assurance/Quality Control (QA/QC) activities prescribed in the *PG&E Program Quality Assurance Project Plan* (QAPP), Revision 3 (CH2M HILL, 2014); and the *Addendum to the PG&E Program QAPP for Dioxins and Furans* (CH2M HILL, 2010). The QAPP identifies the method-specific QC requirements for each analytical parameter and matrix and defines a plan to test that the correct sampling, analytical, and data reduction procedures were followed by using audits and data validation.

2. Analytical Data

This DQE report covers 43 soil (or solid) samples and other laboratory related QC samples. These samples were reported by the laboratories in three sample delivery groups.

ASSET Laboratories (ASET) of Las Vegas, Nevada; BC Laboratories, Inc (BCLB) of Bakersfield, California; and Pace Analytical Services, LLC (PIM) of Minneapolis, Minnesota performed the required analyses. All laboratories are certified by the California Department of Health Service's Environmental Laboratory Accreditation Program for the analyses included in Table 1 where appropriate. Samples were analyzed for one or more of the analytes/methods provided in Table 1.

Table 1. Analytical Parameters

Parameter	Method	Laboratory
Metals	SW6010B [a]	ASET/BCLB
Hexavalent Chromium [Cr(VI)]	SW7199 [a]	ASET
Mercury	SW7471A [a]	ASET
Dioxins and Furans	SW8290 [a]	PIM

[a] SW-846 Test Methods for Evaluating Solid Waste, 3rd Edition, revision 4, 1996.

The SDGs were evaluated by Jacobs chemists for data quality. Analytical performance was initially assessed on a SDG or an analytical batch basis. The association of laboratory QC samples and environmental samples from the same analytical batches is determined by the laboratory lot control number. A level 2 data validation protocol as outlined in Section 6.3 of the QAPP was utilized in the assessment of the data. The assessment includes a review of: (1) the chain of custody documentation; (2) holding-time compliance; (3) the required quality control (QC) samples at the specified frequencies; (4) method blanks; (5) laboratory control sample (LCS); (6) surrogate spike recoveries; and (7) matrix spike/matrix spike duplicate (MS/MSD) samples.

Data flags were assigned according to the QC acceptance limits defined in the QAPP. These flags, as well as the reason for each flag, are entered into the electronic database and are available to data users. Multiple flags can routinely be applied to a specific sample method/matrix/analyte combination, but there will be only one final flag. As discussed below, a final flag is applied to the data on the basis of the flags entered into the database and is the most conservative of the applied validation flags. The final flag also includes matrix and blank sample impacts.

Data flags can be separated into the following two categories to be used in estimating both contractor and analytical completeness:

- Flags caused by laboratory deviation from requirements in the QAPP
- Flags applied because of the nature of the sample matrix or method limitations

The categories of data flags are tracked in the database and used to calculate both contractual and analytical completeness.

- The database keeps track of the type of protocol violation, and contractual and analytical completeness during data validation.

The data flags are those listed in the QAPP and are defined as follows:

J = Analyte was present but reported value may not be accurate or precise because one or more QC specifications were not met, or concentration is greater than the method detection limit (MDL) but less than the project quantitation limit.

R = The result has been rejected; identification and/or quantitation could not be verified because critical QC specifications were not met.

U = Analyte was analyzed for but not detected at the specified detection limit.

UJ = Analyte was analyzed for but not detected. The sample quantitation limit is estimated.

In addition, the following flags, which have no QC implications and are not listed in the QAPP, were used:

None = A database flag with no QC implications. A flag is not applied. This is a placeholder for calculating QC criteria issues that do not require flagging.

Exclude = A database flag with no QC implications. When multiple data points have been reported, such as dilutions or re-extractions, the data that best matches QAPP QC requirements are presented to the data users and the remainders are marked with this flag.

3. Data Assessment

The overall summaries of the data validation findings are contained in Tables A1 through A5 at the end of this report.

- **Table A1 – Calibration Exceedances – Qualified Data.** Presents the data qualified because of calibration criteria exceedances.
- **Table A2 – Matrix Spike Precision/Accuracy - Qualified Data**. Presents the data qualified due to MS/MSD criteria exceedances, and other matrix-related issues
- **Table A3 – Surrogate Recovery – Qualified Data.** Presents the data qualified because of surrogate recovery criteria exceedances.
- **Table A4 – Results between the RL and MDL - Qualified Data**. Presents the results which are estimated because the result is between the reporting limit (RL) and the method detection limit (MDL).
- **Table A5 – Site Completeness by Analyte - Qualified Data**. Presents the percent completeness by analyte, matrix, and method.

The data assessment included a review of the activities described in the following sections.

3.1 Calibration

Level 2 validation, as defined in the QAPP, does not include review of initial or continuing calibration information, unless that laboratory specifically notes an exceedance in the case narrative. Calibrations that do not meet method requirements result in data that may have either a high or low bias. Detected and non-detected sample results associated with calibrations that had a low bias were qualified as estimated and flagged "J" or "UJ" respectively. Detected sample results associated with calibrations that had a high bias were qualified as estimated and flagged “J”; non-detected results associated with a high bias were not qualified.

All sample results affected by calibration exceedances are listed in Table A1 and are summarized below:

On one analytical run, the continuing calibration verification standard exceeded the method specified control limits for 1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF) for method SW8290. Four detected sample results were qualified as estimated and flagged “J”.

On one or more analytical runs, the sample concentration for 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD), 1,2,3,4,7,8-Hexachlorodibenozfuran (HxCDF), 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD), octachlorodibenzo-p-dioxin (OCDD), or octachlorodibenzofuran (OCDF) exceeded the linear calibration range of the method (SW8290). The samples could not be reanalyzed on a diluted basis. A total of 64 detected sample results were qualified as estimated and flagged “J”.

3.2 Matrix Spike Samples

MS recoveries are used to evaluate the effect of the sample matrix on the recovery of target analytes. A sample is fortified with a known quantity of a target analyte and is carried through the same preparation and analytical procedures as the unspiked sample. MS recoveries outside the QC limits may indicate that the sample’s matrix is affecting the method’s ability to accurately quantify the target analyte in the associated sample, or samples from similar locations. A low MS recovery generally indicates a negative bias in the sample data. Associated parent detected and non-detected sample results were qualified as estimated and flagged “J” and “UJ”. When the MS and/or MSD recoveries were below 10 percent, the associated parent sample detected results were qualified as estimated and flagged “J”. For associated non-detected parent samples, the results were rejected from project use and flagged “R” unless professional judgement was used. A high MS recovery indicates a potential positive bias to the associated sample data. The associated parent detected results were qualified as estimated and flagged “J”. Non-detected parent results associated with a high bias recovery were not qualified. If duplicate MS analyses are performed, a RPD greater than QC criteria may further indicate that the sample matrix is affecting the precision of the method for the target analyte that did not meet criteria. Therefore, the associated parent detected and non-detected results were qualified as estimated and flagged “J” and “UJ” respectively.

All sample results affected by MS accuracy or precision exceedances are listed in Table A2 and are summarized below:

The native sample concentration for Chromium in samples N036051-003A/55197-1 70x200, N036051-023A/55197-6 70x200, and N036666-001A/3973-51-2 for method SW6010B were much greater than 4 times the spike level for the MS/MSD. Accurate evaluation of the spike recovery could not be determined per National Functional Guidelines, and therefore, it could not be determined whether there was a significant impact to the data quality. The data was not qualified.

The MSD for hexavalent chromium for method SW7199 had a recovery that was less than lower control limit for samples N035749-003A/55197-3 and N036051-027A/55197-7 70x200. The associated detected parent sample results were qualified as estimated and flagged “J.”

3.3 Surrogates

Surrogates are primarily used in organic chromatography methods and are added prior to sample preparation. The surrogates are added to all samples, standards, and blanks in an analytical run and provide a measurement to determine recovery for every sample matrix. Surrogate compounds are chosen to represent the various chemistries of the target analytes in a specific method. A low surrogate recovery indicates that the target analytes in associated samples is likely biased low. Associated detected and non-detected sample results were qualified as estimated and flagged “J” and “UJ”. Likewise, a high surrogate recovery indicates that the target analytes in associated samples is likely biased high.

Associated detected results were qualified as estimated and flagged "J" and non-detected results associated with a high bias recovery were not qualified. When the surrogate recoveries were below 10 percent, the associated parent sample detected result was qualified as estimated and flagged "J", and associated non-detected parent sample result was rejected from project use and flagged "R" unless professional judgment was used.

All sample results affected by surrogate accuracy exceedances are listed in Table A3 and are summarized below:

The spike recoveries of the deuterated congeners for 1,2,3,4,6,7,8-HpCDD, 1,2,3,4,6,7,8-HpCDF, and OCDD were below the method acceptance criteria for several samples. Eight associated detected sample results were qualified as estimated and flagged "J."

3.4 Other

In accordance with Method 8290 for dioxins/furans, individual isomers that were reported by the laboratory as estimated maximum possible concentrations (EMPC) were qualified as non-detects and flagged "U." Two sample results were qualified. The affected sample results are listed in Table A2.

3.5 Low Level Detects

Sample results between the MDL and the RL were flagged "J" and are represented in Table A4, which shows the final flag applied after data validation. The qualified results represent values determined at levels where the true value of the measured chemical could not be quantified with a high degree of confidence. The laboratory data met the RLs specified in the QAPP. All data flagged for low-level imprecision were the result of the sample concentrations and were not related to laboratory performance. The data user may consider these qualified results as estimates when making project decisions.

4. Overall Data Review

The goal of this review is to demonstrate that a sufficient number of representative samples were collected, and the resulting analytical data can be used to support the decision-making process. The procedures for assessing the precision, accuracy, representativeness, completeness, and comparability parameters (PARCC) are addressed in the QAPP and addendum. The following summary highlights the PARCC findings for the above-defined events:

- Precision of the data was verified through the review of the laboratory data quality indicators that include: LCS/LCSD, MS/MSD, and laboratory duplicate RPDs. Precision was acceptable.
- Accuracy of the data was verified through the review of the calibration, internal standard, LCS, MS/MSD, and surrogate standard recoveries, as well as the evaluation of the method blank data. Accuracy was generally acceptable, with the exception of several analytical results being qualified as estimated detected results due to calibration, MS/MSD, or surrogate standard recovery issues. Overall, 72 results out of 609 total results (approximately 12 percent) were qualified for accuracy exceptions. Analytical blank data were free of contamination. Two EMPC results were qualified as non-detects.
- Representativeness of the data was verified through the sample's collection, storage, and the verification of holding-time compliance. No issues were reported for sample collection or storage procedures. The data were reported from analyses within the U.S. Environmental Protection Agency (EPA) recommended holding time.
- Comparability of the data was verified through the use of standard EPA analytical procedures and standard units for reporting. Results obtained are comparable to industry standards in that the collection and analytical techniques followed approved, documented procedures.
- Sensitivity is a measurement based upon the analytical method RLs determined by each subcontract laboratory. The analytical reporting limits were determined based upon the completion of instrument-

specific MDL studies performed annually in accordance with the Code of Federal Regulations, Title 40, Part 136, Appendix B. The RLs are generally established by multiplying the MDL by a factor of three to five as recommended by generally accepted laboratory practice and is further supported by the lowest-level analytical standard in the initial calibration process. Sensitivity is ensured through compliance with the RLs specified in the QAPP and addendum. Any nondetect results that were reported by the laboratory, or were flagged non-detect due to blank contamination, have been evaluated against the project screening levels as discussed in the work plan.

- Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements compared to planned measurements. Valid data are defined as data that are not rejected for project use. The completeness goal of greater than 90 percent was met for all analyte/methods as listed in Table A5.

Evaluation of 100 percent of the chemical data was performed by using the QAPP and addendum as a guide for data quality evaluation. The overall completeness was met and no other systematic protocol errors were identified during the monitoring of the field or laboratory efforts. This along with the PARCCS evaluation demonstrate that the overall quality of the analytical program and laboratory are sufficient to meet the project data quality objectives, and the data are considered usable for making project decisions.

5. Data Management

Sampling activity logs and laboratory analytical data are maintained in a project database and/or in project files, where appropriate. Data were collected and include, but are not limited to, the following items described below:

5.1 Field Data

- Daily field progress reports
- Field worksheets
- Daily field notebooks
- Groundwater sample collection logs
- Chain-of-custody reports

5.2 Laboratory Data

- Laboratory data packages grouped by SDG
- Corrective action reports
- Laboratory MDL studies
- Internal data evaluation reports for all data

Laboratory data were received in both hardcopy (PDF format) and in electronic comma-delimited American Standard Code for Information Interchange (ASCII) format. The receipt of both data types was logged into the sample-tracking program to determine completeness and laboratory turnaround-time compliance.

All data quality evaluation is done using a semi-automated data validation program that uses laboratory hardcopy and electronic data simultaneously. All validation flags and discoveries are entered into the project database and are linked directly to each individual data point. This process compares hardcopy data to electronic data. All data quality validation reports are generated from the electronic database.

The data management system was designed to maintain the usability and integrity of the data through a series of procedures and QC checks that began at the field site and carried through to the generation of data for the user. These data included both the chemical data and field operation information. Both the chemical data and the field data were handled in a relational database.

The laboratory hardcopy PDF report and electronic data are stored in the project files and project local area network hard drive areas in the Jacobs office in Redding, California. The original field data forms are stored in the Jacobs office in Portland. Oregon. Laboratories are required to archive the analytical data as outlined in the QAPP and addendum.

6. Works Cited

CH2M HILL. 2010. *Addendum to the PG&E Program Quality Assurance Project Plan for Dioxins and Furans.* January.

CH2M HILL. 2014. *PG&E Program Quality Assurance Project Plan, Revision 3.* December.

U.S. Environmental Protection Agency (EPA). 1996. SW-846 Test Methods for Evaluating Solid Waste, 3rd Edition, revision 4.

Appendix A
Additional Information

TABLE A1

Calibration Criteria - Qualified Data

Analyte	Sample Identification	Result	Calibration Qualifier*	Criteria	Validation Comments
Method (Matrix): SW8290 (Soil)					
1,2,3,4,6,7,8-Heptachlorodibenzofuran	3973-51-2	490 ng/Kg	J	CCV<LCL	
	3973-52-2	570 ng/Kg	J	CCV<LCL	
	3973-53-2	630 ng/Kg	J	CCV<LCL	
	3973-54-2	590 ng/Kg	J	CCV<LCL	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	3973-51-2	4800 ng/Kg	J	>ICLinearRange	
	3973-52-2	5600 ng/Kg	J	>ICLinearRange	
	3973-52-3	300000 ng/Kg	J	>ICLinearRange	
	3973-53-2	7000 ng/Kg	J	>ICLinearRange	
	3973-53-3	590000 ng/Kg	J	>ICLinearRange	
	3973-54-2	5000 ng/Kg	J	>ICLinearRange	
	3973-54-3	410000 ng/Kg	J	>ICLinearRange	
	55197-1	9800 ng/Kg	J	>ICLinearRange	no dilution
	55197-4	5000 ng/Kg	J	>ICLinearRange	
	55197-5	8800 ng/Kg	J	>ICLinearRange	
	55197-6	10000 ng/Kg	J	>ICLinearRange	
1,2,3,4,7,8-Hexachlorodibenzofuran	3973-51-3	3100 ng/Kg	J	>ICLinearRange	
	3973-52-3	5000 ng/Kg	J	>ICLinearRange	
	3973-53-3	6300 ng/Kg	J	>ICLinearRange	
	3973-54-3	8400 ng/Kg	J	>ICLinearRange	
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	3973-51-3	6300 ng/Kg	J	>ICLinearRange	
	3973-52-3	10000 ng/Kg	J	>ICLinearRange	
	3973-53-3	13000 ng/Kg	J	>ICLinearRange	
	3973-54-3	19000 ng/Kg	J	>ICLinearRange	
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	3973-52-3	4200 ng/Kg	J	>ICLinearRange	
	3973-53-3	5000 ng/Kg	J	>ICLinearRange	
	3973-54-3	6600 ng/Kg	J	>ICLinearRange	
2,3,4,6,7,8-Hexachlorodibenzofuran	3973-54-3	3000 ng/Kg	J	>ICLinearRange	
OCDD	3973-51-3	5300000 ng/Kg	J	>ICLinearRange	

TABLE A1

Calibration Criteria - Qualified Data

Analyte	Sample Identification	Result	Calibration Qualifier*	Criteria	Validation Comments
Method (Matrix): SW8290 (Soil)					
OCDD	3973-52-3	5800000 ng/Kg	J	>ICLinearRange	
	3973-53-3	7800000 ng/Kg	J	>ICLinearRange	
	3973-54-3	7400000 ng/Kg	J	>ICLinearRange	
	55197-1	200000 ng/Kg	J	>ICLinearRange	no dilution
	55197-3	910000 ng/Kg	J	>ICLinearRange	
	55197-4	97000 ng/Kg	J	>ICLinearRange	
	55197-5	160000 ng/Kg	J	>ICLinearRange	
	55197-6	160000 ng/Kg	J	>ICLinearRange	
	55197-7	430000 ng/Kg	J	>ICLinearRange	
OCDF	55197-6	11000 ng/Kg	J	>ICLinearRange	
Total HpCDD	3973-51-2	7700 ng/Kg	J	>ICLinearRange	
	3973-52-2	9100 ng/Kg	J	>ICLinearRange	
	3973-52-3	550000 ng/Kg	J	>ICLinearRange	
	3973-53-2	12000 ng/Kg	J	>ICLinearRange	
	3973-53-3	950000 ng/Kg	J	>ICLinearRange	
	3973-54-2	8100 ng/Kg	J	>ICLinearRange	
	3973-54-3	660000 ng/Kg	J	>ICLinearRange	
	55197-1	18000 ng/Kg	J	>ICLinearRange	no dilution
	55197-4	9600 ng/Kg	J	>ICLinearRange	
	55197-5	16000 ng/Kg	J	>ICLinearRange	
	55197-6	23000 ng/Kg	J	>ICLinearRange	
Total HpCDF	55197-1	4000 ng/Kg	J	>ICLinearRange	no dilution
	55197-5	4700 ng/Kg	J	>ICLinearRange	
	55197-6	9000 ng/Kg	J	>ICLinearRange	
Total HxCDD	3973-51-3	26000 ng/Kg	J	>ICLinearRange	
	3973-52-3	44000 ng/Kg	J	>ICLinearRange	
	3973-53-3	54000 ng/Kg	J	>ICLinearRange	
	3973-54-3	74000 ng/Kg	J	>ICLinearRange	
Total HxCDF	3973-51-3	32000 ng/Kg	J	>ICLinearRange	
	3973-52-3	53000 ng/Kg	J	>ICLinearRange	
	3973-53-3	66000 ng/Kg	J	>ICLinearRange	
	3973-54-3	93000 ng/Kg	J	>ICLinearRange	

TABLE A1

Calibration Criteria - Qualified Data

Analyte	Sample Identification	Result	Calibration Qualifier*	Criteria	Validation Comments
Method (Matrix): SW8290 (Soil)					
Total PeCDF	3973-52-3	16000 ng/Kg	J	>ICLinearRange	
	3973-53-3	17000 ng/Kg	J	>ICLinearRange	
	3973-54-3	26000 ng/Kg	J	>ICLinearRange	
Total TCDF	3973-51-3	640 ng/Kg	J	>ICLinearRange	
	3973-52-3	1200 ng/Kg	J	>ICLinearRange	
	3973-53-3	1300 ng/Kg	J	>ICLinearRange	
	3973-54-3	1900 ng/Kg	J	>ICLinearRange	

%D = percent difference

ng/Kg = nanogram per kilogram

* The most severe flag for each analyte becomes the final validation flag.

Qualifier Description:

J = The analyte was positively identified, the quantitation is an estimate.

Criteria:

>ICLinearRange = Result greater than linear calibration range

CCV<LCL = Continuing calibration recovery less than lower control limit

TABLE A2

Matrix Spike Precision/Accuracy - Qualified Data

Analyte	Sample Identification	Result	MS/MSD Qualifier*	MS Recovery	Criteria
Method (Matrix): SW7199 (SOIL)					
Chromium, hexavalent	55197-3	15 mg/Kg	J	%R = 59 LCL=75 UCL=125	SD<LCL
	55197-7 70x200	28 mg/Kg	J	%R = 71.1% LCL = 75 UCL = 125	SD<LCL
Method (Matrix): SW8290 (Soil)					
2,3,7,8-Tetrachlorodibenzofuran	3973-53-2	0.74 ng/Kg	U		EMPC
2,3,7,8-Tetrachlorodibenzo-p-dioxin	3973-51-2	0.41 ng/Kg	U		EMPC

%R = percent recovery
LCL = lower control limit
UCL = upper control limit

mg/Kg = milligrams per kilogram
ng/Kg = nanogram per kilogram

* The most severe flag for each analyte becomes the final validation flag.

Qualifier Description:

J = The analyte was positively identified, the quantitation is an estimate.
U = The analyte was analyzed for, but not detected. The associated numerical value is at or below the reporting limit (RL).

Criteria:

EMPC = Estimated Maximum Possible Concentration
SD<LCL = Matrix spike duplicate recovery criteria less than lower limit

TABLE A3

Surrogate Recovery - Qualified Data

Method	Matrix	Sample Identification	Analyte	Result	Surrogate Qualifier*	Surrogate Recovery	Criteria
SW8290	Soil		**1,2,3,4,6,7,8-Heptachlorodibenzofuran**				
		3973-53-3		49000 ng/Kg	J		Sur<LCL
		3973-54-3		68000 ng/Kg	J	%R=35 LCL=40 UCL=135	Sur<LCL
		3973-54-3		68000 ng/Kg	J		Sur<LCL
SW8290	Soil		**1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin**				
		3973-51-3		320000 ng/Kg	J	%R=28 LCL=40 UCL=135	Sur<LCL
		3973-53-3		590000 ng/Kg	J		Sur<LCL
SW8290	Soil		**OCDD**				
		3973-52-3		5800000 ng/Kg	J		Sur<LCL
		3973-53-3		7800000 ng/Kg	J		Sur<LCL
		3973-54-3		7400000 ng/Kg	J		Sur<LCL

%R = percent recovery
LCL = lower control limit
UCL = upper control limit

ng/Kg = nanogram per kilogram

* The most severe flag for each analyte becomes the final validation flag.

Qualifier Description:
J = The analyte was positively identified, the quantitation is an estimate.

Criteria:
Sur<LCL = Surrogate recovery less than lower limit

TABLE A4

Results between the RL and MDL - Qualified Data

Analyte	Sample Identification	Result	Low level Detects Final Qualifier*	MDL	RL	Criteria
Method (Matrix): SW8290 (Soil)						
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55197-2	2.2 ng/Kg	J	0.39	4.4	<RL
1,2,3,4,7,8-Hexachlorodibenzofuran	55197-2	2.4 ng/Kg	J	0.17	4.4	<RL
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	55197-2	1.7 ng/Kg	J	0.31	4.4	<RL
1,2,3,6,7,8-Hexachlorodibenzofuran	55197-2	1.3 ng/Kg	J	0.18	4.4	<RL
1,2,3,7,8,9-Hexachlorodibenzofuran	55197-2	0.61 ng/Kg	J	0.23	4.4	<RL
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	55197-2	2.5 ng/Kg	J	0.41	4.4	<RL
1,2,3,7,8-Pentachlorodibenzofuran	3973-51-2	3.7 ng/Kg	J	0.17	4.4	<RL
	3973-54-2	3.3 ng/Kg	J	0.16	4.1	<RL
	55197-2	0.33 ng/Kg	J	0.17	4.4	<RL
	55197-6	2.1 ng/Kg	J	0.17	4.5	<RL
	55197-7	3.3 ng/Kg	J	0.17	4.4	<RL
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	55197-2	0.58 ng/Kg	J	0.14	4.4	<RL
2,3,4,6,7,8-Hexachlorodibenzofuran	55197-2	1.4 ng/Kg	J	0.24	4.4	<RL
2,3,4,7,8-Pentachlorodibenzofuran	55197-2	0.67 ng/Kg	J	0.13	4.4	<RL
2,3,7,8-Tetrachlorodibenzofuran	3973-51-2	0.48 ng/Kg	J	0.12	0.88	<RL
	3973-53-2	0.74 ng/Kg	U	0.13	0.9	<RL
	3973-54-2	0.54 ng/Kg	J	0.12	0.82	<RL
	55197-6	0.42 ng/Kg	J	0.12	0.89	<RL
2,3,7,8-Tetrachlorodibenzo-p-dioxin	3973-51-2	0.41 ng/Kg	U	0.27	0.88	<RL
	3973-52-2	0.77 ng/Kg	J	0.26	0.83	<RL
	3973-53-2	0.79 ng/Kg	J	0.28	0.9	<RL
	3973-54-2	0.6 ng/Kg	J	0.26	0.82	<RL
Total PeCDD	55197-2	1.2 ng/Kg	J	0.14	4.4	<RL

TABLE A4

Results between the RL and MDL - Qualified Data

Analyte	Sample Identification	Result	Low level Detects Final Qualifier*	MDL	RL	Criteria
Method (Matrix): SW8290 (Soil)						
Total TCDD	3973-53-2	0.79 ng/Kg	J	0.28	0.9	<RL

ng/Kg = nanogram per kilogram

MDL = Method Detection Limit

RL = Reporting Limit

* The most severe flag for each analyte becomes the final validation flag.

Qualifier Description:

J = The analyte was positively identified, the quantitation is an estimate.

U = The analyte was analyzed for, but not detected. The associated numerical value is at or below the reporting limit (RL).

Criteria:

<RL = Result less than the RL

TABLE A5

Site Completeness by Analyte - Qualified Data

			Number of Occurrences								
Method	Analyte	Units	Analyses	Detects	Non detects	Blank Flags	J Flags	Contractor R Flags	Total R Flags	Contractor Completeness (%)	Overall Completeness (%)
SW6010B	Antimony	MG/KG	7		7					100	100
	Arsenic	MG/KG	7	7						100	100
	Barium	MG/KG	7	7						100	100
	Beryllium	MG/KG	7		7					100	100
	Cadmium	MG/KG	7		7					100	100
	Chromium	MG/KG	43	43						100	100
	Cobalt	MG/KG	7	7						100	100
	Copper	MG/KG	7	7						100	100
	Lead	MG/KG	7	7						100	100
	Molybdenum	MG/KG	7	5	2					100	100
	Nickel	MG/KG	7	7						100	100
	Selenium	MG/KG	7		7					100	100
	Silver	MG/KG	7		7					100	100
	Thallium	MG/KG	7	1	6					100	100
	Vanadium	MG/KG	7	7						100	100
	Zinc	MG/KG	43	43						100	100
SW7199	Chromium, hexavalent	MG/KG	43	43			2			100	100
SW7471A	Mercury	MG/KG	7		7					100	100
SW8290	1,2,3,4,6,7,8-Heptachlorodibenzofuran	NG/KG	15	15			6			100	100
	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	NG/KG	15	15			12			100	100
	1,2,3,4,7,8,9-Heptachlorodibenzofuran	NG/KG	15	15			1			100	100
	1,2,3,4,7,8-Hexachlorodibenzofuran	NG/KG	15	15			5			100	100
	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	NG/KG	15	15			1			100	100
	1,2,3,6,7,8-Hexachlorodibenzofuran	NG/KG	15	15			1			100	100
	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	NG/KG	15	15			4			100	100
	1,2,3,7,8,9-Hexachlorodibenzofuran	NG/KG	15	15			1			100	100
	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	NG/KG	15	15			4			100	100
	1,2,3,7,8-Pentachlorodibenzofuran	NG/KG	15	15			5			100	100
	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	NG/KG	15	15			1			100	100

TABLE A5

Site Completeness by Analyte - Qualified Data

Method	Analyte	Units	Number of Occurrences: Analyses	Detects	Non detects	Blank Flags	J Flags	Contractor R Flags	Total R Flags	Contractor Completeness (%)	Overall Completeness (%)
SW8290	2,3,4,6,7,8-Hexachlorodibenzofuran	NG/KG	15	15			2			100	100
	2,3,4,7,8-Pentachlorodibenzofuran	NG/KG	15	15			1			100	100
	2,3,7,8-Tetrachlorodibenzofuran	NG/KG	15	13	2		3			100	100
	2,3,7,8-Tetrachlorodibenzo-p-dioxin	NG/KG	15	13	2		3			100	100
	OCDD	NG/KG	15	15			11			100	100
	OCDF	NG/KG	15	15			1			100	100
	Total HpCDD	NG/KG	15	15			11			100	100
	Total HpCDF	NG/KG	15	15			3			100	100
	Total HxCDD	NG/KG	15	15			4			100	100
	Total HxCDF	NG/KG	15	15			4			100	100
	Total PeCDD	NG/KG	15	15			1			100	100
	Total PeCDF	NG/KG	15	15			3			100	100
	Total TCDD	NG/KG	15	13	2		1			100	100
	Total TCDF	NG/KG	15	15			4			100	100

% = Percent
J-Flags = Estimated results
R-Flags = Rejected results
mg/Kg = milligrams per kilogram
ng/Kg = nanogram per kilogram

Appendix G
Cost Evaluation

Soil Engineering Evaluation/Cost Analysis, PG&E Topock Compressor Station, Needles, California

Basis of Estimate

Final

March 20, 2021

Pacific Gas & Electric Company

Contents

Attachment

Tables

Basis of Estimate

1. Purpose of Estimate

The purpose of this Construction Cost Estimate is to establish an Engineer's opinion of probable construction cost at 30% Construction Plan Development for the analysis of contractor bids.

2. General Project Description

Project scope includes excavating areas of concern (AOCs), waste transport and disposal, backfill, and site restoration.

3. Overall Costs

Table 1 is a summary breakdown of the costs. The Contract Costs shown exclude Owner Contingency and any owner costs associated with the supervision, inspection and overhead (SIOH) of the project.

Table 1. Summary of Costs

PG&E Topock Compressor Station – Needles, CA

Alternative	Low Range (-30%)	Estimated Costs [a]	High Range (+50%)
Alt 1	$0	**$0**	$0
Alt 2	$3,697,000	**$5,281,000**	$7,922,000
Alt 3	$3,238,000	**$4,626,000**	$6,939,000
Alt 4	$3,611,000	**$5,159,000**	$7,739,000
Alt 5 [b]	NA	NA	NA

[a] See Attachment A for cost estimate details. This estimate is valid for 120 days.

[b] The cost of Alternative 5 was not evaluated because this alternative does not provide overall protection of human health.

4. Scope of Work

This project consists of the excavation, transportation and disposal of contaminated soil, backfill, and site restoration. There are five proposed alternatives:

Alternative 1:

1. No remedial action taken.

Alternative 2:

1. Premobilization
   - Remedial design
   - Contractor submittals
   - Performance and payment bond
2. Mobilization / Site Setup
   - Mobilization
   - Site setup / erosion controls
   - Construct stockpile staging area
   - Fence removal
   - Pre-excavation survey
   - Utility locate

3. Excavation
   - Excavate, haul, and stockpile
   - Analytical testing
   - Post-excavation survey
   - Traffic control
4. Transportation and disposal
   - Load waste material
   - Transport and dispose material
   - Waste profile sampling
5. Backfill / restoration / demobilization
   - Clean fill analytical confirmation
   - Backfill – imported and locally sourced
   - Traffic control
   - Post-backfill survey
   - Fence replacement
   - Seeding and grounds restoration
   - Demobilization
6. Final construction completion report
7. Construction management support
   - Dust monitoring
   - Field staff, supplies, per diem, vehicle, and field office
8. Project Management

Alternative 3:

1. Premobilization
   - Remedial design
   - Contractor submittals
   - Performance and payment bond
2. Mobilization / Site Setup
   - Mobilization
   - Site setup / erosion controls
   - Construct stockpile staging area
   - Fence removal
   - Pre-excavation survey
   - Utility locate
3. Excavation
   - Excavate, haul, and stockpile
   - Analytical testing
   - Post-excavation survey
   - Traffic control
4. Transportation and disposal
   - Load waste material
   - Transport and dispose material
   - Waste profile sampling
5. Screening
   - Spill control berm
   - Dust control
   - Screen excavated material for separation
6. Backfill / restoration / demobilization
   - Clean fill analytical confirmation
   - Backfill – imported and locally sourced
   - Traffic control

- Post-backfill survey
- Fence replacement
- Seeding and grounds restoration
- Demobilization

7. Final construction completion report

8. Construction management support
   - Dust monitoring
   - Field staff, supplies, per diem, vehicle, and field office
   - Project Management

Alternative 4:

1. Premobilization
   - Remedial design
   - Contractor submittals
   - Performance and payment bond

2. Mobilization / Site Setup
   - Mobilization
   - Site setup / erosion controls
   - Construct stockpile staging area
   - Fence removal
   - Pre-excavation survey
   - Utility locate

3. Excavation
   - Excavate, haul, and stockpile
   - Analytical testing
   - Post-excavation survey
   - Traffic control

4. Transportation and disposal
   - Load waste material
   - Transport and dispose material
   - Waste profile sampling

5. Screening
   - Spill control berm
   - Dust control
   - Temporary water line
   - Screen excavated material for separation
   - Rinse material for site reuse
   - Transport rinsate back to ponds after use

6. Backfill / restoration / demobilization
   - Clean fill analytical confirmation
   - Backfill – imported and reuse from screening/washing
   - Traffic control
   - Post-backfill survey
   - Fence replacement
   - Seeding and grounds restoration
   - Demobilization

7. Final construction completion report

8. Construction management support
   - Dust monitoring
   - Field staff, supplies, per diem, vehicle, and field office
   - Project Management

Alternative 5:

1. Premobilization
   - Remedial design
   - Contractor submittals
   - Performance and payment bond
2. Mobilization / Site Setup
   - Mobilization
   - Site setup
   - Construct stockpile staging area
   - Fence removal
   - Pre-excavation survey
   - Utility locate
3. Transportation and disposal
   - Load waste material
   - Transport and dispose material
   - Waste profile sampling
4. Final construction completion report
5. Construction management support
   - Dust monitoring
   - Field staff, supplies, per diem, vehicle, and field office
   - Project Management

5. Markups

The markups summarized in Table 2 are based upon general assumptions about how the project will be contracted. Actual markup percentages may vary from those shown here, and are the responsibility of the bidding contractor.

Table 2. Contractor Markups

PG&E Topock Compressor Station – Needles, CA

Markup Category	Percentage
Indirect	20.00%
Contingency	20.00%
Fee	8.00%

6. Escalation Rate

This estimate does not include escalation.

7. Estimate Classification

This is not an offer for construction and/or project execution. This AACE Classification Class 4 cost estimate is assumed to represent the actual total installed cost within the range of -30 percent to +50 percent (% based on AACE Class 4, which is recommended for estimates at the 30% design level) of the cost indicated. It would appear prudent that internal budget allowances account for the highest cost indicated by this range as well as other site specific allowances. The cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor and material costs, competitive market conditions, implementation schedule, and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding.

8. Estimate Methodology

Parts of this cost estimate are considered a bottom rolled up type estimate with cost items and breakdown of Labor, Materials and Equipment. Vendor resources such as quotes and internet sources were incorporated where applicable.

9. Cost Resources

The following is a list of the various cost resources used in the development of the cost estimate:

- R.S. Means, 2016
- HCSS estimating software
- Vendor quotes
- Internet research if applicable
- CH2M and Jacobs Historical Data and similar project costs
- Estimator judgment

10. Labor Costs

The HCSS database is fixed at the U.S. National Average.

11. Taxes

A 7.75% tax is applied to material and equipment.

12. Major Assumptions

The estimate is based on the assumptions that the work will be done on a competitive bid basis, the contractor will have a reasonable amount of time to complete the work, and all work can be performed without schedule disruptions.

General assumptions for the scope of work include:

- No costs for temporary security have been included in this estimate.
- No salvage value has been included for any materials removed or demolished on the project.
- It is appropriate to dispose of excavated waste at a disposal site in Beatty, NV and they have capacity to accommodate generated waste.

This estimate should be evaluated for market changes after 120 days beyond the issue date. It is assumed that much of the materials and equipment will be provided by local general, electrical, mechanical, and plumbing contractors.

It is assumed that the work is performed under a 50-hour work week. Additionally, it is assumed that all materials and labor are readily available and that the contractor has reasonable and unlimited access to the work areas.

13. Allowances

No allowances were included in this cost estimate for known work that is not sufficiently detailed at this time.

14. Excluded Costs

The cost estimate excludes the following costs:

- Non-construction or soft costs for design, services during construction, land, legal and owner administration costs
- Material Adjustment allowances above and beyond what is included at the time of the cost estimate

Attachment A
Cost Estimate Detail

Cost Estimate Details Summary Soil Engineering Evaluation/Cost Analysis, PG&E Topock Compressor Station				
Cost Type	**Alternative 1: No Remediation**	**Alternative 2: Excavation and Offsite Disposal**	**Alternative 3: Excavate, Screen to 3/8", 50% reused as Backfill, 50% Offsite Disposal**	**Alternative 4: Excavate, Screen to 3/8", 50% reused as Backfill after Rinse, 50% Offsite Disposal**
Total Capital Cost	$0	$5,281,000	$4,626,000	$5,159,000
Estimated Range of Costs (Class 4)	From	From	From	From
-30%	$0	$3,697,000	$3,238,000	$3,611,000
	To	To	To	To
+50%	$0	$7,922,000	$6,939,000	$7,739,000

This is not an offer for construction and/or project execution.

These AACE Classification Class 4 cost estimates are assumed to represent the actual total installed cost within the range of -30 percent to +50 percent (% based on AACE) of the cost indicated. It would appear prudent that internal budget allowances account for the highest cost indicated by this range as well as other site specific allowances. The cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor and material costs, competitive market conditions, implementation schedule, and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding.

Cost resources in this estimate includes vendor quotes, RS Means, and estimator's judgment based on previous projects.

Alternative 2: Excavation and Offsite Disposal						**COST ESTIMATE SUMMARY**
Site:		**Description:**	Excavate and haul to staging area, offsite disposal			
Location: Topock, CA						
Phase:						
Base Year: 2021						
Date:						

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
1 Premobilization					
Remedial Design	1	LS	$100,000	$100,000	
Contractor Submittals	1	LS	$10,000	$10,000	
Performance and Payment Bond	2%		$1,148,228	$22,965	construction costs only - excludes T&D
SUBTOTAL				$132,965	
2 Mobilization/Site Setup					
Mobilization	1	EA	$118,900	$118,900	includes travel costs
Site Setup/Erosion Controls	1	LS	$29,300	$29,300	
Construct Stockpile Staging Area	1	LS	$16,400	$16,400	
Fence Removal	407	LF	$10	$4,070	
Surveying	2	DY	$3,800	$7,600	Establish excavation areas
Utility Locate	2	DY	$1,800	$3,600	
SUBTOTAL				$179,870	
3 Excavation					
AOC1, AOC 9, AOC 11, AOC14, AOC27, SWMU 1					
Excavate and Haul to Staging Area	4,700	CY	$37	$173,910	assumed 3 - 5 cy trucks to haul to stockpile area - 576 bcy/shift
Stockpile Management	4,700	CY	$9	$42,303	
AOC10					
Excavate and Haul to Staging Area	2,549	CY	$58	$147,860	
Stockpile Management	2,549	CY	$15	$38,240	
Special Excavator Areas (AOC 10-1, AOC 9-1, SWMU 1-3)	1,259	CY	$6	$8,168	Additional cost factor to excavation, steep area.
Drop-off, Assembly, Disassembly, Pick-up	1	LS	$53,412	$53,412	
Analytical - Confirmation Samples					Includes 15% QC
Metals	137	EA	$91	$12,467	SW6010B/SW7471A
Dioxin	137	EA	$607.25	$83,193	SW846 8290
Shipping Samples	18	EA	$125	$2,250	
Shoring SWMU 1-2	5,600	SF	$20	$109,256	
Surveying	5	DY	$3,800	$19,000	Post excavation survey
Traffic Control	5	DY	$5,156	$25,780	North Side of I-40
SUBTOTAL				$715,839	
4 Transportation and Disposal					
Load Trucks for Offsite Disposal	7,250	CY	$10	$72,496	assumed 20 loads/day for offsite disposal
Analytical - Waste Profile	29	EA	$750	$21,749	Assumed 1 per 250 CY
T&D - Non Haz Soil	7,612	TN	$200	$1,522,400	assumed 70% ($300/cy)
T&D - Haz Soil	3,262	TN	$283.33	$924,222	assumed 30% ($425/cy)
SUBTOTAL				$2,540,867	
5 Backfill/Restoration/Demobilization					
Analytical - Clean Fill	3	EA	$645	$1,935	assumed 1 per 1,000 cy
Backfill - Import	1,351	CY	$73	$98,608	
Backfill - Local Source	5,899	CY	$11	$63,648	
Traffic Control	3	DY	$4,349	$13,047	North Side of I-40
Surveying	5	DY	$3,800	$19,000	post backfill survey
Fence Replacement	407	LF	$40	$16,280	
Seeding/Restoration	1	LS	$15,000	$15,000	allowance
Demobilization	1	LS	$25,000	$25,000	allowance
SUBTOTAL				$252,518	
6 Final Construction Completion Report					
Final Construction Completion Report	1	LS	$50,000	$50,000	
SUBTOTAL				$50,000	
7 Construction Management Support					
Construction Manager	864	HR	$135	$116,640	4 month field duration (50 hr work week). Includes travel time to site
Field Technician	864	HR	$90	$77,760	
Real Time Dust Monitor	12	MTH	$400	$4,800	PDR-1000 dust monitor x 3 ea
Setup Fixed Monitoring Station	1	LS	$2,500	$2,500	
Monitoring System Rental (3 ea)	4	MTH	$3,000	$12,000	
Pickup Rental	8	MTH	$1,500	$12,000	2 ea
Temporary Field Office	4	MTH	$5,000	$20,000	temporary field office, sanitation, field supplies
Per Diem - Lodging	240	DY	$102	$24,480	
Per Diem - Meals	240	DY	$61	$14,640	
Daily Field Supplies	80	DY	$75	$6,000	
SUBTOTAL				$290,820	
8 Project Management					Assumed 14 mths from design to Final Construction Completion Report
Project Manager	1,120	HR	$175	$196,000	
Subcontract Administrator	80	HR	$92	$7,360	
Administrative	560	HR	$62	$34,720	
SUBTOTAL				$238,080	
TOTAL				**$4,400,959**	
Contingency	20%		$4,400,959	$880,200	Scope and bid contingency
Total Capital Costs				**$5,281,159**	

Alternative 3: Excavation, Screen and Offsite Disposal						**COST ESTIMATE SUMMARY**
Site:		**Description:**	Excavate, Screen to 3/8", 50% reused as Backfill, 50% Offsite Disposal. Screening excludes all AOC 10 areas. AOC 10 areas for offsite disposal without processing.			
Location:	Topock, CA					
Phase:						
Base Year:	2021					
Date:						

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
1 Premobilization					
Remedial Design	1	LS	$100,000	$100,000	
Contractor Submittals	1	LS	$10,000	$10,000	
Performance and Payment Bond	2%		$1,352,960	$27,059	construction costs only - excludes T&D
SUBTOTAL				$137,059	
2 Mobilization/Site Setup					
Mobilization	1	EA	$118,900	$118,900	includes travel costs
Site Setup/Erosion Controls	1	LS	$29,300	$29,300	
Construct Stockpile Staging Area	1	LS	$16,400	$16,400	
Temporary K-Rail	200	LF	$30	$6,000	
Fence Removal	407	LF	$10	$4,070	
Surveying	2	DY	$3,800	$7,600	Establish excavation areas
Utility Locate	2	DY	$1,800	$3,600	
SUBTOTAL				$185,870	
3 Excavation					
AOC1, AOC 9, AOC 11, AOC14, AOC27, SWMU 1					
Excavate and Haul to Staging Area	4,700	CY	$37	$173,910	assumed 4 - 10 cy trucks to haul to stockpile area - 576 bcy/shift
Stockpile Management	4,700	CY	$9	$42,303	
AOC10					
Excavate and Haul to Staging Area	2,549	CY	$58	$147,860	
Stockpile Management	2,549	CY	$15	$38,240	
Special Excavator Areas (AOC 10-1, AOC 9-1, SWMU 1-3)	1,259	CY	$6	$8,168	Additional cost factor to excavation, steep area.
Drop-off, Assembly, Disassembly, Pick-up	1	LS	$53,412	$53,412	
Analytical - Confirmation Samples					
Metals	137	EA	$91	$12,467	SW6010B/SW7471A
Dioxin	137	EA	$607.25	$83,193	SW846 8290
Shipping Samples	18	EA	$125	$2,250	
Shoring SWMU 1-2	5,600	SF	$20	$109,256	
Surveying	5	DY	$3,800	$19,000	Post excavation survey
Traffic Control	5	DY	$5,156	$25,780	North Side of I-40
SUBTOTAL				$715,839	
4 Transportation and Disposal					AOC10 (2,404 cy) + 5,000 cy from other areas
Load Trucks for Offsite Disposal	4,899	CY	$10	$48,995	assumed 20 loads/day for offsite disposal
Analytical - Waste Profile	20	EA	$750	$14,698	Assumed 1 per 250 CY
T&D - Non Haz Soil	5,144	TN	$200	$1,028,800	assumed 70% ($300/cy)
T&D - Haz Soil	2,205	TN	$283.33	$624,743	assumed 30% ($425/cy)
SUBTOTAL				$1,717,236	
5 Screening					
Mob/Setup Screening Plan	1	LS	$47,531	$47,531	
Spill Prevention Berm Construction	600	LF	$4	$2,538	Pushing local material to build. Assumed 150'x150' area
Dust Control	13	Day	$1,078	$13,567	Water truck, filled using nearby hose station.
Screening	4,700	CY	$11	$51,703	
SUBTOTAL				$115,339	
6 Backfill/Restoration/Demobilization					
Analytical - Clean Fill	3	EA	$645	$1,935	assumed 1 per 1,000 cy
Backfill - Screened Material	2,350	CY	$53	$124,557	
Backfill - Import	1,351	CY	$65	$87,802	
Backfill - Local	3,549	CY	$11	$38,290	
Traffic Control - Backfill	3	DY	$4,349	$13,047	North Side of I-40
Surveying	5	DY	$3,800	$19,000	post backfill survey
Fence Replacement	407	LF	$40	$16,280	
Seeding/Restoration	1	LS	$15,000	$15,000	allowance
Demobilization	1	LS	$20,000	$20,000	allowance
SUBTOTAL				$335,911	
7 Final Construction Completion Report					
Final Construction Completion Report	1	LS	$50,000	$50,000	
SUBTOTAL				$50,000	
8 Construction Management Support					
Construction Manager	1,064	HR	$135	$143,640	5 month field duration (50 hr work week). Includes travel time to site
Field Technician	1,064	HR	$90	$95,760	
Real Time Dust Monitor	15	MTH	$400	$6,000	PDR-1000 dust monitor x 3 ea
Setup Fixed Monitoring Station	1	LS	$2,500	$2,500	
Monitoring System Rental (3 ea)	5	MTH	$3,000	$15,000	
Pickup Rental	10	MTH	$1,500	$15,000	2 ea
Temporary Field Office	5	MTH	$5,000	$25,000	temporary field office, sanitation, field supplies
Per Diem - Lodging	300	DY	$102	$30,600	
Per Diem - Meals	300	DY	$61	$18,300	
Daily Field Supplies	100	DY	$75	$7,500	
SUBTOTAL				$359,300	

Alternative 3: Excavation, Screen and Offsite Disposal						**COST ESTIMATE SUMMARY**
9 Project Management						Assumed 14 mths from design to Final Construction Completion Report
Project Manager		1,120	HR	$175	$196,000	
Subcontract Administrator		80	HR	$92	$7,360	
Administrative		560	HR	$62	$34,720	
	SUBTOTAL				$238,080	
	TOTAL				**$3,854,635**	
Contingency		20%		$3,854,635	$770,900	Scope and bid contingency
Total Capital Costs					**$4,625,535**	

Alternative 4: Excavation, Screen, Wash and Offsite Disposal				**COST ESTIMATE SUMMARY**
Site:		**Description:**	Excavate, Screen to 3/8", 50% reused as Backfill after Rinse, 50% Offsite Disposal. Screening excludes all AOC 10 areas. AOC 10 areas for offsite disposal without processing.	
Location:	Topock, CA			
Phase:				
Base Year:	2021			
Date:				

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
1 Premobilization					
Remedial Design	1	LS	$100,000	$100,000	
Contractor Submittals	1	LS	$10,000	$10,000	
Performance and Payment Bond	2%		$1,788,718	$35,774	construction costs only - excludes T&D
SUBTOTAL				$145,774	
2 Mobilization/Site Setup					
Mobilization	1	EA	$118,900	$118,900	includes travel costs
Site Setup/Erosion Controls	1	LS	$29,300	$29,300	
Construct Stockpile Staging Area	1	LS	$16,400	$16,400	
Temporary K-Rail	200	LF	$30	$6,000	
Fence Removal	407	LF	$10	$4,070	
Surveying	2	DY	$3,800	$7,600	Establish excavation areas
Utility Locate	2	DY	$1,800	$3,600	
SUBTOTAL				$185,870	
3 Excavation					
AOC1, AOC 9, AOC 11, AOC14, AOC27, SWMU 1					
Excavate and Haul to Staging Area	4,700	CY	$37	$173,910	assumed 4 - 10 cy trucks to haul to stockpile area - 576 bcy/shift
Stockpile Management	4,700	CY	$9	$42,303	
AOC10					
Excavate and Haul to Staging Area	2,549	CY	$58	$147,860	
Stockpile Management	2,549	CY	$15	$38,240	
Special Excavator Areas (AOC 10-1, AOC 9-1, SWMU 1-3)	1,259	CY	$6	$8,168	Additional cost factor to excavation, steep area.
Drop-off, Assembly, Disassembly, Pick-up	1	LS	$53,412	$53,412	
Analytical - Confirmation Samples					
Metals	137	EA	$91	$12,467	SW6010B/SW7471A
Dioxin	137	EA	$607.25	$83,193	SW846 8290
Shipping Samples	18	EA	$125	$2,250	
Shoring SWMU 1-2	5,600	SF	$20	$109,256	
Surveying	5	DY	$3,800	$19,000	Post excavation survey
Traffic Control	5	DY	$5,156	$25,780	North Side of I-40
SUBTOTAL				$715,839	
4 Transportation and Disposal					AOC10 (2,404 cy) + 5,000 cy from other areas
Load Trucks for Offsite Disposal	4,899	CY	$10	$48,995	assumed 20 loads/day for offsite disposal
Analytical - Waste Profile	20	EA	$750	$14,698	Assumed 1 per 250 CY
T&D - Non Haz Soil	5,144	TN	$200	$1,028,800	assumed 70% ($300/cy)
T&D - Haz Soil	2,205	TN	$283.33	$624,743	assumed 30% ($425/cy)
SUBTOTAL				$1,717,236	
5 Screening					
Mob/Setup Screening/Wash Plan	1	LS	$111,000	$111,000	construct temp pipeline to deliver rinsate water to processing area
Spill Prevention Berm Construction	600	LF	$4	$2,538	Pushing local material to build. Assumed 150'x150' area
Dust Control	13	Day	$1,078	$13,567	Water truck, filled using nearby hose station.
Screening	4,700	CY	$11	$52,455	
Rinsing Screened Material	2,350	CY	$84	$196,237	Only rinsing material used for backfill on site. Assumed 300 gal/water/cy for rinsing cycle. One time use only and not recirculated. Rinse then contain in frac tanks prior to transport to ponds. Approx. 38,652 gal of water per day. 20 total days = approx 128 cy/dy
Manage Rinse Water	1	LS	$175,300	$175,300	2,577 cy x 300 gal/cy = 773,044 gal
SUBTOTAL				$551,097	
6 Backfill/Restoration/Demobilization					
Analytical - Clean Fill	3	EA	$645	$1,935	assumed 1 per 1,000 cy
Backfill - Screened Material	2,350	CY	$53	$124,557	
Backfill - Import	1,351	CY	$65	$87,802	
Backfill - Local	3,549	CY	$11	$38,290	
Traffic Control	3	DY	$4,349	$13,047	North Side of I-40
Surveying	5	DY	$3,800	$19,000	post backfill survey
Fence Replacement	407	LF	$40	$16,280	
Seeding/Restoration	1	LS	$15,000	$15,000	allowance
Demobilization	1	LS	$20,000	$20,000	
SUBTOTAL				$335,911	
7 Final Construction Completion Report					
Final Construction Completion Report	1	LS	$50,000	$50,000	
SUBTOTAL				$50,000	
8 Construction Management Support					

Alternative 4: Excavation, Screen, Wash and Offsite Disposal						COST ESTIMATE SUMMARY
Construction Manager		1,064	HR	$135	$143,640	5 month field duration (50 hr work week). Includes travel time to site
Field Technician		1,064	HR	$90	$95,760	
Real Time Dust Monitor		15	MTH	$400	$6,000	PDR-1000 dust monitor x 3 ea
Setup Fixed Monitoring Station		1	LS	$2,500	$2,500	
Monitoring System Rental (3 ea)		5	MTH	$3,000	$15,000	
Pickup Rental		10	MTH	$1,500	$15,000	2 ea
Temporary Field Office		5	MTH	$5,000	$25,000	temporary field office, sanitation, field supplies
Per Diem - Lodging		300	DY	$102	$30,600	
Per Diem - Meals		300	DY	$61	$18,300	
Daily Field Supplies		100	DY	$75	$7,500	
	SUBTOTAL				$359,300	
9 Project Management						Assumed 14 mths from design to Final Construction Completion Report
Project Manager		1,120	HR	$175	$196,000	
Subcontract Administrator		80	HR	$92	$7,360	
Administrative		560	HR	$62	$34,720	
	SUBTOTAL				$238,080	
	TOTAL				**$4,299,108**	
Contingency		20%		$4,299,108	$859,800	Scope and bid contingency
Total Capital Costs					**$5,158,908**	