REPORT

SITE SPECIFIC SOIL MANAGEMENT PLAN COLUMBIA SOLAR ENERGY PROJECT SITE L-A GRADING, TRENCHING, AND EXCAVATING ACTIVITIES

USS-POSCO INDUSTRIES PITTSBURG, CALIFORNIA

Prepared for

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Acronyms

bgs	below ground surface
Cal-OSHA	California Occupational Safety and Health Administration
CAMU	Corrective Action Management Unit
CCR	California Code of Regulations
CFR	Code of Federal Regulations
COI	contaminant of interest
cPAH	carcinogenic polyaromatic hydrocarbon
CSE	Columbia Solar Energy, LLC
DCP	Dust Control Plan
DTSC	California Environmental Protection Agency - Department of Toxic Substances Control
EC	Environmental Compliance
ESL	Environmental Screening Level
HAZWOPER	Hazardous Waste Operations and Emergency Response
HBL	health-based level
HSO	Health and Safety Officer
HSP	Health and Safety Plan
HWCL	California Hazardous Waste Control Law
LUC	Land Use Covenant
McCarthy	McCarthy Building Companies, Inc.
mg/kg	milligram(s) per kilogram
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl(s)
PEL	Permissible Exposure Limit
PID	photoionization detector
PM_{10}	particulate matter less than 10 microns
PPE	personal protective equipment
Project	Columbia Solar Energy Project on 105 acres of Site L-A at UPI

RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
Site	Columbia Solar Project Site located at 2907 Pittsburg-Antioch Highway, Pittsburg, California, consisting of 105-acres within Site L-A
Site L-A	UPI's 135-acre area at 900 Loveridge Road, Pittsburg, California
SMP	Soil Management Plan
STLC	Soluble Threshold Limit Concentration
SVOC	Semi-volatile organic compounds
SWAT	Solid Waste Assessment Test
SWMU	solid waste management unit
SWPPP	Storm Water Pollution Prevention Plan
TCLP	Toxicity Characteristic Leaching Procedure
TP	Transportation Plan
TPH	total petroleum hydrocarbons
TPH-d	total petroleum hydrocarbons as diesel
TSP	total suspended particles
TTLC	Total Threshold Limit Concentration
UCI	upper confidence interval
UPI	USS-POSCO Industries
URS	URS Corporation Americas
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WET	Waste Extraction Test

I certify under penalty of law that this document and all attachments are prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who managed the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

URS developed this Soil Management Plan (SMP) to address the sampling and reuse/disposal of potentially impacted soil/material if encountered during grading, trenching, and excavating activities associated with the redevelopment of a portion of Site L-A (Contra Costa County Assessor's Parcel No.: 073-200-021) at 2907 Pittsburg Antioch at the USS-POSCO Industries plant in Pittsburg, California (Figures 1 and 2). The SMP identifies monitoring and appropriate health and safety procedures that must be implemented during the earthwork for the Project. URS provides general procedures to manage potentially impacted soil/material to protect the health of workers and the public. See McCarthy Building Company's Inc.'s 2014 Health and Safety Plan, for more specific health and safety information and procedures to protect Site workers and the public.

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URS developed this Soil Management Plan (SMP) to address the sampling and disposal of potentially impacted soil/material if encountered during grading, trenching, and excavating activities associated with Columbia Solar Energy, LLC (CSE) plans to develop a solar energy facility (Project) on a portion of USS POSCO Industries (UPI) Plant's Site L-A located at 2907 Pittsburg Antioch Highway, Pittsburg, California, 94565 (Figures 1 and 2). Site L-A is approximately 135 acres in size; the solar energy facility will occupy approximately105 acres of Site L-A (Site) (Figure 2).

UPI leased the Site to CSE. UPI will ensure that CSE's activities on the Site meet all applicable Land Use Covenant (LUC) requirements for Site L-A (LUC DOC 2010 0132574 00). The LUC requires a California Environmental Protection Agency - Department of Toxic Substances Control (DTSC) approved Soil Management Plan (SMP), a Dust Control Plan, and Site Specific Health and Safety Plan (HSP) before earthwork on the Site can commence. The City of Pittsburg also requires a DTSC-approved SMP before the Site grading permit will be issued.

Site L-A operated as a hazardous waste disposal unit for over four decades. The Site L-A remediation/cleanup may not have removed all of the impacted material present in the subsurface at the Site. Workers may encounter hazardous waste and contaminated media during excavations associated with the project and they must: receive training on recognizing impacted soil at Site L-A and report potential sightings of such substances to Site superintendent/SSO as soon as it is safe to do so.

There are two phases of work,

1) Site Grading and Earthwork, which includes: trenching; excavation; soil management of stockpiles; site fence post installation; site grubbing and construction debris management; excavation, drilled pier foundations for electrical voltage inverters and substation structures and main transformer foundation excavation; and use of soil for Site fill that meets the Site's reuse criteria, that is excavated during that cut portion of the Project cut and fill to level the Site. McCarthy will use the approximately 135,000 cubic yards of clean fill stockpiled on Site for Site fill. The final site condition before the solar project construction will be bare soil that is then hydroseeded at the conclusion of the project.
2) Post-earthwork construction, including solar facility installation and installation of utilities within the trenches previously excavated and filled with clean fill, followed by backfill and compaction with clean fill and installation of an electrical substation.

Site workers, off Site workers, the public, and the environment will be protected by the procedures described in this SMP on how the Site soil will be managed, cut, and filled, during earthwork. This SMP addresses the sampling, analysis, characterization, management and/or disposal of visibly contaminated soil, soil that is not visibly contaminated, and debris encountered during grading, trenching, and excavating activities associated with the development of the Project.

Site and off Site workers and the public will be protected by the health and safety procedures described in this SMP. Specific procedures are provided to manage potentially impacted soil/material in a manner protective of the health of workers and the public. Public exposure will be minimal because the public will be excluded from the work area, and McCarthy will implement dust control procedures and monitor the dust controls effectiveness to prevent public exposure to potential contaminants during construction.

1.1 PURPOSE

URS developed this Soil Management Plan (SMP) to address the sampling and disposal of visually impacted soil/material if encountered during grading, trenching, and excavating activities associated with Columbia Solar Energy, LLC (CSE) will develop a solar energy facility (Project) on a portion of USS-POSCO Industries (UPI) Plant's Site L-A (Contra Costa County Assessor's Parcel No. 073-200-021) located at 2907 Pittsburg-Antioch Highway, Pittsburg, California, 94565 (Figures 1 and 2) (Site). Site L-A is approximately 135 acres in size; the solar energy facility will occupy approximately105 acres of Site L-A (Figure 2).

There are three major stakeholder entities in this Project:

1. The Project Owner, CSE;
2. The Engineering and Construction Contractor, McCarthy Building Companies, Inc. (McCarthy); and
3. The Property Owner, UPI.

UPI leased the Site to CSE to develop into a solar energy facility. UPI will ensure that CSE's activities on the Site meet all applicable Land Use Covenant (LUC) requirements for the Site (LUC DOC-2010-0132574-00. The LUC requires a California Environmental Protection Agency - Department of Toxic Substances Control (DTSC) approved Soil Management Plan (SMP), a Dust Control Plan, and a Site Specific Health and Safety Plan (HSP) before earthwork on the Site can commence. The City of Pittsburg requires a DTSC-approved SMP before the Site grading permit will be issued.

There are two phases of the Project as described below.

1) Site Grading and Earthwork, which includes: trenching; excavation; soil management of stockpiles; site fence post installation; site grubbing and construction debris management;; excavation, drilled pier foundations for electrical voltage inverters and substation structures and main transformer foundation excavation; and use of soil for Site fill that meets the Site's reuse criteria, that is excavated during that cut portion of the Project cut and fill to level the Site. McCarthy will use the approximately 135,000 cubic yards of clean fill stockpiled on Site. The final site condition before the solar project construction will be bare soil that is then hydroseeded at the conclusion of the project. The McCarthy grading plan is included as Figure 3.
2) Post-earthwork construction, including solar facility installation and installation of utilities within the trenches previously excavated and filled with clean fill, followed by backfill and compaction with clean fill and installation of an electrical substation.

For the purpose of this document, "earthwork" is used to describe soil disturbing activities during first phase of work, such as but not limited to, excavation, trenching, grading, and electrical substation and inverter drilled pier and foundation excavation. Earthwork has the potential to create dust which will be monitored using personal air monitoring and perimeter air monitoring equipment, as described in Section 7.1.3.

The Site soil will be managed, cut, and filled to be protective of Site workers, off Site workers, and the public, as described in this SMP. This SMP addresses the sampling, analysis,

characterization, management and/or disposal of visibly contaminated soil. It also addresses management of soil that is not visibly contaminated, and debris encountered during grading, trenching, and excavating activities associated with the development of the Project.

1.2 PROJECT SCOPE OF WORK

CSE retained URS Corporation Americas (URS) to develop this SMP for DTSC's review and approval as part of the project permitting effort. McCarthy developed and submitted a HSP for DTSC's review and approval as part of the Project permitting effort. DTSC will provide environmental agency oversight for the earthwork on the Site. UPI retained URS to conduct management of hazardous soils found during the earthwork, including stockpiling oversight, sampling, analysis, characterization, profiling and off Site transportation and disposal oversight if needed.

Site L-A operated as a hazardous waste disposal unit for over four decades. The Site L-A remediation/cleanup may not have removed all of the impacted material present in the subsurface at the Site. Workers may encounter hazardous waste and contaminated media during excavations associated with the project and they must: receive training on recognizing impacted soil at Site L-A and report potential sightings of such substances to Site superintendent/SSO as soon as it is safe to do so. Additional information regarding the hazardous Site operations is included in Section 4.

The Project initially consists of earthmoving activities to prepare the Site for the installation of photovoltaic panels, an electrical substation, electrical voltage inverters, and related equipment and enclosures. The Site is a relatively flat, barren, dirt lot on the southern portion of the UPI property. The earthmoving work will include the following activities.

- Site fencing including reusing some of the existing Site L-A fencing.
- Site grubbing and construction debris management activities (concrete, cables, and other construction debris are aboveground or buried throughout the Site and will be removed and recycled/disposed of off Site, as needed to prepare the Site for the Project earthwork.)
- Soil management activities including on-Site soil excavation, hauling, soil stockpile management, stockpiled soil sampling and analysis, and off Site disposal, if required.
- Excavating and grading activities to prepare the Site for the solar energy facility (Figure 3). This includes use of the clean soil stockpile on-Site.
- Installation of an electrical substation to transfer the electrical power generated to Pacific Gas and Electric Company's nearby electric transmission line. This substation includes drilled pier foundation construction to a maximum depth of approximately 14-feet below existing grade. The substation work will take about 3 months to construct and will start 2 to 3 weeks after grading starts and end about 6 weeks after the conclusion of the Site's earthmoving activities.
- Trenching activities for future installation of underground utilities for the solar energy facility. McCarthy will fill the trenches with clean fill and survey them for later use by the solar farm installation contractor.
- Installation of a drilled pier foundation for the electrical voltage inverters.

- Use of soil for Site fill that meets the Site's reuse criteria, that is excavated during Project's cut and fill to level the Site. UPI stockpiled approximately 135,000 cubic yards of clean fill on-Site to use for Site fill.

This SMP covers earthmoving activities as described above. McCarthy will conduct additional post earthwork construction activities at the Site as part of the solar facility installation including installation of utilities within the trenches followed by backfill and compaction with clean fill. The solar panel rack installation work will not involve earthwork.

Previously, URS conducted remediation on Site L-A on UPI's behalf under DTSC's oversight. The Project earthwork will be conducted by a grading contractor with a hazardous waste license and Occupational Safety and Health Administration (OSHA) 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) trained employees, due to the potential to encounter hazardous soils.

Although all known visible deposits of dried sludge, lead scale, and oily waste were excavated and removed from Site L-A during past remediation activities, additional deposits may be encountered during the grading, trenching, and excavating activities associated with the redevelopment of Site L-A. The most likely deposit to be encountered is lead scale, given that it was randomly deposited within the open hearth furnace slag disposal area (refer to Figure C-1).

Deposits of dried sludge, lead scale, and oily waste are readily distinguishable from other materials/soils on Site L-A due to their color. For purposes of Site L-A redevelopment, all observed materials/soils that are reddish/rust (dried sludge deposits); grayish-black to black (lead scale deposits); and oily black (oily waste deposits) color will be managed in accordance with this SMP as potentially contaminated hazardous soil/material, and managed by URS on UPI's behalf. McCarthy will excavate soil from these locations until all visibly contaminated soil is removed, and then an additional 1 foot of additional soil will be excavated as a safety measure. URS will collect confirmation samples from the remaining sidewalls and base of the excavation to confirm visual results that soils above the Site reuse/clean-up criteria were removed.

McCarthy will move visibly contaminated soil to the northeast corner of Site L-A (owned by UPI) outside of the Site, and place it on plastic sheeting in stockpiles according to the color of the soil material (Figure 2). URS on UPI's behalf will sample, analyze, characterize, profile, and manage these potentially hazardous waste soils. URS, on behalf of UPI, will dispose of soil exceeding the Site reuse/clean-up criteria in accordance with applicable regulations (Section 7.2). McCarthy may reuse the stockpiled soil if it is below the Site soil reuse/clean-up criteria per contaminants of interest (COI), according to the Soil Management Flow Diagram, Figure 4. McCarthy will stockpile visibly contaminated soil on UPI's Site L-A area (Figure 2), and then URS on UPI's behalf, will sample, analyze, and manage the visibly impacted stockpiles.

URS will collect confirmation soil samples to demonstrate that the remaining soil in sidewalls and at the excavation base meets Site soil cleanup criteria in excavation areas within the Project Site where visibly contaminated soil is removed. During the confirmation sampling/analysis, if URS finds lead soil concentrations between 1,200 and 5,500 mg/kg then those soils could be used on Site as fill under two feet of clean fill or be disposed of off Site. McCarthy will survey fill areas where soils with lead concentrations of 1,200 mg/kg or more are used on Site and UPI will enter the survey locations into the deed restriction. Soils over 5,500 mg/kg will be disposed of off Site as hazardous waste. Soil with COI concentrations less than the cleanup levels can be used on Site without restrictions.

URS will analyze confirmation soil samples for the following contaminants of interest (COI) according to the color of the contaminated soil, as follows:

- Arsenic (all)
- Benzene (oily)
- Lead (all)
- Nickel (red)
- Carcinogenic Polyaromatic Hydrocarbon (cPAH [as coal tar product]) (oily)
- Polychlorinated Biphenyl (PCB) (oily)
- Total Petroleum Hydrocarbons diesel and motor soil. (oily)

UPI has stockpiled approximately 135,000 cubic yards of clean fill on Site L-A to use as part of the Site development. UPI has previously provided to DTSC the analytical results on these clean soils in their 2014 LUC Inspection Report on Site L-A. McCarthy will use the stockpiled clean soil as clean fill in the Project utility corridors and potentially the drilled pier foundations (substation and inverter piers henceforth collectively described as "piers"). McCarthy will use the remaining soil as part of the Project cut and fill to grade the Site for the Project construction.

McCarthy will excavate approximately 7,000 cubic yards of soil from the existing Site surface to facilitate Site drainage to the new infiltration basins on the northern portion of the Site. This soil will be reused on Site, if visibly clean or determined to be acceptable after soil excavation confirmation sampling.

McCarthy will excavate the three planned utility corridor trenches and potentially the drilled pier locations and McCarthy will backfill with clean on Site or off Site fill to be protective of the solar facility construction workers and future solar facility maintenance workers. The approximate trench locations are shown on Figure 2. The foundations for the substation may be constructed according to the building plans after excavation, rather than filled with clean fill and re-excavated.

The drilling locations of the concrete piers for the substation and inverter equipment stands will utilize Sonotube, CMP, or other protective measures to keep the drilling locations from caving and until the area is ready for post-earthwork activities. McCarthy will survey both the utility trenches and the drilled pier locations (if filled with clean fill) for identification in the LUC. These surveyed locations will also be used by UPI, the solar facility construction contractor, and future maintenance workers.

This SMP identifies the monitoring and appropriate health and safety procedures to be implemented to be protective of Site and off Site workers and the public. Specific procedures must be implemented to manage potentially impacted soil/material in a manner protective of the health of workers and the public. Public exposure will be minimal because the public will be excluded from the work area, and McCarthy will implement dust control procedures and monitor the dust controls effectiveness to prevent public exposure to potential contaminants during construction. This plan is consistent with the United States Environmental Protection Agency (USEPA) guidance documents pertaining to moving hazardous soil within an area of contamination. According to the USEPA guidance documents, moving hazardous soil within an area of contamination does not constitute treatment, storage, or disposal of a hazardous waste under the Resource Conservation and Recovery Act (RCRA) or the California Hazardous Waste Control Law (HWCL), which is the state equivalent to RCRA and administered by the California

Environmental Protection Agency - DTSC. Appendix A provides a summary of the USEPA guidance documents.

The SMP may be updated at the discretion of DTSC or at the request of UPI with the approval of DTSC. UPI and CSE will maintain a copy of this SMP on Site, and at their local offices, to ensure enforcement of all soil management requirements.

McCarthy will design the project, obtain grading and building permits, and purchase equipment (except for CSE Supplied Equipment, e.g., solar panels) to utilize fixed tilt technology for a 19 Megawatt (MW) (alternating current rating) solar energy project. The Project consists of Site grading; installation of three utility corridors; installation of: photovoltaic (PV) panels, inverters, related electrical equipment, equipment enclosures, and an electric switchyard; and installation of a fence around the Site. The PV panels are the predominant project feature and will encompass most of the 105 acre Site. The Project will be interconnected to the Pacific Gas and Electric (PG&E) 115 kilovolt (kV) transmission line located adjacent to the Site on the southeast corner of the Site.

The Project will be an unmanned facility with no occupied buildings on Site and with no public access. CSE will conduct maintenance on an as-needed basis. Site maintenance materials will be stored in one or two conex boxes on Site or brought on Site by the maintenance contractors, as needed. The maintenance contractor will provide temporary drinking water and sanitary facilities for the on Site workers, as neither will be available on Site. CSE will cut the Site grass on an as needed basis but no less often than annually. CSE will wash the solar panels as needed to maintain performance and current planning is to wash the panels twice annually.

The Site will be fenced with a security fence with no trespassing signs posted. The fence will be equipped with locked gates. The Site will have security lighting at night.

The Site is currently a zero stormwater discharge site. Stormwater is currently contained on Site and infiltrates into the local groundwater over the Site. Runoff generally flows by gravity to the north portion of the Site into the low-lying areas along the BNSF Railroad tracks and infiltrates there. This same surface flow pattern and infiltration pattern will be followed with the completion of the solar power facility. The Site will continue to be a zero discharge site.

After the earthmoving work, the solar panels will be mounted on a rack system manufactured and provided to the project by CEMCO Materials located adjacent to the west side of the Site. The solar panel racks will be mounted on “C” shaped posts which will be driven into the ground using mechanical/hydraulic force. Earthmoving will not be used to install the rack support posts.

McCarthy will bury Site utilities in three utility trenches as shown on Figure 2. McCarthy will excavate these trenches and will replace the existing soil with clean fill so that future maintenance workers will not have contact with potentially contaminated Site soils in the utility. McCarthy will survey these areas, and UPI will enter the survey data into the LUC so that future maintenance work on CSE utilities will not need a SMP or HSP.

Similarly, McCarthy will excavate the drilled pier foundations for the voltage inverter stations located along the utility trenches and will backfill with clean fill so that the installation crew will not contact potentially contaminated Site soils in the drilled pier foundations. McCarthy will survey both the utility trenches and the drilled pier locations so that construction contractor can be sure the future work is conducted in the correct locations. Alternatively, McCarthy may construct the drilled piers according to the building plans after excavation rather that filling with clean fill followed by re-excavation.

The Project’s electrical substation location is on the south-east corner of the Site and is shown on Figure 2.The foundations for the substation will be constructed after excavation rather than filled with clean fill and re-excavated. The substation pad preparation consists of over-excavation, re-compaction and possible import of structural fill, if needed. Procedures for re-using material

as described in this section will be followed unless it conflicts with geotechnical requirements. Imported structural fill will be used, in that case.

URS will confirm imported, off Site base rock/structural fill is certified virgin material from a quarry with analytical data confirming it meets DTSC imported clean fill criteria, included in Appendix A-5. McCarthy will utilize new or existing chain link fencing topped with barbed wire around the Project perimeter and around the Project substation. McCarthy will install the fence posts with minimum soil disturbance. If temporary fencing is used, McCarthy will replace with permanent fencing at the end of the Project construction.

The final Site will be graded, bare soil that will be hydroseeded after the project construction.

The Project will be designed and built to meet the following criteria.

Project name	Columbia Solar
City, State	Pittsburg, CA
Nameplate capacity (MW direct current at STC)	25.5 MW direct current
Guaranteed Capacity (MW) at High Side of Inverter Step up Transformer	19 MW alternating current
Projected annual delivered energy (MWh)	42,069 MWh
PV Module technology	Crystalline
Inverters	Bonfiglioli RPS Station 2.4MWac
Racking technology	CEMCO
Facility Collection AC design voltages 34.5 kV / 115 kV, System Voltage	Voltages will be as follows: Inverter to Transformer is 380V, from Transformer to Substation will be 34.5kV, and Substation to point of interconnection will be 115kV

CSE's objectives are to construct the Project safely and in compliance with environmental regulatory requirements for human health, the public, and the environment.

a. Conduct the work proposed in a manner that protects project workers, the public at large and the environment from remaining contaminants and activities taking place within the Project Site.

b. Protect all workers from COI present in Site L-A and potential exposure to those compounds in concentrations above occupational health protection standards.

c. Identify, segregate, accumulate, and reuse/dispose of all impacted or potentially impacted soil excavated from within the footprint of the Site safely and in accordance with all applicable laws and regulations including hazardous waste regulations, OSHA standards, and standards in Title 8 California Code of Regulations (CCR), 5192, and 29 Code of Federal Regulations (CFR), 1910.120

d. Maintain accurate accounting of all soil and materials excavated as part of the Project and accurate accounting of all soil management and disposition during and after the implementation of Project activities. URS will submit these records at the completion of the Project earthwork activities.

e. Meet the Project's required commercial operation date.

4.1 UPI SITE DESCRIPTION AND BACKGROUND

This section's text was extensively copied from the previous DTSC-approved Site L-A SMP (URS 2009). The remediation cleanup goals for previous remediation project were approved by DTSC during the 2004 site remediation project were above the construction worker protective criteria and in some cases above the hazardous waste criteria. This section's text was updated with current Project specific details.

The UPI plant is located on approximately 470 acres in an industrial area of Pittsburg, California (Figure 1), and conducted manufacturing and finishing of steel since 1909. Site L-A occupies approximately 135 acres of the UPI site. The Project Site occupies approximately 105 acres of the 135 acres Site L-A.

Site L-A was used by UPI as an industrial landfill to store and dispose of hazardous and non-hazardous waste from 1939 through 1984 over and under unlined barren soil.

UPI is bordered to the north by New York Slough and industrial facilities, to the west by Harbor Street and industrial facilities and single family residential housing, to the south by the Pittsburg-Antioch Highway and a low-density single-family residential area, and to the east by Loveridge Road and industrial facilities. The address of the UPI Plant is 900 Loveridge Road. The CSE Site address is 2907 Pittsburg-Antioch Highway, Pittsburg, California.

Historically, steel was manufactured in open hearth furnaces and then finished by various processes at the UPI Plant. Finished steel products included sheet steel, wire rope, nails, and pipe. At present, UPI operations consist only of steel finishing; no molten steel manufacturing occurs at the plant. UPI receives coils of hot-rolled steel from off Site sources and produces cold-rolled steel, galvanized steel, and tin- or chromium-plated steel through the processes of cold reduction, annealing, and finishing.

4.2 SITE L-A DISPOSAL, CHARACTERIZATION, AND REMEDIATION HISTORY

4.2.1 Waste Disposal History

Waste disposal on Site L-A began in the 1930s. Early wastes, including various construction materials, were placed on top of the ground in low-lying areas. Cut and fill operations for general plant and office debris began some time about 1975. The last year of this disposal activity was 1992. Cut and fill consisted of cutting four to six feet deep trenches with a bulldozer and backfilling them with wastes.

Slag, a by-product of open hearth steel furnace operations, was deposited on Site L-A from the 1930s to 1962 when operations of the open hearth furnace facility ceased. Small quantities of lead scale from the former facility Wire Mill were placed randomly within the slag disposal area from the 1930s to 1984 when operations of the former Wire Mill ceased; however most of the lead scale generated was reported to have been recycled. From the mid-1950s through the early 1970s, waste oils were deposited at various locations on Site L-A. Highly diluted canal water treatment sludge from the Incoming Water Filter Plant has been disposed via pipeline onto Site L-A since 1959; this practice was discontinued in 2006. From 1972 to 1978, dried wastewater treatment sludge from the Site L-B Former Sludge Drying Beds was placed on Site L-A. A

bioremediation area was established within Site L-A in 1988 to bioremediate soil impacted with fuel oil excavated from the Boiler House in 1987.

4.2.2 Site Characterization

Three investigations were conducted to characterize conditions within Site L-A. Reports of these investigations include the following:

- Waste Characterization Program, Waste Disposal Site L-A, April 1984 (Dames & Moore);
- Water Quality Solid Waste Assessment Test (SWAT), February 1990 (MARK Group); and
- RCRA Facility Investigation (RFI), dated April 1998 (MARK Group).

Site L-A was contained within one solid waste management unit (SWMU), SWMU 24. Based on these investigations, Site L-A was divided into eight discrete subunits (SWMUs 24.1 through 24.8), which are described in the following sections. The SWMU locations are presented on Figure C-1, and analytical data for each SWMU is presented in Appendix C. Because COIs exceeded DTSC-approved Site-specific cleanup criteria, some of the identified SWMUs have been remediated. Remediation activities are described in *Corrective Measures Completion Report* (URS 2004), and summarized in the sections that follow (excerpts of this report are included in Appendix C).

As part of corrective action field activities, excavation boundaries were increased until all confirmation sampling results achieved an area-wide 95 percent (%) upper confidence interval (UCI) statistical value that was below the site-specific reuse/clean-up criteria for site COIs. The majority of the SWMU materials/soils excavated were disposed in a Corrective Action Management Unit (Unit I Corrective Action Management Unit [CAMU]) located in another area of the UPI Plant identified as Site L-B. All excavated materials/soils classified as RCRA waste and all excavated materials/soils with PCB concentrations above laboratory detection levels were disposed of off Site at appropriate treatment, storage, and disposal facilities. Confirmation sampling confirmed that materials/soils left in place met the statistically analysis in accordance with USEPA SW846 for the 95 % UCI value that were below the DTSC-approved site-specific soil cleanup levels. A summary of SWMU waste and remediation confirmation analytical results is provided in Tables C-1 and C-2 of Appendix C. The investigation/confirmation sampling locations are also included in Appendix C. Cleanup levels are included in Appendix E.

The site cleanup criteria for some of the wastes remediated exceed the San Francisco Bay Regional Water Quality Control Board's Environmental Screening Level (ESLs) (RWQCB Dec. 2013) for construction worker protection and/or the California hazardous waste criteria. Therefore the earthwork contractor will have a hazardous waste contractor's license and personnel conducting earthwork on Site L-A will be 40-hour HAZWOPER trained.

4.2.2.1 Hydrogeologic Conditions

The 2009 URS SMP noted that the vadose zone at the UPI Plant extends to varying depths depending upon the season and rainfall. In the vicinity of Site L-A, the vadose zone can extend to a depth of over 20 feet below ground surface (bgs). The vadose zone is characterized by clay, sandy clay and silt with locally developed sand in lenses or thin beds.

The UPI Plant is located within the Pittsburg Groundwater Basin that extends from the foothills located approximately two miles to the south of the plant to the Sacramento River to the north, and from the vicinity of Port Chicago on the west to a few miles east of the City of Antioch. Most of the bedrock exposed in the foothills along the southern edge of the basin consists of fairly impervious shale and sandstone. These rocks are steeply inclined below the alluvium producing only limited recharge to the groundwater basin. Recharge appears to be restricted to percolation from creeks, rainfall, and from the New York Slough (the slough). At present, Site L-A surface runoff typically flows north with the topography and ponds adjacent to the railroad tracks that border the north side of Site L-A and, therefore, contributes to basin recharge.

Five hydrostratigraphic units in the vicinity of the UPI Plant have been identified, including:

- Surface clays;
- An upper sand water-bearing zone;
- An upper clay aquitard;
- A lower water-bearing zone; and
- A basement clay.

Typically, all water-bearing units are found within 150 feet of the ground surface in the vicinity of the UPI Plant. The lower water-bearing zone (also referred to as “main aquifer”) is thought to be channel sands from the San Joaquin River, whereas the shallower deposits (“upper clay aquitard,” “upper sand water-bearing zone,” and “surface clays”) are mixed fluvial, alluvial, and marsh deposits. The shallower sands tend to be quite discontinuous in lateral extent. The thick section of hard clay below the main aquifer is considered to be old bay mud deposits.

Regional flow direction of groundwater is generally to the north towards the slough. The regional gradient in the main aquifer has been estimated to be about 0.004 feet/foot (approximately 20 feet/mile). The groundwater horizontal velocity has been estimated to range from 0.7 feet/day to 2.4 feet/day. The velocity of groundwater in the shallower water-bearing zone is approximately 0.03 feet/day due to the finer-grained texture of these sediments. Increased demand on the groundwater resources in the vicinity of the UPI Plant in the 1920's resulted in over-draft pumping from the Pittsburg Groundwater Basin main aquifer. This over-pumping of the main aquifer was in response to significant degradation in surface water quality which resulted from increased irrigation, industrial and municipal use, and drought conditions. This practice led to the reversal of the subsurface flow direction and caused brackish water intrusion from the river system, which led to the degradation of local groundwater quality. This clearly indicated hydraulic communication between the slough and the main aquifer.

Data from soil borings and monitoring wells at the UPI Plant indicate that groundwater occurs in the following two general hydraulic intervals:

- An unconfined upper water-bearing zone, extending from an average 10 feet to 80 feet bgs, and consisting primarily of clay and silty clay interbedded with silty to clayey sand deposits with the bottom 20 to 30 feet bgs; and
- A confined lower water-bearing zone consisting of sand averaging 70 feet in thickness, the top of which occurs at an approximate depth of 100 feet bgs.

All Site L-A wells were destroyed as part of the Site L-A remediation implementation under State of California Department of Water Resources and Contra Costa County regulations. There are no groundwater monitoring wells remaining within the Project Site.

4.2.3 SWMU 24 Subunit 24.1: Dried Sludge Disposal Areas

Dried wastewater treatment sludge from the Site L-B former sludge drying beds was placed within three disposal areas, collectively identified as SWMU 24.1. The three disposal areas (approximately 19 acres) were located in the western and central portions of Site L-A, as shown on Figure C-1 in Appendix C. In SWMU 24.1, COI's included arsenic, chromium, lead and zinc. Based on an evaluation of analytical data, the dried sludge and underlying fill soils required remediation because arsenic concentrations exceeded the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic (160 milligrams per kilogram [mg/kg]). The highest reported concentration of arsenic in sludge was 1,200 mg/kg and in underlying fill soils was 440 mg/kg. Remediation activities consisted of excavation of SWMUs 24.1-1, 24.1-2, and 24.1-3, visual confirmation of the presence of dried sludge, backfill, and disposal. During remediation activities, approximately 112,500 cubic yards of dried sludge from the three areas were excavated and placed in an on Site CAMU (located within Site L-B on the UPI plant site).

At a few locations, thin seams of dried sludge were left in place because further excavation would have required disturbance of a woodland area, the primary Site L-A haul road, and a nitrogen gas pipeline (Appendix C, Figure C-1). In those areas where dried sludge was left in place, soil samples were collected along the excavation sidewalls at a frequency of one sample per 1,000 lineal feet of side wall and analyzed for arsenic. The confirmation soil sample locations are provided in Appendix C. Arsenic was detected as high as 160 mg/kg. These in-place results indicated that the 95 % UCI was below the site-specific soil cleanup level for arsenic (160 mg/kg).

4.2.4 SWMU 24 Subunit 24.2: Open Hearth Furnace Slag Disposal Area

Slag, a by-product of open hearth steel furnace operations, was deposited in the eastern portion of Site L-A, as shown on Figure C-1 in Appendix C. It has been estimated that approximately 780,000 cubic yards of slag were placed over approximately 56 acres. The only COI is lead. Based on the evaluation of analytical data, slag did not require remediation because the lead concentrations did not exceed the site-specific soil cleanup level calculated for the industrial/commercial worker for lead (5,500 mg/kg) or the RFI screening criterion (construction worker health-based level [HBL]) for lead (1,200 mg/kg). The highest reported concentration of lead was 1,500 mg/kg and the calculated 95 % UCI for lead was 638 mg/kg.

Lead scale from the Former Wire Mill was placed randomly within the slag disposal area (SWMU 24.2), and was randomly deposited within the slag disposal area (SWMU 24.3) and all known and visible lead scale deposits have been remediated. Because of its large size, it was not practical to investigate the slag disposal area further given that additional lead scale deposits were only suspected. The Project HSP will identify appropriate personal protective equipment to protect the project construction workers.

4.2.5 SWMU 24 Subunit 24.3: Lead Scale Disposal Areas

Lead scale from the Former Wire Mill was placed randomly within the slag disposal area (SWMU 24.2). Based on Site investigations/remediation activities, six lead scale deposits collectively identified as SWMU 24.3 and covering approximately 1.3 acres, were discovered

within the central and eastern portions of Site L-A, as shown on Figure C-1 in Appendix C. The only COI was lead. Based on the evaluation of analytical data, lead scale required remediation because the lead concentrations exceeded the site-specific soil cleanup level calculated for the industrial/commercial worker for lead (5,500 mg/kg)). Lead concentrations also exceeded the RFI screening criterion (construction worker HBL) for lead (1,200 mg/kg). The highest reported concentration of lead was 87,000 mg/kg. Remediation activities consisted of excavating and stockpiling approximately 665 cubic yards of lead scale, classification sampling and analysis of excavated lead scale, remediation confirmation sampling and analysis, backfill, and disposal in an appropriate landfill (500 cubic yards were placed in the on Site CAMU located on Site L-B and 165 cubic yards were shipped off Site as RCRA hazardous waste). The confirmation soil sample locations are provided in Appendix C. Twenty-seven confirmation samples were collected and analyzed for total lead. The results of the confirmation sampling and analysis ranged from 5.5 mg/kg to 11,000 mg/kg. The total lead results were statistically analyzed in accordance with USEPA SW846 for the 95 % UCI and the concentrations were found to be below the site-specific soil cleanup level (5,500 mg/kg) for lead. It is estimated that less than 300 cubic yards of material/soil with lead concentrations exceeding the construction worker HBL remain on Site underneath a two-foot layer (minimum) of clean cover soil in SWMUs 24.3-3, -4, and -5 (Appendix C, Figure C-1).

4.2.6 SWMU 24 Subunit 24.4: Canal Water Treatment Sludge Disposal Area

Highly diluted canal water treatment sludge from the Incoming Water Filter Plant has been disposed via pipeline into the northwestern portion of Site L-A, as shown on Figure C-1 in Appendix C. Over the period of 1959 to 1989, approximately 12,000 gallons per day were piped to Site L-A. Starting in 1989, and continuing until 2006, the daily volume was reduced to approximately 4,000 gallons per day. The SWMU 24.4 covers approximately 8.5 acres. The COIs in SWMU 24.4 are metals (arsenic, chromium, lead, and zinc). Based on the evaluation of analytical data, the canal water treatment sludge disposal area did not require remediation because metal concentrations were below RFI screening criteria. The highest detected concentrations of arsenic, chromium, lead, and zinc are shown in Table C-1 of Appendix C.

4.2.7 SWMU 24 Subunit 24.5: Oil Disposal Areas

Waste oils from plant operations were disposed of at four confirmed disposal areas, collectively identified as SWMU 24.5. The four disposal areas (approximately 1.6 acres) were located in the north-central portion of Site L-A, as shown on Figure C-1 in Appendix C. COIs included PCBs, oil and grease, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals. Based on the evaluation of analytical data, oily waste required remediation because arsenic concentrations in all four areas exceeded the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic (160 mg/kg) and PCB concentrations in just one of the disposal areas (24.5-1) exceeded the PCB self-implementing soil cleanup level of 25 mg/kg (Toxic Substances Control Act regulations for PCBs (CFR, Title 40 [40 CFR], Sections 750 and 761 [the MEGA Rule]). The highest reported concentration of arsenic in oily waste was 408 mg/kg. The highest reported concentration of PCBs in oily waste was 88 mg/kg. During remediation activities, approximately 16,490 cubic yards of oily waste and underlying soil from the four areas were excavated (7,400 cubic yards were placed in an on Site CAMU on Site L-B and 9,090 cubic yards were shipped off Site for disposal (7,260 cubic yards as hazardous waste

and 1,830 as non-hazardous waste). Remediation areas were backfilled using on Site slag and soils.

Based on evaluations conducted during the RFI, underlying native soils did not require remediation due to arsenic concentrations. Because oily waste was easily distinguished from underlying native soils, visual confirmation was used to confirm that remediation was complete with respect to arsenic concentrations. To verify that PCB concentrations in the soils remaining after remediation were below the PCB self-implementing soil cleanup level, confirmation sampling as specified in the Mega Rule (grid sample with points 1.5 meters apart) was conducted. A total of 1,242 first round samples (163 composite samples) were collected and another 615 re-excavation area samples (78 composites) were collected from areas where the analytical results were above the cleanup level. Based on the 95% UCI statistical evaluation, the final confirmation sampling results for PCB concentrations in the soils remaining after remediation were below the PCB self-implementing soil cleanup level for high-occupancy areas of 1 mg/kg. The highest PCB concentration after remediation was 6.3 mg/kg. The confirmation samples locations are provided in Appendix C, Figure C-1.

4.2.8 SWMU 24 Subunit 24.6: Bioremediation Area

The Bioremediation Area is located in the northeastern portion of Site L-A, as shown on Figure C-1 in Appendix C. The containment structure was constructed by excavating a shallow basin, using the excavated soil to build a surrounding earthfill berm. The basin was then lined with a polyvinyl chloride membrane and a protective geotextile. A trench was installed along one side of the basin to collect any potential leachate. The Bioremediation Area covers approximately three-quarters of an acre. The COIs include total petroleum hydrocarbons (TPH) as diesel (TPH-d) and TPH as fuel oil No. 6. Based on the evaluation of analytical data, the bioremediation area did not require remediation because TPH-d and TPH as fuel oil No. 6 were not detected in any of the samples analyzed. However an unknown hydrocarbon, atypical of diesel fuel or fuel oil No. 6, was detected in each basin sample at concentrations ranging from 360 mg/kg to 1300 mg/kg. The sample containing the highest concentration of the unknown hydrocarbon (S24.6-SW04) was found nontoxic after analysis by the fish bioassay screen (Appendix C, Figure C-1).

4.2.9 SWMU 24 Subunit 24.7: Subregions

Four subregions within Site L-A but outside of the discrete waste disposal areas (e.g., the dried sludge disposal areas, SWMU 24.1) have been identified and are collectively identified as SWMU 24.7 (refer to Figure C-1 in Appendix C). General plant waste (inert construction debris such as concrete, bricks, lumber, and ferrous and non-ferrous metals) and office waste (paper and miscellaneous trash) have been disposed within these subregions as well as within the discrete waste disposal areas.

During the RFI, samples were collected from 15 test pits excavated at randomly selected locations within this SWMU. To establish random sample locations, each subregion was subdivided into approximately equal areas matching the number of samples desired. Each area was then divided into six subareas. One of the six subareas was then selected for sampling by a toss of a single die. The SWMU boundaries and soil sampling locations are provided in Appendix C. Samples were analyzed for oil and grease, VOCs, SVOCs, and metals. Based on the

evaluation of analytical data, the subregions did not require remediation because detected concentrations did not exceed RFI screening criteria.

4.2.10 SWMU 24 Subunit 24.8: Lead Impacted Area

The Lead Impacted Area (approximately 0.62 acres) was located in the east-central portion of Site L-A, as shown on Figure C-1 in Appendix C. The only COI was lead. Based on the RFI investigation, the source of the lead impact is not known. Based on the evaluation of analytical data, the lead-impacted soil required remediation because the lead concentrations exceeded the site-specific soil cleanup level calculated for the industrial/commercial worker for lead (5,500 mg/kg). Lead concentrations also exceeded the RFI screening criterion (construction worker HBL) for lead (1,200 mg/kg). The highest reported concentration of lead in soil was 25,500 mg/kg. Remediation activities consisted of excavation and stockpiling approximately 8,100 cubic yards of the lead-impacted soil, classification sampling and analysis of excavated soils, remediation confirmation sampling and analysis, backfill, and disposal in the on Site CAMU. The confirmation soil sample locations are provided in Appendix C on Figure C-1. Nine confirmation samples were collected and analyzed for total lead. The results of the confirmation sampling and analysis ranged from 21 mg/kg to 14,000 mg/kg with eight of the sample results for lead below 940 mg/kg. The total lead results were statistically analyzed in accordance with USEPA SW846 for the 95 % UCI and the concentrations were found to be below the site-specific soil cleanup level (5,500 mg/kg) for lead.

4.3 SITE L-A LAND USE RESTRICTIONS

On May 26, 2004, UPI submitted to DTSC a Corrective Action Measures Completion Report, documenting the completion of the excavation and hauling described above. On March 3, 2005, DTSC approved the Corrective Action Measures Completion Report, and stated that DTSC "finds the Report acceptable and acknowledges that USS-POSCO has successfully completed implementation of the approved remedy."

Site L-A cleanup may not have removed all the waste and contamination. DTSC and UPI agreed to a LUC to Restrict Use of Property to protect present or future human health or safety or the environment as a result of the presence on Site L-A of hazardous materials as defined in Health and Safety Code section 25260. The LUC sets forth Environmental Restrictions, that apply to and encumber Site L-A and every portion thereof no matter how it is improved, held, used, occupied, leased, sold, hypothecated, encumbered, or conveyed. The LUC: (a) runs with the land pursuant to Health and Safety Code section 25202.5 and Civil Code section 1471; (b) inures to the benefit of and passes with each and every portion of the property, (c) is for the benefit of, and is enforceable by DTSC, and (d) is imposed upon the entire property unless expressly stated as applicable only to a specific portion thereof.

Site L-A Environmental Restrictions are as follows:

- Site L-A is not be used for any of the following purposes:
  - A residence, including any mobile home or factory built housing, constructed or installed for use as residential human habitation.
  - A hospital for humans.
  - A public or private school for persons under 21 years of age.
  - A day care center for children.
  - Raising of food (cattle, food crops).
- No activities involving earthwork, including disturbing or moving soil (e.g., grading, excavation, removal, trenching, filling, earth movement, or mining) will be allowed on Site without a HSP and a SMP.

Failure of the Owner or Occupant to comply with the LUC will be grounds for DTSC to require modification or removal of any improvements constructed or placed upon any portion of Site L-A in violation of the LUC. Violation of the LUC, including but not limited to, failure to submit, or the submission of any false statement, record or report to DTSC, will be grounds for the DTSC to pursue administrative, civil or criminal actions, as provided by law.

CSE will comply with the deed restrictions detailed above. The construction and operation of the solar facility complies with the Site use restrictions. This project specific SMP and the accompanying HSP address the Project earthmoving specific SMP and HSP requirement, once approved by DTSC.

4.4 SITE-SPECIFIC SOIL CLEANUP LEVELS USED FOR THE SITE REMEDIATION

As stated in the URS 2009 SMP, a site-specific health risk assessment for soils was completed for the UPI Plant and the results were documented in a report entitled *Final Derivation of Site-Specific Soil Cleanup Levels*. In a letter dated June 17, 1999, DTSC approved the site-specific soil cleanup levels for the COIs: arsenic (160 parts per million [ppm]), benzene (9.1 ppm), lead (5,500 ppm), nickel (6,000 ppm), and potentially cPAHs (6.3 ppm) (Appendix E).

In a letter dated May 31, 2000, USEPA and DTSC were informed that UPI would proceed with the corrective action process using the PCBs self-implementing soil cleanup levels (1 mg/kg) allowed by the MEGA Rule [40 CFR, Part 761.61(a)].

The site-specific soil cleanup levels are not protective of industrial/commercial worker exposures. McCarthy and URS workers may encounter hazardous waste and contaminated media during excavations associated with the Project. At the recommendation of DTSC, cleanup levels for a construction worker scenario were not used. Instead, DTSC recommended that institutional controls (i.e., deed restrictions) stipulate that HSP be prepared prior to any future grading or excavation at SWMUs with COI concentrations exceeding RFI construction worker screening criteria. Exposures to construction workers will then be controlled through the use of personal protective equipment (PPE) and other control measures (e.g., the use of wetting agents) as specified in the HSP. The USEPA PCB self-implementing soil cleanup levels are protective of human health and the environment.

In the unlikely event that other contaminants, besides the six primary COIs (i.e., arsenic, benzene, lead, nickel, cPAHs, and PCBs) are measured in soil during grading, trenching, and excavating activities associated with the redevelopment of Site L-A, HBLs provided in Appendix E may be used as a screening tool to determine if these additional contaminants may warrant further evaluation. These HBLs are revisions to the ones used in the RFI. The RFI HBLs that are based on the cancer endpoint were revised during the site-specific health risk assessment to reflect a target increased cancer risk level of one in one hundred thousand, which was a revision that had been made while deriving the site-specific soil cleanup levels. Appendix E also contains an excerpt from the *Final Derivation of Site-Specific Soil Cleanup Levels* report that documents the procedure for calculating concentrations of cPAHs.

5.1 Environmental Contamination Organization and Responsibilities

5.1.1 Organization

The organization of the Environmental Contamination (EC) team is depicted in the Project Organization Chart attached in Appendix B. The organizational chart shows areas of responsibility and lines of communication between DTSC, UPI, CSE, McCarthy, URS, and SCA. It also shows the various sub-contractors to the extent they are known at the time this plan was developed. McCarthy will develop and maintain a Project contact list.

Contacts:

1. Property Owner: UPI, 900 Loveridge Road, P.O. Box 471, Pittsburg, CA 94565, General Telephone number: 925-439-6728, Fax: 925-439-6706, Contact Freddy Ripoli (925) 303-5071, FAX (925) 439-6706
2. Developer: CSE, 1350 Bayshore Highway, Suite 825, Burlingame, CA 94010, General Telephone Number: 650-288-3722, Fax: 650-288-3719, Clay Minchen Contact 650-288-3722, ext. 303.
3. Construction Contractor: McCarthy, 2241 Douglas Blvd. Suite 200, Roseville, CA 95661, General Telephone Number: 916-786-3833, Fax: 916-783-3234 Kevin Black Contact 916-949-3783.
4. Environmental Compliance Monitoring Contractor: URS, 1333 Broadway, Suite 800, Oakland, CA 94612, Contact: Joe Morgan, Office: 510-874-3201, Fax: 510-874-3268, Cell: 510-381-4130.
5. Hazardous Waste Contractor - Top Grade Construction, 50 Contractors Street, Livermore, CA 94551, Contact TBD, Main Office 925-449-5764
6. Transportation Contractor: Clean Harbors, 4101 Industrial Way, Benicia, CA 94510, Contact TBD, Main Office 707-747-6699

5.1.2 Responsibilities

Site Owner/ Developer

The Site Owner is UPI. The solar facility developer is CSE. CSE has the overall responsibility for implementing and overseeing the construction and excavation activities, soil stockpile management, health and safety programs, and in compliance with the LUC and deed restriction. All engineering or geologic work will be performed or supervised by a California Professional Geologist or Engineer in accordance with the Business and Professions Code, Chapters 7 and 12.5, and the California Code of Regulations, Title 16, Chapters 5 and 29.

CSE retained McCarthy to be the Engineering and Procurement Contractor (EPC) including the Project grading and trenching and the restoration. CSE or its authorized representative McCarthy will obtain permits and property access agreements required for the CSE Site redevelopment.

CSE retained URS to be the environmental compliance monitoring contractor for health and safety and soil management oversight to take appropriate actions to protect workers or the environment if conditions warrant.

UPI/CSE required that the McCarthy HSP prepared for the Project earthwork address the potentially impacted soils/materials that could be encountered during construction. UPI/CSE will assure that all plans, equipment used, procedures followed and activities undertaken meet the minimum requirements of Section 5192 of Tittle 8 of the California Code of Regulations (8 CCR 5192), Section 1910.20 of Tittle 29 of the Code of Federal Regulations (29 CFR 1910.20) and DTSC's June 2011 DTSC HASP Guidance. The HSP are as stringent as or more stringent than the *Health and Safety Plan for Site L-A Grading and Trenching* (URS 2009). UPI will submit the SMP and HSP as the landowner to DTSC for review and approval.

UPI will be responsible for the sampling, analysis, characterization, profiling, and managing excavated visually impacted soil and hazardous waste soils.

Construction Contractor

CSE selected McCarthy to design, obtain permits, and construct the project, including retaining the hazardous waste contractor for the Project earthmoving. McCarthy will oversee the construction and excavation activities, soil stockpile management, and McCarthy's health and safety programs (Appendix B). McCarthy developed and will implement a safety program and HSP in accordance with California Occupational Safety and Health Administration (Cal-OSHA) regulations. The safety program will include an Injury and Illness Prevention Program, a Code of Safe Practices, and a Safety Program Manual. McCarthy will ensure that construction personnel follow proper health and safety procedures and will provide a qualified foreman for each construction crew to serve as a point of contact for the construction. McCarthy developed and will implement the Site Storm Water Pollution Prevention Plan (SWPPP). McCarthy is in the process of entering into a contract with their various sub-contractors. The selected contractors will have the appropriate certified licenses to conduct their work. The grading contractor will have a current hazardous-waste contractor's certificate.

McCarthy will train all CSE Project field personnel to identify hazardous soils and will instruct on proper communication and compliance. All Project employees engaged in subsurface work will report potential sightings of visual impacted contamination to URS or the Site superintendent as soon as it is operationally safe to do so.

EC Contractor and Monitoring

CSE selected URS to be the environmental compliance (EC) and monitoring contractor to develop this SMP. URS will monitor the implementation and oversight of the construction and excavation activities, and soil stockpile management in accordance with environmental compliance, and URS's health and safety program. URS will assign properly qualified and 40-hour HAZWOPER trained personnel to act as EC monitoring staff to monitor this SMP. EC monitors will work under the supervision of URS' Professional Engineers or Professional Geologists. URS will have a Health and Safety Officer (HSO), who will monitor compliance with procedures, and will approve any modifications required due to changing Site conditions. The HSO will assist the EC monitors in complying with the HSP.

URS' EC monitors will be located on Site and will monitor construction at all times during grading, trenching, and excavating activities for visual evidence of potentially impacted soils/materials (materials/soils that are red/rust or grayish-black to black, or black [with oil] in color). If potentially impacted soils/materials are observed, the EC monitors will document McCarthy to stockpile this material on plastic sheeting on the northeast corner of Site L-A in accordance with this SMP. The URS EC monitors will stop construction and excavation activities should monitoring indicate non-compliance with this SMP. If URS EC monitor(s) observes visibly impacted materials/soils, the construction work in the immediate area of the observed potentially impacted materials/soils will be stopped by the Construction Superintendent until the URS EC monitor(s) confirms that workers and the public are not at risk. This will entail confirming that the dust monitor readings are below the Site action levels and reorganizing the work in that area, i.e., to arrange for truck(s) to be loaded with the soil.

URS' EC monitors will also observe the use of the non-visibly contaminated soil as fill during the cut and fill earthwork portion of the Project.

McCarthy will conduct the first three days of earthwork in Level C personal protective equipment to allow collection of monitoring data to demonstrate that the dust control procedures are working and the Site workers are protected (McCarthy 2014). SCA Environmental, Incorporated (SCA), sub-contracted to URS, will conduct worker and Site perimeter air monitoring. SCA will send Worker and Site perimeter air monitoring cassettes to the analytical laboratory daily for expedited analysis (Section 7.1.3). McCarthy's HSP details the Site action levels and procedures (McCarthy 2014).

6.1 PROJECT CONSTRUCTION

6.1.1 Schedule and Landowner Notification

A final construction schedule will be prepared prior to the start of construction activities. McCarthy's preliminary Project schedule is attached to the SMP as Appendix G. UPI notified DTSC 30 days in advance of the Project start. CSE will notify property owners and tenants adjacent to the Project redevelopment area in advance by CSE of construction through the City of Pittsburg. In high traffic areas, construction will generally take place in off-peak periods, if necessary to minimize impacts to traffic and industrial or commercial business activities. Temporary alternative vehicle and pedestrian access will also be established as necessary.

6.1.2 Equipment and Material

McCarthy will transport the following materials to the Site over surface streets by truck (but not be limited to): solar panel racks, solar panels, electrical cable, inverters, cement, aggregate, gravel, sand, and cement slurry (from local mix plants) for drilled pier foundations; signs and fencing; fuel and lubrication for equipment; and drinking water. McCarthy will obtain water for dust control from UPI in the Project Area.

McCarthy's short-term waste generation from construction operations will be collected and hauled to local refuse facilities for recycling or disposal. This includes debris, concrete, and steel found during the project grading. McCarthy will provide trash containers for daily refuse from construction workers. McCarthy's other construction wastes will include potentially impacted materials/soils from grading, trenching and excavating activities, some of which may require off Site disposal in accordance with federal and state laws and regulations. McCarthy will provide and maintain portable chemical toilets for the Project crews.

6.1.3 General Grading/Excavation

This SMP is consistent with the USEPA guidance documents pertaining to moving hazardous soil within an area of contamination. According to the USEPA guidance documents, moving hazardous soil within an area of contamination does not constitute treatment, storage or disposal of a hazardous waste under RCRA or the California HWCL. Refer to Appendix A for a summary of the USEPA guidance documents on this issue.

McCarthy will contact Underground Service Alert, which will notify service providers of intended subsurface construction to avoid conflict with existing utilities and disruptions of service to utility customers. In addition, McCarthy will pothole and visually confirm the location(s) of all active underground utilities if construction within the 5 feet of the utilities is necessary. Site L-A groundwater monitoring wells have been destroyed. A qualified URS EC monitor, under the supervision of an URS employed Professional Engineer or Professional Geologist, will be on Site to monitor during all excavation, trenching, grading and soil management activities to document that the work complies with this SMP. If non-compliance to the SMP is observed, EC Monitors will alert McCarthy and halt site work.

The topography in the Project area is relatively flat and extensive grading is not anticipated, however, excavations averaging 5 to 6 feet deep, with one localized location at a maximum

depth of 10.6 feet deep for the infiltration basins on the northern part of the Site property are anticipated as part of Site development activities. The maximum depth of the substation foundations is 14 feet bgs.

All excavations, with the exception of utility corridor trenches and drilled pier foundations which will be backfilled with off Site clean soil (refer to Section 2), can be backfilled with visibly clean excavation spoils including potentially impacted materials/soils if sampled and analyzed as part of the excavation confirmation sampling and found to be below the Site L-A DTSC-approved Site-specific cleanup levels (Appendix E). If not backfilled with clean fill, drilled pier foundations will utilize Sonotube, CMP, or other protective measures to keep the drilled locations from caving in.

McCarthy will use water trucks to control fugitive dust emissions at the construction Site during earth-moving operations and in order to control dust as noted in the Dust Suppression Plan. In order to minimize the impact of mud tracks and the transport of potentially contaminated soil/materials onto city streets and into surface water, heavy equipment that has contacted Site soils will be decontaminated by brushing or washing excess soil from excavating and wheel/track portions of the equipment, prior to leaving the Site. Potentially impacted materials/soils removed from equipment and work areas will be added to the stockpile of potentially impacted materials/soils, and wash water will be managed per the requirements of McCarthy prepared SWPPP.

McCarthy will place trench backfill as described in the construction plans and specifications. All trenches will be delineated by caution tape and/or fencing. In some instances, McCarthy will use steel plates (or other appropriate means), as necessary, to cover any open trench left at the end of each workday.

The restoration process will entail removal of debris, construction signs, surplus material, and equipment, following construction completion.

6.1.4 General Requirements for Development

All utility corridor trenches, when newly created, will be backfilled with clean fill from the existing Site stockpile or from off Site sources. URS will sample and analyze visibly contaminated soils before reuse/off Site disposal as described in detail in Section 7.1.4. Acceptance criteria for clean off Site fill are discussed in Section 6.1.4.2 and Appendix A-5. McCarthy will survey the utility corridors and any clean filled drilled pier foundations in order to be identified in the LUC. Alternatively, McCarthy may construct the drilled piers when excavated and not fill them with clean fill. If the drilled piers are not backfilled with clean fill then they will not be surveyed and included in the LUC. McCarthy will excavate and construct the substation foundations, and not fill them with clean fill and re-excavate. The substation foundation locations will not be surveyed and included in the LUC.

The exclusion zone will be fenced to restrict access by unauthorized personnel. No soils removed from the Site will be disposed at, or transported for reuse to, off Site properties zoned for agricultural or residential use.

6.1.4.1 Sources of On Site Clean Soil

A large portion of Site L-A was already covered with clean fill from off Site sources. In addition, there are areas (SWMU 24.7) of Site L-A that have been unaffected by past disposal activities, and therefore, are an additional source of potential on Site clean fill. SWMU 24.7 is shown on Figure C-1 in Appendix C. UPI has also stockpiled approximately (135,000 cubic yards) of clean soil from the nearby Highway 4 expansion to be used as fill on the Site.

6.1.4.2 Clean Soil Acceptance Criteria

Environmental Screen Levels (ESLs) established by the Regional Water Quality Control Board - San Francisco Bay Region (RWQCB 2013) will be used as the criteria for acceptance of additional clean fill, i.e., base rock for the substation foundation, staging area, and roadways, if needed, from off Site sources except for arsenic for which one half the RWQCB-approved background value of 24 mg/kg will be used. The ESLs used will be from Table A-2, Shallow Soil Screening Levels (<3 m below ground surface) for Commercial/Industrial Land Use, in which groundwater is a current or potential drinking water resource. Sampling frequency and analytical requirements for on Site and off Site fill sources will follow the DTSC *Information Advisory Clean Imported Fill Materials*, dated October 2001. This advisory is attached as Appendix A-5 to this SMP. This document addresses imported fill (other than virgin quarry material) for sensitive properties relative to human health concerns; ecological issues are not specifically addressed. The analytical results of the off Site fill will be provided to McCarthy by the vendor prior to delivery of the material to Site L-A. Imported base rock for roadways and the staging area will remain on Site after the Project construction.

6.1.5 Transportation Plan

URS will oversee the hazardous waste transportation subcontractor for the removal, transportation, and disposal activities of Site stockpiles in accordance with all applicable federal, state, and local laws, regulations, and ordinances. McCarthy will manage traffic impacts as required by the City of Pittsburg and/or Caltrans.

URS will generate a detailed Transportation Plan (TP) for the disposal of hazardous material, and will be in accordance with DTSC's *Transportation Plan, Preparation Guidance for Site Remediation* (DTSC and CalEPA 1994) and the Department of Transportation's *Hazardous Materials Transportation Guide*. URS will develop the TP for this work after project construction plans and specifications are completed.

6.2 SAFETY PROCEDURES

McCarthy's HSP is as strict as or stricter than the February 2009 Health and Safety Plan for Site L-A Grading and Trenching (URS 2009) and is project-specific for the Project. McCarthy's HSP provides additional safety procedures that must be implemented when contaminated soils are encountered.

Safety procedures for construction are the responsibility of McCarthy and apply to construction crews in all areas. All Project personnel will follow the DTSC approved McCarthy 2014 HSP,

and will comply with federal OSHA and Cal-OSHA requirements, including 29 CFR Part 1926 (Safety and Health for Construction) and Title 8 CCR, Industrial Relations.

Potential safety issues in the excavation, sampling, loading, and transportation of potentially impacted materials/soils include the following:

- Traffic (roadway)
- Excavation and trenching
- Noise
- Heavy equipment
- Dust
- Fall hazards
- Chemical exposures to potential contaminants
- Heat stress
- Fire and explosion
- Oxygen deficiency
- Electrical hazards
- Overhead and underground utilities

McCarthy's HSP specifies the minimum clothing requirement for all Project field personnel. Level C PPE is required during soil disturbance activities when action levels of the PID or personal air monitoring are exceeded (McCarthy 2014). Level D PPE is required during soil disturbance activities when Health and Safety dust monitoring action levels are not exceeded. McCarthy's HSP discusses these issues and the transitions from Level D to Level C and back to Level D in more detail.

This section contains an update of the DTSC-approved 2009 SMP for procedures for sampling, analysis, and evaluation of all visibly and potentially impacted materials/soils, whether reused on Site or sent off Site for disposal.

7.1 MONITORING FOR POTENTIALLY IMPACTED MATERIALS/SOILS

URS will monitor for potentially impacted materials/soils during grading, trenching, and excavating construction activities to reduce or eliminate the impact of exposure to workers and/or the public to such materials/soils.

Monitoring for potentially impacted materials/soils will follow the procedures described below. URS will record the results of the monitoring in field notebooks, and daily logs will be prepared to summarize findings. URS will submit these findings to DTSC in a report at the conclusion of the earthmoving portion of the Project. URS will submit the findings to DTSC more frequently in summary tabular format, if requested by DTSC.

7.1.1 Monitoring Personnel

URS EC monitor(s) will monitor for the presence of potentially impacted materials/soils during grading, trenching, and excavating construction activities. The EC monitors will be qualified professionals familiar with the indications and characteristics of contaminated soil, and will be under the supervision of an URS Professional Engineer or Professional Geologist. The URS monitor(s) will be on Site during all excavation, trenching, grading and soil management activities. The EC monitors will notify the McCarthy Construction Superintendent, who will then notify UPI/CSE/McCarthy Project Managers if and when potentially impacted materials/soils are observed. The EC monitors will maintain field notebooks, prepare daily summary logs, and take photographs on an as-needed basis.

7.1.2 Visual Monitoring

McCarthy/URS will train all Project personnel in the identification of impacted soil and proper communication. Also, URS EC monitor(s) will conduct continuous visual monitoring during all grading, excavation and trenching activities. All Project personnel will conduct visual monitoring of the earthwork and the following procedures to ensure proper oversight:

- Visual observation will identify soil that has staining or discoloration. For purposes of the Project, URS, on behalf of UPI, will manage all observed materials/soils that are red/rust or grayish-black to black, or black (with oil) in color in accordance with this SMP as potentially impacted soil/material.
- URS will record the monitoring observations and locations of visually potentially impacted materials/soils in a field notebook.
- If URS EC monitor(s) observes visibly contaminated materials/soils, the construction work in the immediate area of the materials/soils will be stopped by the Construction Superintendent until the URS EC monitor(s) confirms that workers and the public are not at risk. This will entail confirming that the dust monitor readings are below the Site action levels and reorganizing the work in that area, i.e., to arrange for truck(s) to be loaded with the soil.

- Work will resume excavating and loading the visually impacted soils plus one foot of additional soil into trucks to move the soil to the northeast corner of Site L-A for URS on UPI's behalf to manage.

7.1.3 Air Monitoring

URS has retained SCA to conduct the Site air monitoring during the Project's earthmoving activities. In addition to the continuous monitoring for visual evidence of potentially impacted materials/soils, SCA will conduct air monitoring to identify and quantify levels of hazardous substances and health hazards to determine the appropriate level of employee protection required for construction personnel within the contaminated zone.

SCA will perform air monitoring activities to meet the following Site specific requirements:

- Current Bay Area Air Quality Management District (BAAQMD) standards and requirements, including perimeter monitoring.
- Air monitoring will identify ambient air vapor and dust levels that may require an increase in the level of PPE. URS will use a photoionization detector (PID) for monitoring VOCs to document potential worker and off Site exposure.
- SCA will perform dust monitoring using a field- screening instrument such as an active dust/particle sampler (e.g., personal DataRam™) to monitor total dust in real time in down-wind air within the breathing zone of field personnel.

Action levels for worker protection are presented in the table below. SCA will record the results of the air and dust monitoring in field notebooks. SCA will record any unusual conditions in daily summary logs. The action levels shown in the table below are the Permissible Exposure Limits (PELs) for nickel, total airborne dust/total suspended particles (TSP), total respirable dust/particulate matter less than 10 microns (PM_{10}), cPAH, and PCB. The action level for arsenic and benzene is 50 percent of the PEL, and for lead the action level is 60 percent of the PEL. The PELs developed by Cal-OSHA are legally enforceable throughout California, and present a conservative level of worker protection.

COI Action Levels for Air Monitoring

Compound	OHSA/Cal-OSHA Action Level
Arsenic	0.005 mg/m^3
Benzene	0.5 ppm
Lead (Scale)	0.03 mg/m^3
Nickel	1.0 mg/m^3
TSP/Total Airborne Dust *	10 mg/m^3
Total Respirable Dust (PM_{10})*	5 mg/m^3

COI Action Levels for Air Monitoring

Compound	OHSA/Cal-OSHA Action Level
cPAH (as coal tar product)	0.2 mg/m^3
PCB (as chlorodiphenyl 54% chlorine)	0.5 mg/m^3

Notes:
mg/m^3 milligrams per cubic meter
ppm parts per million
* TSP/Total Airborne Dust Action Level and Total Respirable Dust are based on the "nuisance dust" standard when no other regulated contaminants are present.

- URS will monitor levels of potential contaminants in the breathing zone at least once every hour and during trench/excavation entry with a photoionization detector (PID) in areas where visibly contaminated materials/soils are encountered.
- PPE will be upgraded to Level C when air monitoring results exceed actions levels. Increased dust control measures will be implemented at the work zone boundaries (McCarthy 2014).
- A combustible gas/oxygen indicator with readout in percent lower explosive limit and percent oxygen would be used to monitor for combustible gases in the trench/excavation.
- Ventilation equipment (i.e., fans) will be available on Site for use as necessary during trenching, and dust will be controlled using water when needed. The HSP identifies safety equipment required for general construction activities (e.g., hard hats, safety glasses, and work boots) and other PPE.

7.1.4 Sampling and Laboratory Analysis

Soils with no visual evidence of contamination will be stockpiled separately from potentially impacted materials/soils and can be reused for Site grading anywhere within Site L-A, with the exception of the utility corridors.

The following table summarizes the required analyses based on visual evidence of contamination to be used for stockpile sampling and confirmation sampling.

Table A
Sampling and Analysis Plan

Soil Characteristics	Color	Necessary Analyses
Not Impacted	N/A	None
Dried Sludge Deposits	Red/rust	Arsenic, lead, and nickel by USEPA 6010B to be conducted by URS
Lead Scale Deposits	Grayish-black to black	Lead by USEPA 6010B to be conducted by URS

Table A Sampling and Analysis Plan		
Soil Characteristics	**Color**	**Necessary Analyses**
Oil Waste Deposits and Oily Material	Black, with oil	Arsenic & lead by USEPA 6010B, PCBs by USEPA 3500B//8082, TPH-g by EPA Method 8260B, TPH-d & mo by EPA Method 8015M, cPAH by EPA Method 8270C conducted by URS.

Visibly Contaminated Soil

The different types of visually impacted materials/soils (i.e., dried sludge deposits [red/rust in color], lead scale deposits [grayish-black to black in color], and oily waste deposits [black, with oil] in color) will be stockpiled separately based on color from each other in the Northeast Corner of Site L-A for URS on UPI's behalf to manage, sample, analyze and properly dispose.

Dried Sludge Deposits (red/rust in color) and Lead Scale Deposits (grayish-black to black in color)

McCarthy will use the following procedures to properly handle the dried sludge and lead scale deposits that are found or identified at the Site:

- Visible dried sludge deposits (red/rust in color) and lead scale deposits (grayish-black to black in color) will be stockpiled separately from each other on the Northeast Corner of Site L-A for management by URS on UPI's behalf (Figure 2). URS, on behalf of UPI, will sample visibly contaminated stockpile soil approximately every 100 cubic yards for reuse or disposal characterization.
- McCarthy will stockpile dried sludge deposits and lead scale deposits to a height of approximately six feet. To select the sampling locations, URS will divide the surface area of the stockpiles in sectors corresponding to the number of samples that need to be collected.
- URS will divide each sector into six subsectors. One subsector from each sector will then be randomly selected by a toss of a single die (or any other equivalent method for selecting random samples). URS will randomly select the depth of the sample by a toss of a single die.
- URS will obtain samples from dried sludge deposits and lead scale deposit stockpiles from the desired depth using a manual hand-auger or the excavation bucket. Samples will be collected from the desired depths in each boring or from the excavation bucket by driving an aluminum tube-lined drive sampler (or equivalent sampling device), or by placing representative samples into a wide-mouth sample container using a hand trowel. URS will collect a duplicate stockpile soil samples for every 10 stockpile samples.

URS will label soil samples, place them into an insulated cooler with ice, and deliver the samples to a State of California certified analytical laboratory under chain-of-custody procedures. URS will retain Curtis & Tompkins Laboratories, Ltd of Berkeley, California, for stockpile sampling

analyses. URS will note the locations and identification of soil samples submitted for laboratory analysis in field notebooks and daily summary logs.

UPI may choose to have URS assess the soil data using statistical methods. Statistical evaluation of the analytical results will use the most current USEPA guidance. URS will follow the USEPA December 2002 guidance, *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites* for statistical evaluation of analytical results; unless a more current guidance is issued.

- If the 95% UCI evaluation for visibly contaminated soil stockpile samples results are below the site-specific cleanup level of 160 mg/kg for arsenic and 5,500 mg/kg for lead, then the stockpiled soils can be relocated anywhere within Site L-A, with the exception of designated clean utility corridors. Soil stockpiles with a 95% UCI lead concentration between 1,200 mg/kg and 5,500 mg/kg can be reused on Site for fill if covered with two feet of clean fill, surveyed and entered into the LUC. If soils are reused on Site based on the 95%UCI evaluation, the soil stockpile will be mixed thoroughly prior to reuse, and must be reused in the same location. Alternatively soil with lead concentrations above 1,200 mg/kg can be disposed of off Site as a hazardous waste.
- If the visibly contaminated soil stockpile samples 95% UCI evaluation results are above the Site-specific cleanup levels of 160 mg/kg for arsenic, and/or 5,500 mg/kg for lead, then the stockpiled soils will be transported according to DOT regulations and disposed of off Site at a properly permitted facility. Additional sampling of the stockpile is also acceptable to reduce the volume of soil/materials sent off Site for disposal.

Confirmation Samples

Confirmation sampling is only required if visually impacted materials/soils are present after planned excavations are completed. URS will collect confirmation soil samples, if required, at a frequency of one sample per 1,000 square feet, and analyzed as outlined in Table A.

If analytical results exceed Site Cleanup Levels, McCarthy will remove additional soil from the excavation, and URS will collect additional confirmation soil samples (as described above) from the sector(s) from which additional soil was removed. URS will evaluate for further remediation based upon the analytical results. McCarthy will repeat this process until analytical results are below the Site-specific cleanup levels.

Oily Waste Deposits (black, with oil and PCBs may or may not be present) and Oily Material Impacted Soil (URS will manage this work on UPI's behalf)

Oily waste deposits (black, with oil and PCBs may or may not be present) and oily material impacted soil will be stockpiled separately from each other for sampling and management by URS on UPI's behalf. McCarthy will stockpile visibly contaminated soil on the Northeast Corner of Site L-A. URS will collect a soil samples by URS for approximately every 100 cubic yards of visibly contaminated materials/soils stockpiled for reuse or disposal characterization in accordance with the following standards, methods and procedures:.

- McCarthy will stockpile oily waste deposits and oily material impacted soil to a height of approximately six feet. URS will divide the surface area of the stockpile in sectors corresponding to the number of samples to be collected.

- URS will divide each sector into six subsectors. URS will then randomly select one subsector from each sector by a toss of a single die (or any other equivalent method for selecting random samples). URS will then randomly select the depth of the sample by a toss of a single die.
- URS will collect soil stockpile samples with the assistance of mechanical equipment such as from a backhoe bucket by driving a stainless steel or brass tube into the soil within the bucket until the tube is completely filled with soil and no headspace remains. URS will seal both ends of the tube with Teflon sheets and polyethylene end caps.
- URS will label the soil samples, place them into an insulated cooler with ice, and deliver the samples to a State of California certified analytical laboratory under URS chain-of-custody procedures. URS will note the locations and identification of soil samples submitted for laboratory analysis in field notebooks and daily summary logs. URS will collect a duplicate soil sample for every 10 field samples.

UPI may choose to have URS assess the soil stockpile data using statistical methods if there are sufficient soil stockpile volume/stockpile samples for the evaluation. The statistical evaluation of the analytical results will use the most current USEPA guidance. URS will follow the USEPA December 2002 guidance, *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites* for statistical evaluation of analytical results; unless a more current guidance is issued.

- If the 95% UCI evaluation of visibly contaminated soil stockpile samples results are below the site-specific cleanup level of 160 mg/kg for arsenic, 5,500 lead, and below the PCB self-implementing soil cleanup level (1 mg/kg), then the stockpiled soils can be relocated anywhere within Site L-A, with the exception of designated clean utility corridors. Soils with lead concentration between 1,200 mg/kg and 5,500 mg/kg can be reused on Site for fill if covered with two feet of clean fill, surveyed and entered into the LUC. If soils are reused on Site based on the 95%UCI evaluation, the soil stockpile will be mixed thoroughly prior to reuse, and must be reused in the same location. Alternatively soil with lead concentrations above 1,200 mg/kg can be disposed of off Site as a hazardous waste.
- If the visibly contaminated soil stockpile samples 95% UCI evaluation results are above the Site-specific cleanup levels of 160 mg/kg for arsenic, 5,500 mg/kg for lead, and/or above the PCB self-implementing soil cleanup level of 1 mg/kg, then the stockpiled soils will be transported according to DOT regulations and disposed of off Site at a properly permitted facility. Additional sampling of the stockpile is also acceptable to reduce the volume of soil/materials sent off Site for disposal.

Confirmation Samples

URS will only conduct confirmation analysis of the excavation base and sidewalls samples for PCBs if PCBs are present in the visibly contaminated stockpiled soil above 1.0 mg/kg based on URS's stockpile sampling and analysis results. In this case only, URS will conduct confirmation sampling analyses for PCBs as specified in 40 CFR Section 761.280 using a prescriptive grid system to be based on the following sampling guidelines and standards.

- Sampling points 1.5 meters apart in the north-south and east-west directions.

- URS will collect confirmation soil samples for arsenic and lead, if required, at a frequency of one sample per 1,000 square feet.

URS will evaluate the need for further contaminated soil excavation based upon the following analytical results:

- If the analytical results are below the Site-specific cleanup level of 160 mg/kg for arsenic , 1,200 mg/kg for lead, and below the PCB self-implementing soil cleanup level of 1 mg/kg, then no further remediation will be warranted.
- If the analytical results are above the Site-specific cleanup levels of 160 mg/kg for arsenic, 1,200 mg/kg for lead, or the PCB self-implementing soil cleanup level of 1 mg/kg, then at a minimum, an additional foot of soil will be excavated from the sampling sector(s) which exceeded the Site-specific cleanup levels.

After additional soil removal, URS will collect additional confirmation soil samples (as described above) from the sector(s) from which additional soil was removed. URS will evaluate further remediation based upon the analytical results if the analytical results are above the Site-specific cleanup levels. URS will repeat this process until analytical results are below the Site-specific cleanup levels.

The following table summarizes the USEPA methods, required volumes, holding times for the Project samples and preservatives.

Sample Volume Requirements and Holding Time

Compound	Prep Method/Analytical Method	Minimum Volume (g)	Holding Time (days)	Preservative
Arsenic, Lead Nickel,	EPA 6010B	2	180	None
Benzene	EPA 8260B	5	14	None
cPAHs	EPA 8270-SIM	30	14/40[1]	None
TPH-Diesel	EPA 8015M	50	14/40[1]	None
TPH-Gasoline	EPA 8260B	5	14/40[1]	None
PCBs	EPA 8082	30	14/40[1]	None

[1] 14/40: 14 days from sample collection to extraction, then 40 days from extraction to analysis.

7.1.5 Recordkeeping and Reporting

The URS EC monitor(s) will maintain records of monitoring and sampling activities conducted during grading, trenching, and excavating construction activities. URS will tabulate monitoring results and analytical data by location. URS will provide weekly written reports during construction activities that document findings of field monitoring and laboratory analyses to all required agencies, including DTSC. McCarthy will survey the relocation areas, if visibly contaminated materials/soils are relocated within Site L-A. McCarthy will also survey the locations of the trenches and drilled pier locations that are excavated and filled with clean fill by a professional surveyor so that the future trenching and drilled pier work can be conducted in clean fill. UPI will enter the survey data into the LUC.

7.2 POTENTIALLY IMPACTED MATERIALS/SOILS MANAGEMENT

UPI/CSE will follow the BAAQMD procedures for dust control mitigation measures for soil stockpile management as outlined in Appendix F. In addition to the soil stockpile measures in Appendix F (URS 2014), the UPI/CSE will implement the following practices for potentially impacted materials/soils:

- McCarthy will take appropriate health and safety precautions to protect employees and the public to prevent or minimize any exposures to potentially hazardous substances (McCarthy 2014).
- Potentially impacted materials/soils will be stockpiled in the north east corner of Site L-A, outside the Project area on plastic sheeting surrounded by a small soil berm, separate from the non-potentially impacted materials/soils which will be stockpiled within the Project area, and covered with plastic sheeting or keep stockpiles adequately wet (minimum: water three times daily) or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.). McCarthy will stockpile the different colored impacted materials/soils separately from each other.
- McCarthy will maintain the perimeter fencing around the exclusion zone, individual excavations, and around areas containing stockpiled material/soils. McCarthy may use temporary fencing to supplement the existing Site L-A perimeter fencing, if needed.
- Potentially impacted materials/soils may be relocated anywhere within Site L-A if analytical results are below the DTSC-approved Site-specific cleanup levels for lead (1,200 mg/kg) and arsenic (160 mg/kg) and/or self-implementing soil cleanup levels for PCBs (1 mg/kg).
- URS, on behalf of UPI, will oversee the disposal of impacted materials/soils with analytical results above the DTSC-approved Site-specific cleanup levels for lead and arsenic and/or self-implementing soil cleanup levels for PCBs of off Site to a properly licensed landfill.

URS will oversee the transportation subcontractor for the removal, transportation, and disposal activities in accordance with all applicable federal, state, and local laws, regulations, and ordinances. As discussed in Section 6.1.5, URS will provide a detailed TP for this work after Project construction plans and specifications have been completed. URS will provide a TP for the transportation and disposal of hazardous waste from the Site.

In general, URS will implement the following procedures for impacted materials/soils requiring off Site disposal:

- URS will classify stockpiled soils/materials to be disposed of off Site (minimum one sample per 100 cubic yards).
- URS will detail in the TP the source, approximate quantity, nature of contamination, and associated hazards of the waste materials. Information regarding the characterization methods will also be included in the TP. If materials/soils are classified as hazardous waste, the materials/soils will be manifested and sent to a regulated hazardous waste facility for proper treatment (if needed) and disposal. URS will coordinate the profiling and characterization of these soils with CleanHarbors Buttonwillow landfill.
- URS will oversee the covering of materials/soils loaded into trucks or trailers for off Site disposal to minimize fugitive dust emissions to the atmosphere.

- Materials/soils intended for off Site disposal that have concentrations greater than or equal to Total Threshold Limit Concentrations (TTLCs) and/or Waste Extraction Test (WET)/ Soluble Threshold Limit Concentrations (STLCs) are California hazardous wastes and will be manifested and shipped as hazardous wastes. Similarly, materials/soils intended for off Site disposal that have concentrations greater than or equal to Toxicity Characteristic Leaching Procedure (TCLP) concentrations are defined as a RCRA hazardous waste, and will be disposed or treated off Site as a RCRA hazardous waste. URS will coordinate the profiling and characterization of these soils with CleanHarbors Buttonwillow CA, hazardous waste landfill for off- Site disposal.
- Materials/soils intended for off Site disposal with reported PCB concentrations are subject to landfill restrictions, and may be classified as hazardous waste according to the federal Toxics Substances Control Act. PCBs with a total concentration of 50 mg/kg or greater and/or a WET / STLC concentration of 5 mg/L are a California hazardous waste. URS will coordinate the profiling and characterization of these soils with CleanHarbors Buttonwillow CA, hazardous waste landfill for off Site disposal.
- Any hazardous waste shipped off Site will be accompanied by the required signed hazardous waste manifests. UPI will be responsible for maintaining the hazardous waste manifest records for the Project; URS will provide copies of the manifests in the Project Completion Report. Hazardous waste will be placarded and transported to a regulated hazardous waste facility by a licensed hazardous waste transportation company, and in accordance with the URS TP and McCarthy's HSP (2014).
- The URS TP will discuss the transport vehicles that will be used for off Site waste hauling, as well as the haul routes, traffic control procedures (both on Site and off Site), on Site loading procedures, inspection and record keeping practices, and a contingency plan for accidental off Site releases.

7.3 MATERIALS/SOILS MANAGEMENT

McCarthy can use excavated, materials/soils with Site contaminant concentrations below the Site cleanup criteria within the Project area but not used as backfill in utility corridor trenches. If McCarthy stockpiles such materials/soils, McCarthy will keep them damp to minimize wind and rain erosion.

7.4 STORM WATER MANAGEMENT

McCarthy developed and will implement the SWPPP for the Project (SWPPP WDID#: 2 07C370095). The SWPPP describes the planned redevelopment including the management of soil in accordance with this SMP, identifies potential sources of storm water pollution on the property, and recommends appropriate best management practices or pollution control measures to reduce the discharge of pollutants in storm water runoff.

7.5 AIR EMISSIONS

McCarthy will control the air emissions from fugitive dust during construction with the following mitigation measures excerpted from the Project specific Dust Control Plan attached to this SMP as Appendix F. (URS 2014)

- Water all disturbed active construction areas and access and haul roads at least twice per day;
- Cover all trucks hauling soil, sand, and other loose materials, or require all trucks to maintain at least two feet of freeboard, or employ other equivalent means (such as watering the top layer of materials exposed during short on Site hauls) as may be approved by the BAAQMD;
- Pave, apply water two times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas;
- Sweep daily (with water sweepers) all paved access roads, paved parking areas and paved staging areas;
- Apply (non-toxic) soil stabilizers to inactive construction areas (previously disturbed areas inactive for ten days or more), or employ other equivalent means (such as watering disturbed areas to maintain adequate moisture content) as may be approved by the BAAQMD;
- Enclose, cover, water twice daily or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.);
- Limit traffic speeds on unpaved roads to 15 miles per hour;
- Install sandbags or other erosion control measures to prevent sediment runoff to public roadways;
- Replant vegetation (hydroseed) in disturbed areas at the conclusion of the Project work;
- McCarthy will install a rumble strip at the exclusion zone truck exit point and at the Stockpile Management area. McCarthy may use an engineered gravel pad or 50 feet of pavement instead of the rumble strip system. McCarthy will clean the rumble strips will be cleaned daily at a minimum or more frequently, if soil build up occurs and the removal from the truck tires is inhibited.
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 miles per hour or operate in a manner such that visible dust emissions from all excavation and grading activity does not exceed 0.5 on the Ringelmann chart, for a period or periods aggregating more than 3 minutes in any hour;
- Install appropriate air monitoring equipment as required by the BAAQMD;
- Limit the number of construction areas as well as limit access to those areas to approved personnel with adequate protective equipment;
- Post signs at all Project entry points or within 200 feet of Project activities to warn the public and non-construction employees of hazardous activities at the Project Site; and
- SCA will monitor ambient and construction dust monitoring using a personal DataRam™ or equivalent dust-monitoring instrument. The HSP (McCarthy 2014) identifies the action level for increasing dust control measures for worker protection.

7.6 DECONTAMINATION

Decontamination is the process of removing or neutralizing contaminants that have accumulated on personnel or equipment while within the exclusion zone. The McCarthy HSP describes these procedures in more detail. Decontamination methods physically remove contaminants. Personnel, clothing, and equipment leaving the exclusion zone area of the Site (Figure 2) will be decontaminated to remove any harmful contaminants as described below.

- McCarthy will limit equipment access to the area to minimize the equipment that requires decontamination when potentially impacted materials/soils are encountered within the exclusion zone.
- McCarthy will decontaminate heavy equipment that has potentially contacted impacted materials/soils by brushing excess soil from excavating and wheel/track portions of the equipment. McCarthy will add potentially impacted materials/soils removed from equipment and work areas to the stockpile of potentially impacted materials/soils in the Northeast Corner of Site L-A for management by URS on UPI's behalf.

Equipment and emergency decontamination procedures are detailed in the HSP (McCarthy 2014).

When in Level C PPE, Project personnel will place disposable coveralls and used respirator cartridges will be placed in a 55-gallon drum at the end of the workday for proper off Site disposal Respirators will be cleaned daily after use and stored to maintain their shape and to keep them clean until their next use.

In all PPE levels, Project personnel will remove residual contaminated soil from workers' boots by washing and rinsing in a standing washtub. McCarthy will transfer washing solutions and rinsate to 55-gallon drums and used for dust control.

8.1 POST EARTH MOVING SITE MANAGEMENT

This section on post earthmoving site management is included for information only. McCarthy's HSP details of the post earthmoving Site management.

The Cal OSHA Lead regulation (CCR Title 8 1532) will apply to Construction Workers on the Solar Farm Installation Project after the earthwork is completed (Appendix H). Those workers will not be 40-hour HAZWOPER trained.

Cal OSHA Lead in Construction regulations requires training and procedures against potential ingestion and secondary exposures (dirty fingers, clothing, etc.) The contractor's Injury and Illness Prevention Plan will include a Lead Compliance Plan stipulating such procedures (dust control, sanitary facility, etc.). McCarthy will provide a job specific training session for all Site workers on lead awareness to all post-earthmoving Site Personnel.

SCA will conduct a Negative Exposure Assessment (air sampling for workers) based on the earlier earthmoving on-Site monitoring results. The Negative Exposure Assessment results are considered to be representative of the worse-case conditions, so that if the DCP procedures are protective of workers during the earthmoving work, then those same procedures will also be protective during post-earthmoving construction work.

The post-excavation Site workers will be fit tested for a respirator and complete a baseline physical for lead concentrations in their blood. Dust control measures will be implemented for the duration of the Site work as described in the DCP in Appendix F. Assuming that the Negative Exposure Assessment conducted on the excavation/earthwork crews in Phase I shows that the dust control measures are effective, additional dust monitoring testing in Phase II will not be conducted unless the work conditions change, e.g., visible dust is present on the site.

Services will be performed by URS in a manner consistent with that level of care and skill ordinarily exercised by members of the same profession currently practicing in the same locality under similar conditions. No expressed or implied representation or warranty is included or intended in our reports, except that our services were performed, within the limits prescribed by our client, with the customary thoroughness and competence of our profession.

URS cannot warrant or guarantee that not finding indicators of hazardous materials means that hazardous materials do not exist on the Site. There is no investigation that is thorough enough to preclude the presence of materials on the Site that presently, or in the future, may be considered hazardous. Because regulatory evaluation criteria are constantly changing, concentrations of contaminants present and considered to be acceptable may, in the future, become subject to different regulatory standards and require remediation.

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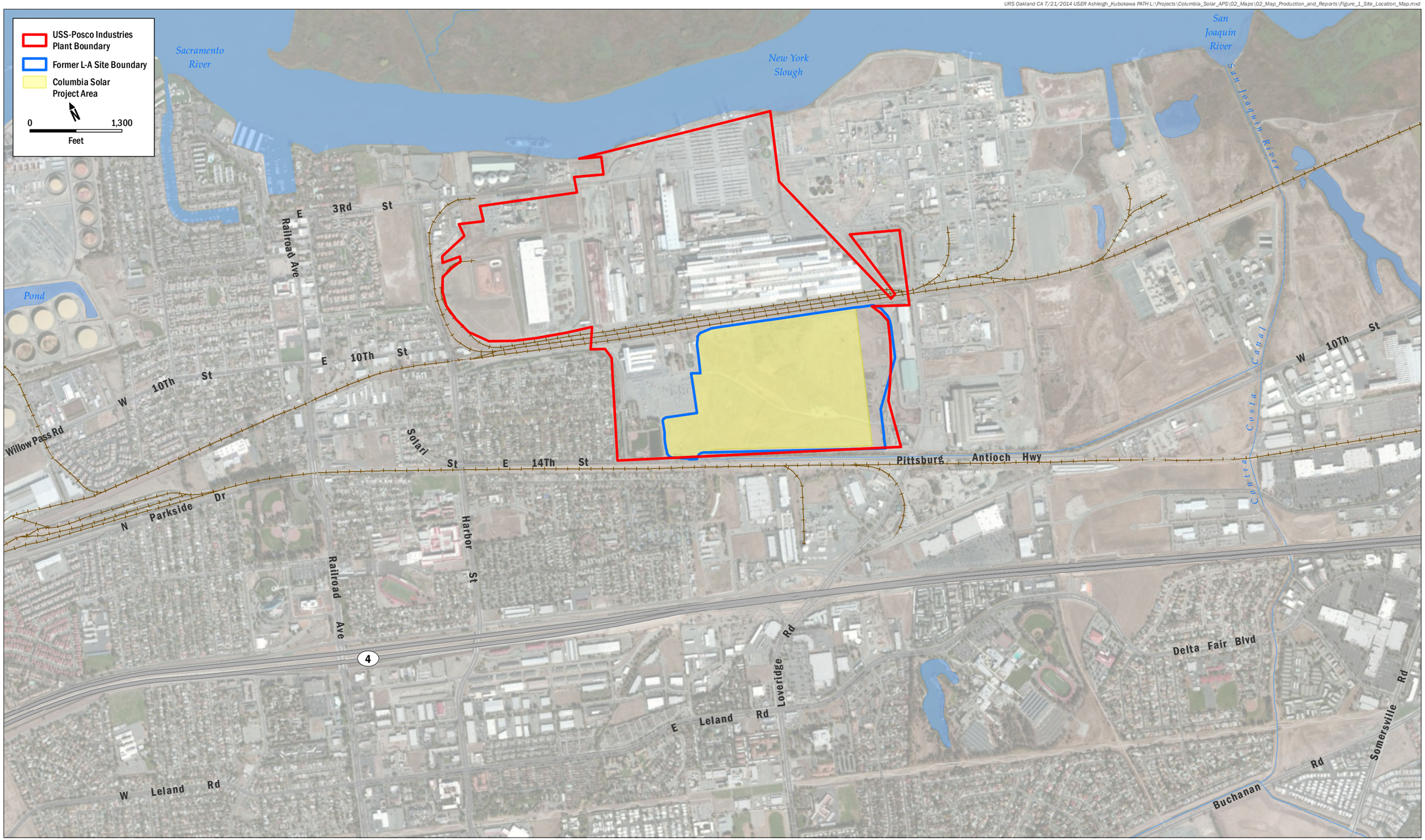
Figures

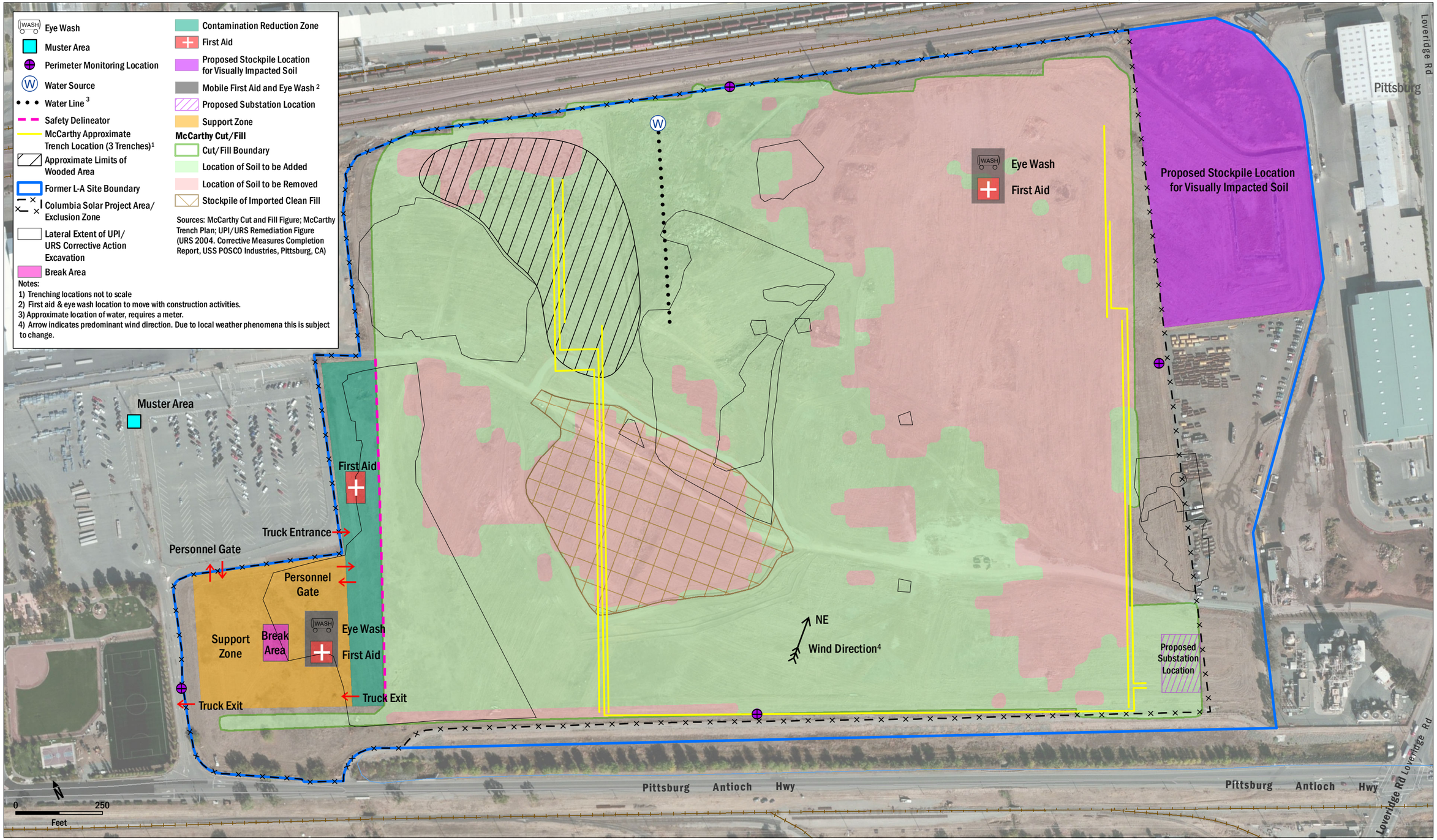
URS Oakland CA 7/21/2014 USER Ashleigh_Kubokawa PATH L:\Projects\Columbia_Solar_APS\02_Maps\02_Map_Production_and_Reports\Figure_1_Site_Location_Map.mxd



URS
Columbia Solar

FIGURE 1
Site Location Map

URS Oakland CA 7/23/2014 USER Ashleigh_Kubokawa PATH L:\Projects\Columbia_Solar_APS\02_Maps\02_Map_Production_and_Reports\Figure2_Site_Plan.mxd

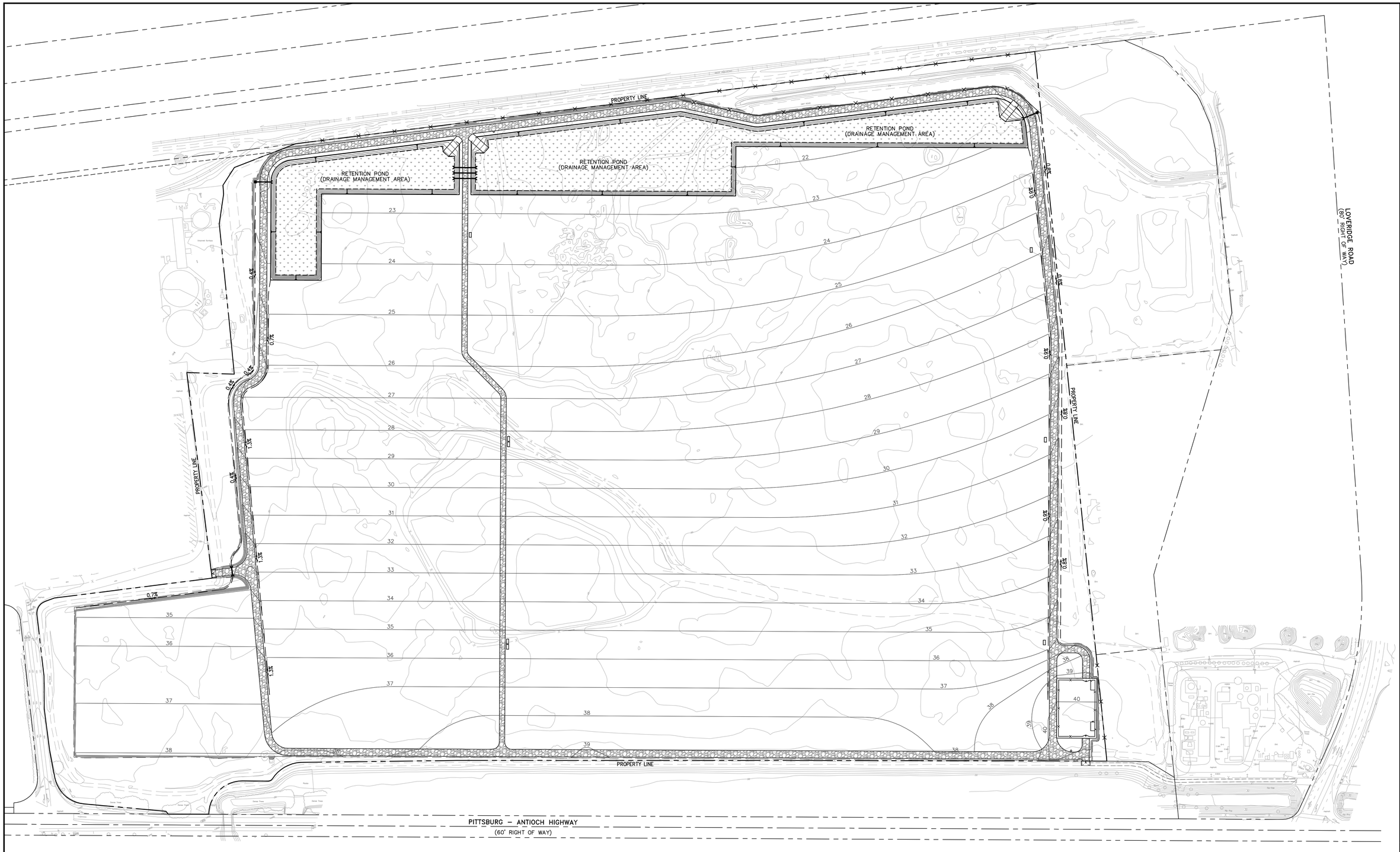


URS
Columbia Solar

FIGURE 2

Site Plan, July 2014

©BKF ENGINEERS



AREA SUMMARY:

DESCRIPTION	IMPERVIOUS AREA (SF)	PERVIOUS AREA (SF)	TOTAL AREA (SF)	FLOW, 10-YEAR (CFS)	FLOW, 100-YEAR (CFS)
EXISTING SITE	0	4,568,638	4,568,638	51.92	75.51
PROPOSED SITE	820	4,567,818	4,568,638	51.94	75.54

SITE IMPERVIOUS AREA INCREASED BY 0.02%

STORMWATER RETENTION REQUIRED:

DRAINAGE AREA (SF)	4,568,638
DRAINAGE AREA (AC)	104.88
100-YEAR, 2-DAY RAINFALL (IN)	3.88
INFILTRATION RATE (IN/DAY)	2.40
ADJUSTED 100-YEAR, 2-DAY RAINFALL (IN)	1.48
REQUIRED TOTAL RETENTION VOLUME (CF)	564,425
REQUIRED TOTAL RETENTION VOLUME (AC-FT)	12.96

RETENTION POND SIZING:

	BOTTOM SURFACE AREA (SF)	TOP SURFACE AREA (SF)	DEPTH FOR RETENTION (FT)	DEPTH FOR FREEBOARD (FT)	TOTAL DEPTH (FT)	VOLUME AVAILABLE FOR RETENTION (CF)
RETENTION POND	247,326	315,509	2.25	1.75	4.00	631,635

GRAPHIC SCALE
100 0 100 200

255 SHORELINE DRIVE
SUITE 200
REDWOOD CITY, CA 94065
650-482-6300 (PHONE)
650-482-6399 (FAX)
BKF
ENGINEERS | SURVEYORS | PLANNERS

REGISTERED PROFESSIONAL ENGINEER
RICHARD A. HAY
C043971
CIVIL
STATE OF CALIFORNIA

CALIFORNIA

COLUMBIA SOLAR ENERGY
GRADING PLAN
STORMWATER MANAGEMENT PLAN
CONTRA COSTA COUNTY

CITY OF PITTSBURG

No.	Revisions

Date: 06/09/2014
Scale: 1"=100'
Design: JT
Drawn: MD
Approved: RH
Job No: 2013024-10

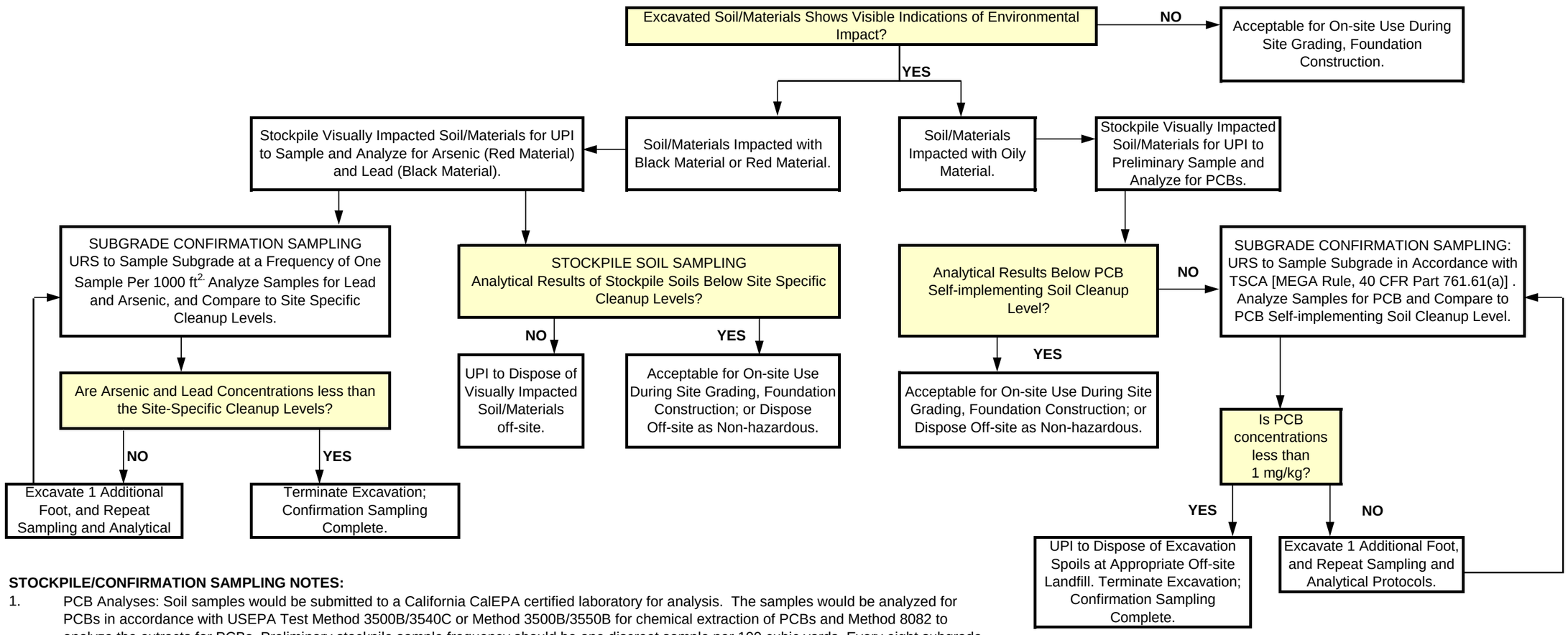
Figure 3

DATE/TIME PLOTTED: 6/9/2014 8:58 AM
PLOTTED BY: Mike Dwyer
FILENAME: J:\2013\2013024\DWG\PRETP\Prelp Grading\20-Stormwater Management Plan.dwg

URS

FIGURE 4

Soil Management Flow Diagram
Columbia Solar Project, Pittsburg, California



STOCKPILE/CONFIRMATION SAMPLING NOTES:

1. PCB Analyses: Soil samples would be submitted to a California CalEPA certified laboratory for analysis. The samples would be analyzed for PCBs in accordance with USEPA Test Method 3500B/3540C or Method 3500B/3550B for chemical extraction of PCBs and Method 8082 to analyze the extracts for PCBs. Preliminary stockpile sample frequency should be one discreet sample per 100 cubic yards. Every eight subgrade confirmation samples would be composited into one prior to analysis.

2. Metals Analyses: Soil samples would be submitted to a California CalEPA certified laboratory for analysis. Soils samples analyzed per USEPA Method 6010. Preliminary stockpile sample frequency should be one discreet sample per 100 cubic yards. Collect subgrade confirmation samples at a frequency of one sample per 1,000 square feet.

3. Final Site-Specific Soil Cleanup and Health-Based Risk Levels for Arsenic and Lead.

Arsenic:	160 mg/kg	Site Specific Cleanup Level (Industrial/Commercial Worker)
Lead:	5500 mg/kg	Site Specific Cleanup Level (Industrial/Commercial Worker)
Lead:	1200 mg/kg	Health-Based Risk Level

4. The PCB Self-implementing Soil Cleanup Level is 1 mg/kg.

5. Confirmation soil sampling would not be required if potentially impacted soil/material is not present after planned excavations are completed.

6. UCI: Upper Confidence Interval according to *Methods for Evaluating Solid Waste* (SW-846) (USEPA, 1986 with updates in 1994, 1995).

Appendix A
Regulatory Agency Guidance Documents

A-1: DTSC September 13, 2006 Memo from Brian Haughton

A-2: USEPA July 1989 Superfund LDR Guide 5

A-3: USEPA June 11, 1992 Letter to Douglas Green

A-4: USEPA March 25, 1996 Letter to Norman Nosenchuck

A-5: DTSC Advisory

Appendix A-1

DTSC September 13, 2006 Memo from Brian Haughton

Memorandum

To: **Robert M. Olken**

Cc: **Mohinder S. Sandhu, Salvatore Ciriello, Andrew Berna-Hicks**

From: **Brian Haughton**

Date: **September 13, 2006**

Re: **USS-POSCO Industries, Inc. ("UPI"):**
Site L-A Brownfield Redevelopment:
Management of Contaminated Soil Within an Area of Contamination ("AOC")

At our August 22, 2006 meeting we reviewed the history of the corrective actions at Site L-A and confirmed that the cleanup levels and other measures approved by DTSC will protect the health of those involved in the planned commercial/industrial redevelopment of the Site. Because some Site soil containing residual metals levels exceeding hazardous waste thresholds may be moved around the Site during redevelopment-related grading and trenching activities, you asked us to excerpt authorities relating to the AOC policy authorizing such movement.

In sum, moving hazardous soil within an AOC does not constitute treatment, storage, or disposal of a hazardous waste under RCRA or HWCL. The AOC policy arose in connection with RCRA's land disposal restrictions (or "LDRs") in the late 1980s. Following are excerpts from four guidance documents bearing on the application of the AOC policy to site-preparation activities relating to the redevelopment of Site L-A.

1. USEPA July 1989 Superfund LDR Guide #5, OSWER Directive 9347.305FS (http://www.epa.gov/superfund/resources/remedy/pdf/93-47305fs-s.pdf), p. 1:

   An AOC is delineated by the areal extent (or boundary) of contiguous contamination. Such contamination must be continuous, but may contain varying types and concentrations of hazardous substances. Depending on site characteristics, one or more AOCs may be delineated. Highlight 1 provides some examples of AOCs.

   Highlight 1: EXAMPLES OF AREAS OF CONTAMINATION (AOCs)

   # A waste source (e.g., waste pit, landfill, waste pile) and the surrounding contaminated soil.

2. USEPA March 8, 1990 National Oil and Hazardous Substances Pollution Contingency Plan, 55 Fed.Reg. 8666, 8758-8760:

> The preamble also discussed when a CERCLA action constitutes "land disposal," defined as placement into a land disposal unit under section 3004(k) of RCRA, which triggers several significant requirements, including RCRA land disposal restrictions (LDRs) and closure requirements (when a unit is closed). It equated an area of contamination (AOC), consisting of continuous contamination of varying amounts and types at a CERCLA site, to a single RCRA land disposal unit, and stated that movement within the unit does not constitute placement. It also stated that placement occurs when waste is redeposited after treatment in a separate unit (e.g., incinerator or tank), or when waste is moved from one AOC to another. Placement does not occur when waste is consolidated within an AOC, when it is treated in situ, or when it is left in place.
>
> ...
>
> EPA disagrees with commenters who considered EPA's interpretation of the definition of "land disposal" under RCRA section 3004(k) to be too narrow. These commenters argued that any movement of waste should be considered "placement" of waste, and thus "land disposal" under RCRA section 3004(k).
>
> The definition of "land disposal" is central to determining whether the RCRA LDRs are applicable to a hazardous waste which is being managed as part of a CERCLA response action, or RCRA closure or corrective action. The term "land disposal" is defined under RCRA section 3004(k) as including, but not limited to, "any placement of such hazardous waste in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, or underground mine or cave." The terms "landfill", "surface impoundment," and the others, refer to specific types of units defined under RCRA regulations. Thus, Congress generally defined the scope of the LDR program as the placement of hazardous waste in a land disposal unit, as those units are defined under RCRA regulations.
>
> EPA has consistently interpreted the phrase "placement * * * in" one of these land disposal units to mean the placement of hazardous wastes into one of these units, not the movement of waste within a unit. See e.g., 51 FR 40577 (Nov. 7, 1986) and 54 FR 41566-67 (October 10, 1989)(supplemental proposal of possible alternative interpretations of "land disposal"). EPA believes that its interpretation that the "placement * * * in" language refers to a transfer of waste into a unit (rather than simply any movement of waste) is not only consistent with a straightforward reading of section 3004(k), but also with the Congressional purpose behind the LDRs. The central concern of Congress in establishing the LDR program was to reduce or eliminate the practice of disposing of untreated hazardous waste at RCRA hazardous waste facilities. The primary aim of Congress was prospective rather than directed at already-disposed waste within a land disposal unit. See 51 FR 40577 (Nov. 7, 1986).

...

With respect to the commenter who asked whether normal earthmoving and grading operations within a land disposal unit constitute "placement into the unit", under EPA's interpretation of RCRA section 3004(k), such activity would not be "placement into the unit" and thus the RCRA LDRs and other subtitle C disposal requirements would not be applicable (nor would the requirement to obtain a permit under RCRA or minimum technology requirements in RCRA section 3004(o) apply). [Emphasis added.]

3. USEPA June 11, 1992 letter to Douglas Green (http://yosemite.epa.gov/osw/rcra.nsf/ea6e50dc6214725285256bf00063269d/EA231818BAF8F6E68525670F006BE85B/$file/11671.pdf):

   Thank you for your letter of April 30, 1992, requesting clarification of the Environmental Protection Agency's (EPA's) interpretation of the applicability of certain Resource Conservation and Recovery Act (RCRA) requirements to common excavation-type activities.

   The particular situation which you presented in your letter involves excavation of soils, such as trenching operations for pipeline installation, where the soils may be hazardous by characteristic, or may contain listed hazardous wastes. We understand that your questions specifically relate to excavations being conducted on public roadways or at other similar locations that are not necessarily associated with or are part of a RCRA regulated treatment, storage, or disposal facility.

   In the example which you cited in your letter, the soils from the excavation or construction activities are temporarily moved within the area of contamination, and subsequently redeposited into the same excavated area. In these situations, we agree that such activity does not constitute treatment, storage, or disposal of a hazardous waste under RCRA. The activity of placing waste in the ground would not normally meet the regulatory definitions of "treatment" or "storage" (40 CFR 260.10). In addition, as you noted in your letter, movement of wastes within an area of contamination does not constitute "land disposal" and thus does not trigger RCRA hazardous waste disposal requirements (55 FR 8666, March 8, 1990). Thus, RCRA requirements such as land disposal restrictions would not apply.

   With respect to generator requirements, as you indicated, a hazardous waste "generator" is one ... who produces a hazardous waste or first causes the waste to be regulated as hazardous (40 CFR 260.10). In the circumstances you described, the excavation does not "produce" the hazardous waste, nor does it subject the waste to hazardous waste regulation since, as discussed above, the activity you described is not "treatment," storage, or "land disposal" of hazardous waste. Therefore, we agree that the activity is not subject to any generator requirements. [Emphasis added.]

4. USEPA March 25, 1996 letter to Norman Nosenchuck (http://www.epa.gov/epaoswer/hazwaste/ca/17.txt):

> The discussion in the June 11, 1992 letter continues to reflect Agency policy on areas of contamination.
>
> The area of contamination concept was discussed in detail in the preamble to the National Contingency Plan (55 FR 8758-8760, March 8, 1990). Through the AOC concept, EPA recognizes that certain discrete areas of generally dispersed contamination may be equated to RARA [sic, should be RCRA] landfills. Just as movement of hazardous wastes within a landfill would not typically constitute a new act of treatment, storage or disposal for purposes of RCRA, movement of media contaminated by hazardous wastes within an area of contamination does not typically trigger RCRA requirements. While the area of contamination concept was first explained in the CERCLA NCP, it is based on an interpretation of RCRA. It applies equally to RCRA corrective action sites and other actions.
>
> In most cases the AOC concept is applied in the context of a government overseen cleanup action, and delineation of AOCs are reviewed, overseen and approved as part of those actions. However, since the AOC concept is an interpretation of current Federal statutory and regulatory requirements, its application outside overseen cleanup actions does not require oversight or advance approval at the Federal level. ...
>
> In your letter, you mention the specific concern that individuals could store soils contaminated with hazardous wastes in temporary piles anywhere within an overall area of contamination while installing pipelines or foundation footings and then replace the soil, "all with no RCRA regulatory requirements or governmental oversight." We note that, while movement of soil contaminated with hazardous waste within an area of contamination would not typically trigger RCRA, the AOC concept in no way shields individuals from otherwise applicable cleanup requirements. ... We believe that, addressing potential cleanup needs for contaminated soils discovered during normal earthmoving and grading activities using cleanup laws is more appropriate than imposing the RCRA permitting process on these activities. [Emphasis added.]

* * *

As these authorities confirm, RCRA (and, therefore, HWCL) requirements are neither necessary nor appropriate at an AOC, such as Site L-A, where proper safety precautions are in place to protect workers and users from risks associated with the movement of soils constituting hazardous waste. If you have any further questions, please do not hesitate to contact me.

Appendix A-2

USEPA July 1989 Superfund LDR Guide 5

United States Environmental Protection Agency
Office of Solid Waste and Emergency Response
Directive: 9347.3-05FS
July 1989

Superfund LDR Guide #5

Determining When Land Disposal Restictions (LDRs) Are Applicable to CERCLA Response Actions

CERCLA Section 121(d)(2) specifies that on-site Superfund remedial actions shall attain "other Federal standards, requirements, criteria, limitations, or more stringent State requirements that are determined to be legally applicable or relevant and appropriate (ARAR) to the specified circumstances at the site." In addition, the National Contingency Plan (NCP) requires that on-site removal actions attain ARARs to the extent practicable. Off-site removal and remedial actions must comply with legally applicable requirements. **This guide outlines the process used to determine whether the Resource Conservation and Recovery Act (RCRA) land disposal restrictions (LDRs) established under the Hazardous and Solid Waste Amendments (HSWA) are "applicable" to a CERCLA response action**. More detailed guidance on Superfund compliance with the LDRs is being prepared by the Office of Solid Waste and Emergency Response (OSWER).

For the LDRs to be applicable to a CERCLA response, the action must constitute placement of a restricted RCRA hazardous waste. Therefore, site managers (OSCs, RPMs) must answer three separate questions to determine if the LDRs are applicable:

(1) Does the response action constitute placement?

(2) Is the CERCLA substance being placed also a RCRA hazardous waste? and if so

(3) Is the RCRA waste restricted under the LDRs?

Site managers also must determine if the CERCLA substances are California list wastes, which are a distinct category of RCRA hazardous wastes restricted under the LDRs (see Superfund LDR Guide #2).

(1) DOES THE RESPONSE CONSTITUTE PLACEMENT?

The LDRs place specific restrictions (e.g., treatment of waste to concentration levels) on RCRA hazardous wastes prior to their placement in land disposal units. Therefore, a key determination is whether the response action will constitute placement of wastes into a land disposal unit. As defined by RCRA, land disposal units include landfills, surface impoundments, waste piles, injection wells, land treatment facilities, salt dome formations, underground mines or caves, and concrete bunkers or vaults. If a CERCLA response includes disposal of wastes in any of these types of off-site land disposal units, placement will occur. However, uncontrolled hazardous waste sites often have widespread and dispersed contamination, making the concept of a RCRA unit less useful for actions involving on-site disposal of wastes. Therefore, to assist in defining when "placement" does and does not occur for CERCLA actions involving on-site disposal of wastes, EPA uses the concept of "areas of contamination" (AOCs), which may be viewed as equivalent to RCRA units, for the purposes of LDR applicability determinations.

An AOC is delineated by the areal extent (or boundary) of contiguous contamination. Such contamination must be continuous, but may contain varying types and concentrations of hazardous substances. Depending on site characteristics, one or more AOCs may be delineated. **Highlight 1** provides some examples of AOCs.

Highlight 1: EXAMPLES OF AREAS OF CONTAMINATION (AOCs)

- A waste source (e.g., waste pit, landfill, waste pile) and the surrounding contaminated soil.
- A waste source, and the sediments in a stream contaminated by the source, where the contamination is continuous from the source to the sediments.*
- Several lagoons separated only by dikes, where the dikes are contaminated and the lagoons share a common liner.

* The AOC does not include any contaminated surface or ground water that may be associated with the land-based waste source.

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For on-site disposal, placement occurs when wastes are moved from one AOC (or unit) into another AOC (or unit). Placement does not occur when wastes are left in place, or moved within a single AOC. **Highlight 2** provides scenarios of when placement does and does not occur, as defined in the proposed NCP. The Agency is current reevaluating the definition of placement prior to the promulgation of the final NCP, and therefore, these scenarios are subject to change.

Highlight 2: PLACEMENT

Placement does occur when wastes are:

- Consolidated from different AOCs into a single AOC;
- Moved outside of an AOC (for treatment or storage, for example) and returned to the same or a different AOC; or
- Excavated from an AOC, placed in a separate unit, such as an incinerator or tank that is within the AOC, and redeposited into the same AOC.

Placement does not occur when wastes are:

- Treated in situ;
- Capped in place;
- Consolidated within the AOC; or
- Processed within the AOC (but not in a separate unit, such as a tank) to improve its structural stability (e.g., for capping or to support heavy machinery).

In summary, if placement on-site or off-site does not occur, the LDRs are not applicable to the Superfund action.

(2) IS THE CERCLA SUBSTANCE A RCRA HAZARDOUS WASTE?

Because a CERCLA response must constitute placement of a restricted RCRA hazardous waste for the LDRs to be applicable, site managers must evaluate whether the contaminants at the CERCLA site are RCRA hazardous wastes. **Highlight 3** briefly describes the two types of RCRA hazardous wastes --listed and characteristic wastes.

Highlight 3: RCRA HAZARDOUS WASTES

A RCRA **solid waste*** is hazardous if it is listed or exhibits a hazardous characteristic.

Listed RCRA Hazardous Wastes

Any waste listed in Subpart D of 40 CFR 261, including:

- F waste codes (Part 261.31)
- K waste codes (Part 261.32)
- P waste codes (Part 261.33(e))
- U waste codes (Part 261.33(f))

Characteristic RCRA Hazardous Wastes

Any waste exhibiting one of the following characteristics, as defined in 40 CFR 261:

- Ignitability
- Corrosivity
- Reactivity
- Extraction Procedure (EP) Toxicity

___

* A solid waste is any material that is discarded or disposed of (i.e., abandoned, recycled in certain ways, or considered inherently waste-like). The waste may be solid, semi-solid, liquid, or a contained gaseous material. Exclusions from the definition (e.g., domestic sewage sludge) appear in 40 CFR 261.4(a). Exemptions (e.g., household wastes) are found in 40 CFR 261.4(b).

Site managers are not required to presume that a CERCLA hazardous substance is a RCRA hazardous waste unless there is affirmative evidence to support such a finding. Site managers, therefore, should use "reasonable efforts" to determine whether a substance is a RCRA listed or characteristic waste. (Current data collection efforts during CERCLA removal and

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remedial site investigations should be sufficient for this purpose.) For listed hazardous wastes, if manifests or labels are not available, this evaluation likely will require fairly specific information about the waste (e.g., source, prior use, process type) that is "reasonably ascertainable" within the scope of a Superfund investigation. Such information may be obtained from facility business records or from an examination of the processes used at the facility. For characteristic wastes, site managers may rely on the results of the tests described in 40 CFR 261.21 - 261.24 for each characteristic or on knowledge of the properties of the substance. Site managers should work with Regional RCRA staff, Regional Counsel, State RCRA staff, and Superfund enforcement personnel, as appropriate, in making these determinations.

In addition to understanding the two categories of RCRA hazardous wastes, site managers will also need to understand the derived-from rule, the mixture rule, and the contained-in interpretation to identify correctly whether a CERCLA substance is a RCRA hazardous waste. These three principles, as well as an introduction to the RCRA delisting process, are described below.

Derived-from Rule (40 CFR 261.3(c)(2))

The derived-from rule states that any solid waste derived from the treatment, storage, or disposal of a listed RCRA hazardous waste is itself a listed hazardous waste (regardless of the concentration of hazardous constituents). For example, ash and scrubber water from the incineration of a listed waste are hazardous wastes on the basis of the derived-from rule. Solid wastes derived from a characteristic hazardous waste are hazardous wastes only if they exhibit a characteristic.

Mixture Rule (40 CFR 261.3(a)(2))

Under the mixture rule, when any solid waste and a listed hazardous waste are mixed, the entire mixture is a listed hazardous waste. For example, if a generator mixes a drum of listed F006 electroplating waste with a non-hazardous wastewater (wastewaters are solid wastes - see **Highlight 3**), the entire mixture of the F006 and wastewater is a listed hazardous waste. Mixtures of solid wastes, and characteristic hazardous wastes are hazardous only if the mixture exhibits a characteristic.

Contained-in Interpretation (OSW Memorandum dated November 13, 1986)

The contained-in interpretation states that any mixture of a non-solid waste and a RCRA listed hazardous waste must be managed as a hazardous waste as long as the material contains (i.e., is above health-based levels) the listed hazardous waste. For example, if soil or ground water (i.e., both non-solid wastes) contain an F001 spent solvent, that soil or ground water must be managed as a RCRA hazardous waste, as long as it "contains" the F001 spent solvent.

Delisting (40 CFR 260.20 and .22)

To be exempted from the RCRA hazardous waste "system," a listed hazardous waste, a mixture of a listed and solid waste, or a derived-from waste must be delisted (according to 40 CFR 260.20 and .22). Characteristic hazardous wastes never need to be delisted, but can be treated to no longer exhibit the characteristic. A contained-in waste also does not have to be delisted; it only has to "no longer contain" the hazardous waste.

If site managers determine that the hazardous substance(s) at the site is a RCRA hazardous waste(s), they should also determine whether that RCRA waste is a California list waste. California list wastes are a distinct category of RCRA wastes restricted under the LDRs (see Superfund LDR Guide #2).

(3) IS THE RCRA WASTE RESTRICTED UNDER THE LDRs?

If a site manager determines that a CERCLA waste is a RCRA hazardous waste, this waste also must be restricted for the LDRs to be an applicable requirement. A RCRA hazardous waste becomes a restricted waste on its HSWA statutory deadline or sooner if the Agency promulgates a standard before the deadline. Because the LDRs are being phased in over a period of time (see **Highlight 4**), site managers may need to determine what type of restriction is in

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Highlight 4: LDR STATUTORY DEADLINES

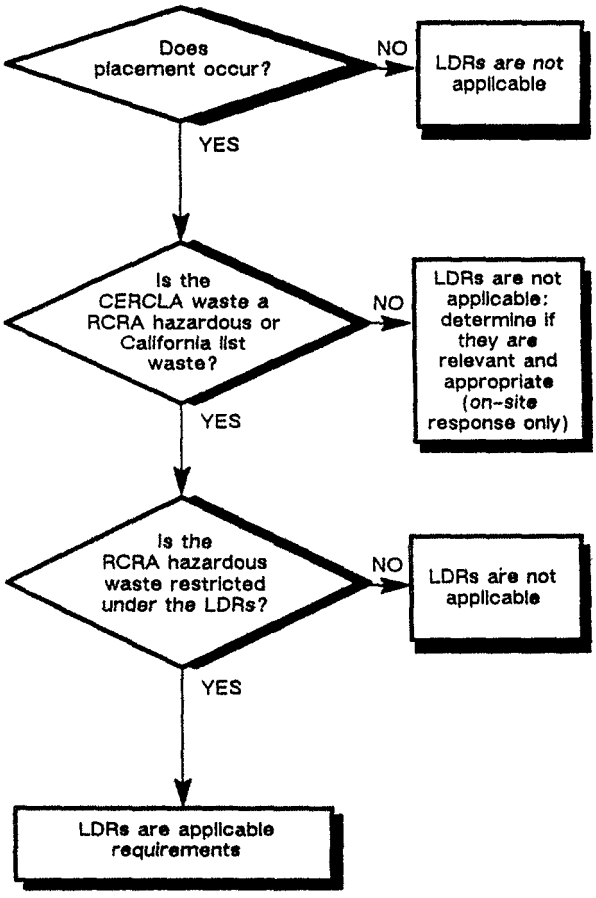
Waste	Statutory Deadline
Spent Solvent and Dioxin-Containing Wastes	November 8, 1986
California List Wastes	July 8, 1987
First Third Wastes	August 8, 1988
Spent Solvent, Dioxin-Containing, and California List Soil and Debris From CERLA/RCRA Corrective Actions	November 8, 1988
Second Third Wastes	June 8, 1989
Third Third Wastes	May 8, 1990
Newly Identified Wastes	Within 6 months of identification as a hazardous waste

effect at the time placement is to occur. For example, if the RCRA hazardous wastes at a site are currently under a national capacity extension when the CERCLA decision document is signed, site managers should evaluate whether the response action will be completed before the extension expires. If these wastes are disposed of in surface impoundments or landfills prior to the expiration of the extension, the receiving unit would have to meet minimum technology requirements, but the wastes would not have to be treated to meet the LDR treatment standards.

APPLICABILITY DETERMINATIONS

If the site manager determines that the LDRs are applicable to the CERCLA response based on the previous three questions, the site manager must: (1) comply with the LDR restriction in effect, (2) comply with the LDRs by choosing one of the LDR compliance options (e.g., Treatability Variance, No Migration Petition), or (3) invoke an ARAR waiver (available only for on-site actions). If the LDRs are determined not to be applicable, then, for on-site actions only, the site manager should determine if the LDRs are relevant and appropriate. The process for determining whether the LDRs are applicable to a CERCLA action is summarized in **Highlight 5**.

Highlight 5 - DETERMINING WHEN LDRS ARE APPLICABLE REQUIREMENTS



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Appendix A-3

USEPA June 11, 1992 Letter to Douglas Green

9441.1992(16)

United States Environmental Protection Agency
Washington, D.C. 20460
Office of Solid Waste and Emergency Response

June 11, 1992

Mr. Douglas H. Green
Piper & Marbury
1200 Nineteenth Street, N.W.
Washington, D.C. 20036-2430

Dear Mr. Green:

Thank you for your letter of April 30, 1992, requesting clarification of the Environmental Protection Agency's (EPA's) interpretation of the applicability of certain Resource conservation and Recovery Act (RCRA) requirements to common excavation-type activities.

The particular situation which you presented in your letter involves excavation of soils, such as trenching operations for pipeline installation, where the soils may be hazardous by characteristic, or may contain listed hazardous wastes. We understand that your questions specifically relate to excavations being conducted on public roadways or at other similar locations that are not necessarily associated with or are part of a RCRA regulated treatment, storage, or disposal facility.

In the example which you cited in your letter, the soils from the excavation or construction activities are temporarily moved within the area of contamination, and subsequently redeposited into the same excavated area. In these situations, we agree that such activity does not constitute treatment, storage, or disposal of a hazardous waste under RCRA. The activity of placing waste in the ground would not normally meet the regulatory definitions of "treatment" or "storage" (40 CFR 260.10). In addition, as you noted in your letter, movement of wastes within an area of contamination does not constitute "land disposal" and thus does not trigger RCRA hazardous waste disposal requirements (55 FR 8666, March 8, 1990). Thus, RCRA requirements such as land disposal restrictions would not apply.

With respect to generator requirements, as you indicated, a hazardous waste "generator" is one, by site, who produces a hazardous waste or first causes the waste to be regulated as hazardous (40 CFR 260.10). In the circumstances you described, the excavation does not "produce" the hazardous waste, nor does it subject the waste to hazardous waste regulation since, as discussed above, the activity you described is not "treatment," storage, or "land disposal" of hazardous waste. Therefore, we agree that the activity is not subject to any generator requirements.

Please let me know if you have any further questions regarding this issue.

Sincerely yours,
Sylvia K. Lowrance, Director
Office of Solid Waste

Appendix A-4

USEPA March 25, 1996 Letter to Norman Nosenchuck

9502.1996(02)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

March 25, 1996

Norman H. Nosenchuck, P.E., Director
Division of Solid & Hazardous Materials
New York State Department of
Environmental Conservation
50 Wolf Road
Albany, New York 12233-7250

Dear Mr. Nosenchuck:

Thank you for your letter requesting additional information on the scope and applicability of the Area of Contamination (AOC) concept. Independent of your request, EPA recently completed guidance on application of the AOC concept during cleanups regulated under the Resource Conservation and Recovery Act (RARA) and other cleanups. This guidance is attached.

As you requested, we have reviewed the June 11, 1992 letter from Sylvia K. Lowrance to Douglas H. Green regarding application of the AOC concept to routine earthmoving and grading activities. The discussion in the June 11, 1992 letter continues to reflect Agency policy on areas of contamination.

The area of contamination concept was discussed in detail in the preamble to the National Contingency Plan (55 FR 8758-8760, March 8, 1990). Through the AOC concept, EPA recognizes that certain discrete areas of generally dispersed contamination may be equated to RARA landfills. Just as movement of hazardous wastes within a landfill would not typically constitute a new act of treatment, storage or disposal for purposes of RCRA, movement of media contaminated by hazardous wastes within an area of contamination does not typically trigger RCRA requirements. While the area of contamination concept was first explained in the CERCLA NCP, it is based on an interpretation of RCRA. It applies equally to RCRA corrective action sites and other actions.

In most cases the AOC concept is applied in the context of a government overseen cleanup action, and delineation of AOCs are reviewed, overseen and approved as part of those actions. However, since the AOC concept is an interpretation of current Federal statutory and regulatory requirements, its application outside overseen cleanup actions does not require oversight or advance approval at the Federal level. When the AOC concept is applied outside the context of an overseen cleanup action, EPA encourages consultation with the appropriate agency and routinely cautions individuals that mis-application of the AOC concept could, potentially, result in substantial fines and penalties associated with improper disposal of hazardous waste. EPA also routinely cautions individuals that state standards may be more stringent and may require oversight or advance approval of all AOCs.

In your letter, you mention the specific concern that individuals could store soils contaminated with hazardous wastes in temporary piles anywhere within an overall area of contamination while installing pipelines or foundation footings and then replace the soil, "all with no RCRA regulatory requirements or governmental oversight." We note that, while movement of soil contaminated with hazardous waste within an area of contamination would not typically trigger RCRA, the AOC concept in no way shields individuals from otherwise applicable cleanup requirements. For example, in many states discovery of contaminated soils triggers reporting requirements under the state cleanup program. In these cases, if a state determined that cleanup was warranted it could require management or removal of contaminated soils, independent of RCRA. We believe that, addressing potential cleanup needs for contaminated soils discovered during normal earthmoving and grading activities using cleanup laws is more appropriate than imposing the RCRA permitting process on these activities.

Thank you for your concern regarding the AOC concept. EPA continues to believe that proper application of this concept will support appropriate remedies and expedite cleanup processes, not encourage avoidance of legitimate cleanup obligations. For additional information, your staff may wish to contact Elizabeth McManus or Hugh Davis, of my staff, at (703) 308-8657 and (703) 308-8633, respectively.

Sincerely yours,

Michael Shapiro, Director
Office of Solid Waste

Enclosure

Attachment

New York State Department of Environmental Conservation
Division of Solid & Hazardous Materials
50 Wolf Road, Albany, New York 12233 - 7250
Division of Solid & Hazardous Materials
(518) 457-6934 FAX (518) 457-0629

February 14, 1996

Mr. Michael Shapiro
Office of Solid Waste MC5301
U.S. Environmental Protection Agency
401 M St., S.W.
Washington, D.C. 20460

Dear Mr. Shapiro:

We need your clarification of an important issue regarding the CERCLA Area of Contamination (AOC) concept and its

applicability to routine excavations where soils containing hazardous waste or exhibiting a hazardous waste characteristic may be encountered.

These routine excavations can occur at construction sites or pipeline trenches where soils are temporarily removed and subsequently redeposited in the same excavated area.

Our specific concern is whether a June 11, 1992 guidance letter from Ms. Sylvia K. Lowrance, Director, Office of Solid Waste (EPA), to Mr. Douglas H. Green (see Enclosure No.l) properly extended the AOC concept to excavations at non-CERCLA sites or other sites without any federal or authorized state oversight. This June 11, 1992 letter is being taken at "face value" as allowing contractors to routinely excavate what may be regulated hazardous waste soil, store it in temporary piles anywhere in the overall area of contamination while installing pipelines or foundation footings, and then replace the soil, all with no RCRA regulatory requirements or governmental oversight.

We question if this June 11, 1992 letter was meant to have broadly sanctioned such activities. We need your guidance in this matter.

The AOC concept, as described in such documents as the EPA memorandum of April 17, 1989 signed by Jonathan Z. Cannon (see Enclosure No. 2) and EPA Superfund LDR Guide #5, "Determining When Land Disposal Requirements (LDRs) Are Applicable to CERCLA Response Actions" (see Enclosure No. 3), is used only in CERCLA contexts.

EPA's letter of January 7, 1991 signed by Don R. Clay, Assistant Administrator (see Enclosure No. 4), extended the AOC concept to RCRA Corrective Action sites, but cautioned that "designation of an AOC is a function performed by the regulatory agency."

The EPA June 11, 1992 letter, however, extended the AOC concept to essentially any temporary excavation activities anywhere.

We hereby request that your office reexamine the reasoning behind this EPA June 11, 1992 letter (see Enclosure No. 1) and determine whether it properly broadened the AOC concept to sanction such activities, even at ordinary construction sites.

Thank you for helping us with this important matter. Please call me if you have any questions.

Sincerely,

Norman H. Nosenchuck, P.E.
Director
Division of Solid & Hazardous Materials

Appendix A-5
DTSC Advisory

Information Advisory
Clean Imported Fill Material

October 2001

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

It is DTSC's mission to restore, protect and enhance the environment, to ensure public health, environmental quality and economic vitality, by regulating hazardous waste, conducting and overseeing cleanups, and developing and promoting pollution prevention.

State of California

California Environmental Protection Agency

Executive Summary

This fact sheet has been prepared to ensure that inappropriate fill material is not introduced onto sensitive land use properties under the oversight of the DTSC or applicable regulatory authorities. Sensitive land use properties include those that contain facilities such as hospitals, homes, day care centers, and schools. This document only focuses on human health concerns and ecological issues are not addressed. It identifies those types of land use activities that may be appropriate when determining whether a site may be used as a fill material source area. It also provides guidelines for the appropriate types of analyses that should be performed relative to the former land use, and for the number of samples that should be collected and analyzed based on the estimated volume of fill material that will need to be used. The information provided in this fact sheet is not regulatory in nature, rather is to be used as a guide, and in most situations the final decision as to the acceptability of fill material for a sensitive land use property is made on a case-by-case basis by the appropriate regulatory agency.

Introduction

The use of imported fill material has recently come under scrutiny because of the instances where contaminated soil has been brought onto an otherwise clean site. However, there are currently no established standards in the statutes or regulations that address environmental requirements for imported fill material. Therefore, the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) has prepared this fact sheet to identify procedures that can be used to minimize the possibility of introducing contaminated soil onto a site that requires imported fill material. Such sites include those that are undergoing site remediation, corrective action, and closure activities overseen by DTSC or the appropriate regulatory agency. These procedures may also apply to construction projects that will result in sensitive land uses. The intent of this fact sheet is to protect people who live on or otherwise use a sensitive land use property. By using this fact sheet as a guide, the reader will minimize the chance of introducing fill material that may result in potential risk to human health or the environment at some future time.

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website at www.dtsc.ca.gov.

Overview

Both natural and manmade fill materials are used for a variety of purposes. Fill material properties are commonly controlled to meet the necessary site specific engineering specifications. Because most sites requiring fill material are located in or near urban areas, the fill materials are often obtained from construction projects that generate an excess of soil, and from demolition debris (asphalt, broken concrete, etc.). However, materials from those types of sites may or may not be appropriate, depending on the proposed use of the fill, and the quality of the assessment and/or mitigation measures, if necessary. Therefore, unless material from construction projects can be demonstrated to be free of contamination and/or appropriate for the proposed use, the use of that material as fill should be avoided.

Selecting Fill Material

In general, the fill source area should be located in nonindustrial areas, and not from sites undergoing an environmental cleanup. Nonindustrial sites include those that were previously undeveloped, or used solely for residential or agricultural purposes. If the source is from an agricultural area, care should be taken to insure that the fill does not include former agricultural waste process byproducts such as manure or other decomposed organic material. Undesirable sources of fill material include industrial and/or commercial sites where hazardous ma-

Potential Contaminants Based on the Fill Source Area

Fill Source:	Target Compounds
Land near to an existing freeway	Lead (EPA methods 6010B or 7471A), PAHs (EPA method 8310)
Land near a mining area or rock quarry	Heavy Metals (EPA methods 6010B and 7471A), asbestos (polarized light microscopy), pH
Agricultural land	Pesticides (Organochlorine Pesticides: EPA method 8081A or 8080A; Organophosphorus Pesticides: EPA method 8141A; Chlorinated Herbicides: EPA method 8151A), heavy metals (EPA methods 6010B and 7471A)
Residential/acceptable commercial land	VOCs (EPA method 8021 or 8260B, as appropriate and combined with collection by EPA Method 5035), semi-VOCs (EPA method 8270C), TPH (modified EPA method 8015), PCBs (EPA method 8082 or 8080A), heavy metals including lead (EPA methods 6010B and 7471A), asbestos (OSHA Method ID-191)

**The recommended analyses should be performed in accordance with USEPA SW-846 methods (1996). Other possible analyses include Hexavalent Chromium: EPA method 7199*

Recommended Fill Material Sampling Schedule

Area of Individual Borrow Area	Sampling Requirements
2 acres or less	Minimum of 4 samples
2 to 4 acres	Minimum of 1 sample every 1/2 acre
4 to 10 acres	Minimum of 8 samples
Greater than 10 acres	Minimum of 8 locations with 4 subsamples per location

Volume of Borrow Area Stockpile	Samples per Volume
Up to 1,000 cubic yards	1 sample per 250 cubic yards
1,000 to 5,000 cubic yards	4 samples for first 1000 cubic yards +1 sample per each additional 500 cubic yards
Greater than 5,000 cubic yards	12 samples for first 5,000 cubic yards + 1 sample per each additional 1,000 cubic yards

terials were used, handled or stored as part of the business operations, or unpaved parking areas where petroleum hydrocarbons could have been spilled or leaked into the soil. Undesirable commercial sites include former gasoline service stations, retail strip malls that contained dry cleaners or photographic processing facilities, paint stores, auto repair and/or painting facilities. Undesirable industrial facilities include metal processing shops, manufacturing facilities, aerospace facilities, oil refineries, waste treatment plants, etc. Alternatives to using fill from construction sites include the use of fill material obtained from a commercial supplier of fill material or from soil pits in rural or suburban areas. However, care should be taken to ensure that those materials are also uncontaminated.

Documentation and Analysis

In order to minimize the potential of introducing contaminated fill material onto a site, it is necessary to verify through documentation that the fill source is appropriate and/or to have the fill material analyzed for potential contaminants based on the location and history of the source area. Fill documentation should include detailed information on the previous use of the land from where the fill is taken, whether an environmental site assessment was performed and its findings, and the results of any testing performed. It is recommended that any such documentation should be signed by an appropriately licensed (CA-registered) individual. If such documentation is not available or is inadequate, samples of the fill material should be chemically analyzed. Analysis of the fill material should be based on the source of the fill and knowledge of the prior land use.

Detectable amounts of compounds of concern within the fill material should be evaluated for risk in accordance with the DTSC Preliminary Endangerment Assessment (PEA) Guidance Manual. If

metal analyses are performed, only those metals (CAM 17 / Title 22) to which risk levels have been assigned need to be evaluated. At present, the DTSC is working to establish California Screening Levels (CSL) to determine whether some compounds of concern pose a risk. Until such time as these CSL values are established, DTSC recommends that the DTSC PEA Guidance Manual or an equivalent process be referenced. This guidance may include the Regional Water Quality Control Board's (RWQCB) guidelines for reuse of non-hazardous petroleum hydrocarbon contaminated soil as applied to Total Petroleum Hydrocarbons (TPH) only. The RWQCB guidelines should not be used for volatile organic compounds (VOCs) or semi-volatile organic compounds (SVOCS). In addition, a standard laboratory data package, including a summary of the QA/QC (Quality Assurance/Quality Control) sample results should also accompany all analytical reports.

When possible, representative samples should be collected at the borrow area while the potential fill material is still in place, and analyzed prior to removal from the borrow area. In addition to performing the appropriate analyses of the fill material, an appropriate number of samples should also be determined based on the approximate volume or area of soil to be used as fill material. The table above can be used as a guide to determine the number of samples needed to adequately characterize the fill material when sampled at the borrow site.

Alternative Sampling

A Phase I or PEA may be conducted prior to sampling to determine whether the borrow area may have been impacted by previous activities on the property. After the property has been evaluated, any sampling that may be required can be determined during a meeting with DTSC or appropriate regulatory agency. However, if it is not possible to analyze the fill material at the borrow area or determine that it is appropriate for use via a Phase I or PEA, it is recommended that one (1) sample per truckload be collected and analyzed for all compounds of concern to ensure that the imported soil is uncontaminated and acceptable. (See chart on Potential Contaminants Based on the Fill Source Area for appropriate analyses). This sampling frequency may be modified upon consultation with the DTSC or appropriate regulatory agency if all of the fill material is derived from a common borrow area. However, fill material that is not characterized at the borrow area will need to be stockpiled either on or off-site until the analyses have been completed. In addition, should contaminants exceeding acceptance criteria be identified in the stockpiled fill material, that material will be deemed unacceptable and new fill material will need to be obtained, sampled and analyzed. Therefore, the DTSC recommends that all sampling and analyses should be completed prior to delivery to the site to ensure the soil is free of contamination, and to eliminate unnecessary transportation charges for unacceptable fill material.

Composite sampling for fill material characterization may or may not be appropriate, depending on quality and homogeneity of source/borrow area, and compounds of concern. Compositing samples for volatile and semivolatile constituents is not acceptable. Composite sampling for heavy metals, pesticides, herbicides or PAH's from unanalyzed stockpiled soil is also unacceptable, unless it is stockpiled at the borrow area and originates from the same source area. In addition, if samples are composited, they should be from the same soil layer, and not from different soil layers.

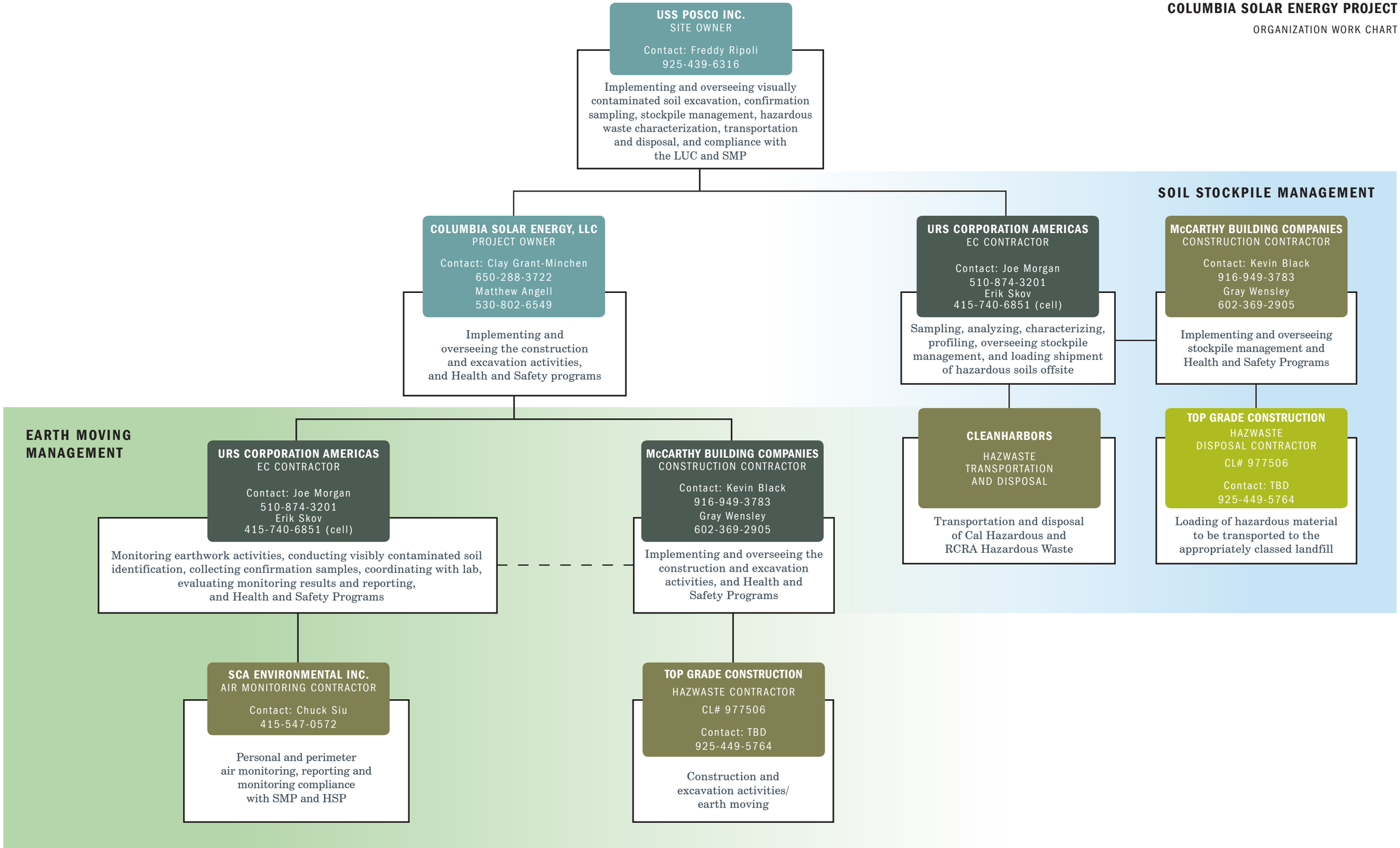
When very large volumes of fill material are anticipated, or when larger areas are being considered as borrow areas, the DTSC recommends that a Phase I or PEA be conducted on the area to ensure that the borrow area has not been impacted by previous activities on the property. After the property has been evaluated, any sampling that may be required can be determined during a meeting with the DTSC.

For further information, call Richard Coffman, Ph.D., R.G., at (818) 551-2175.

Appendix B
Columbia Solar Energy Project
Organizational Chart

COLUMBIA SOLAR ENERGY PROJECT

ORGANIZATION WORK CHART



Appendix C

Excerpts from 2004 *Corrective Measures Completion Report* and Summary of Site L-A Characterization Results (Metals) and Remediation Confirmation Analytical Results (Metals and Organic Constituents)

Table C-1: Summary of Waste and Confirmation Analytical Results - SWMUs 24.1, 24.3, 24.5, and 24.8

Table C-2: Summary of Waste/Soil Analyses for Metals - SWMUs 24.1, 24.2, 24.5, 24.7

Figure C-1: Sampling Locations

REPORT

CORRECTIVE MEASURES COMPLETION REPORT

USS-POSCO INDUSTRIES PITTSBURG, CALIFORNIA

VOLUME 1

Prepared for
California Environmental Protection Agency
Department of Toxic Substances Control
700 Heinz Avenue, Suite 300
Berkeley, California 94710

May 26, 2004

URS

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1333 Broadway, Suite 800
Oakland, CA 94612

26813153.03000

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PCB-impacted soils were identified at SWMUs 17.1 and 24.5-1. The source of PCBs in the soils at SWMU 17.1 was dielectric fluid from an electrical substation that was removed from service in the early 1990s. The source of PCBs at SWMU 24.5-1 was likely waste oils from plant operations. Corrective action was performed at each SWMU in general conformance with *Notice – Self-Implementation of On-Site Cleanup and Disposal of PCB Remediation Material/Soil, USS-POSCO Industries, Pittsburg, California* (URS, 2001b), *Application for a Part B Permit (Revision 3), USS-POSCO Industries, Pittsburg, California* (URS, 2002a), and TSCA (40 CFR 761). Activities are shown in the photo documentation provided in Appendix F.

Weekly construction meetings were held at UPI to discuss corrective action remediation activities. Representatives of UPI, WRS, REI, and URS attended the weekly meetings. Summaries of the weekly construction meetings are provided in Appendix G.

2.1 SWMU 17.1: FORMER SUBSTATION NO. 1

2.1.1 Location

SWMU 17.1 is located in the southeast corner of Third Street and Columbia Avenue, as shown in Figure 2. Based on in formation reported in the CMS (URS, 2000), the former substation prior to remediation covered an area estimated to be approximately 0.34 acres.

2.1.2 Background and Site Description

One transformer, located outside the northeast corner of the substation above a concrete slab, contained oil with PCBs, which was the chemical of interest (COI). Several inspections were made of the substation in 1993 during the Area of Concern (AOC) investigation (Harding Lawson and Associates, 1993). There was no evidence of a release from the transformer. The transformer was removed in the early 1990s.

Between 1996 and 1998, PCBs were identified in soils adjacent to the former transformer location, including soils in a utility trench and in shallow soils to the west and east. PCB-impacted soils were removed in multiple removal actions in November 1997 (utility trench) and January 1998 (west-side soils). Removal of east-side soils was not completed as part of the January 1998 removal action. A June 1998 removal action attempted to remove PCBs from the east-side soils to a level of below 1 milligram per kilogram (mg/kg), but confirmation tests reported PCBs in soil at a high of 55 mg/kg. The volume of remediation material/soil was estimated to be 15 cubic yards.

2.1.3 Remediation

2.1.3.1 Remediation Plan

Remediation at this SMWU was intended to remove soils above the PCB self-implementing soil cleanup levels, as stated in the TSCA regulations for PCBs (40 CFR 750 and 761, i.e., the MEGA Rule). The first goal of the remediation was to achieve the low-occupancy area criterion (current and future use of the former Substation No. 1 meets this definition) of less than

25 mg/kg, as stated in the MEGA Rule. If possible, a secondary goal was to achieve the high-occupancy criterion of less than 1 mg/kg, as stated in the MEGA Rule.

Given the historical PCB concentrations in soils at this SWMU, two remediation phases were planned. Phase I (refer to Area C, Figure 4) included removal of materials/soils with PCB concentrations above 25 mg/kg to one foot below ground surface (bgs) [an estimated volume of 7 loose cubic yards (lcy)]. Phase I excavated materials/soils was planned to be sent to the Kettleman Hills Hazardous Waste Management Facility (Kings County, California) (Chemical Waste Management, Inc.) for Class I disposal. Phase II (refer to Areas A and B, Figure 4) included removal of materials/soils with PCB concentrations above 1 mg/kg to a total depth of 4 feet bgs. Phase II excavated materials/soils were initially intended for disposal in the Unit I CAMU, but as discussed below, no PCB soils were placed in the Unit I CAMU. After remediation and confirmation sampling were completed, the excavation areas were to be backfilled with soil to the elevations and grades of surrounding soils.

2.1.3.2 Remediation Activities

Prior to excavation, plant plans were reviewed and the excavation area geophysically screened for buried structures or utilities. The original site limits of SWMU 17.1 are shown on Figure 3 and the excavation limits are shown on Figure 4.

Remediation at SWMU 17.1 went as described in the previous section (remediation plan). Area C soils were excavated and stockpiled. Approximately 5 bank cubic yards (bcy) of Area C excavated remediation material/soil were place on plastic sheeting, bermed, and covered with plastic sheeting (plastic sheets were taped together and secured in place) until transported to an appropriate disposal facility. Approximately 12 bcy of excavated remediation material/soil from Areas A and B soils were excavated and stockpiled in a separate area. Based on PCB field screening test results, a decision was made to excavate an additional 12 bcy in the Phase I area (Area C). Area C soils were excavated an extra 1 foot bgs, for a total of 2 feet bgs. A new area was also excavated to the north of Area A and was included in the Area C excavation area. This section was approximately 4 feet wide and an additional 2 feet in depth (total depth 4 bgs). It extended from the concrete pad located to the west to the end of Area A. The total estimated quantity of remediation soil excavated from SWMU 17.1 was 29 bcy.

All excavated soils were place on plastic sheeting, bermed, and covered with plastic sheeting (plastic sheets were taped together and secured in place) until transported to an appropriate disposal facility. After remediation was completed, the excavation was backfilled with soil from Site L-B soil stockpiles to the elevations and grades of surrounding soils.

Copies of the daily field reports that URS prepared as part of construction monitoring documentation are provided in Appendix A.

2.1.4 Remediation Confirmation

2.1.4.1 Remediation Confirmation Plan

To verify that PCB concentrations in the soils remaining after remediation were below the PCB self implementing soil cleanup level for low-occupancy areas (25 mg/kg) and below the PCB self-implementing soil cleanup level for high-occupancy areas (1 mg/kg), confirmation sampling

(as specified in 40 CFR Section 761.280) was to be conducted. Approximately 80 soil samples were planned to be collected from a grid system with sampling points 1.5 meters (5 feet) apart. The confirmation sampling layout is shown on Figure 4.

At each sample location, confirmation soil samples were to be collected in clean brass tubes (2 inches in diameter by 6 inches in length) by using a tube-lined core sampler (or equivalent sampling device). The samples were to be submitted to a California Department of Health Services (DHS)–certified laboratory for analysis. The samples were to be analyzed for PCBs in accordance with U.S. Environmental Protection Agency (USEPA) Method 3500B/3500C or USEPA Method 3500B/3500C for chemical extraction of PCBs and USEPA Method 8082 to analyze the extracts for PCBs. Every eight samples were to be combined by the laboratory into one composite sample prior to analysis. Sample concentrations were to be reported on a dry weight basis.

The need for further remediation was to be evaluated according to the analytical results. If the analytical results, based on a statistical evaluation of the upper 95 percent confidence interval (SW-846), were below the target level for PCB (1 mg/kg) then no further remediation would be warranted. DTSC approved the use of the upper confidence interval at 95 percent, as presented in *Notice – Self-Implementation of On-Site Cleanup and Disposal of PCB Remediation Material/Soil, USS-POSCO Industries, Pittsburg, California* (URS, 2001b) and *Application for a Part B Permit (Revision 3), USS-POSCO Industries, Pittsburg, California* (URS, 2002a). If the analytical results, based on a statistical evaluation, were above the target level for PCB, then an additional 1 foot of soil was to be excavated from the sector(s) that were causing the statistical evaluation to exceed the target level for PCB. After additional soil removal, an additional confirmation soil sample was to be collected (as described above) from the sector(s) from which additional soil was removed. Further remediation was to be evaluated based on the analytical results. Further remediation would be warranted if the analytical results, based on a statistical evaluation, were above the target level for PCB. This process was to be repeated until analytical results, based on a statistical evaluation, were below the target cleanup level for PCB.

2.1.4.2 Remediation Confirmation Sampling

A sample grid for the excavation area was set up following the confirmation sampling procedures specified in 40 CFR Section 761.280. Only 22 samples (3 composite samples) were collected from the excavation because of the irregular shape and the various depths of the excavation. Sample locations are shown on Figure 4. Grab soil samples were collected in clean brass tubes, capped, and labeled. Approximately every eight discrete samples within the specified grids were combined in the laboratory to produce an eight-point composite sample prior to analysis. All samples were sent to Sequoia Analytical (Walnut Creek, California) under chain-of-custody procedures for analyses.

All sample concentrations were below the laboratory reporting limit (0.38 mg/kg). Table 2-1 summarizes the PCB analytical data, and Appendix B provides the analytical laboratory reports. The PCB concentrations in the soils remaining after remediation were below the PCB self-implementing soil cleanup level for high-occupancy areas of 1 mg/kg.

2.1.5 Waste Classification and Quantities

Approximately 36 lcy were excavated from SWMU 17.1. Approximately 7 lcy were TSCA-regulated waste (PCB concentrations of greater than 50 mg/kg), and 29 lcy were non-TSCA waste (PCB concentrations of less than 50 mg/kg). Classification was based on analyses performed during previous investigations by the MARK Group or other consultants.

One truck load of TSCA soils (Area C - 7 lcy) was topped off with non-TSCA soils (Areas A and B - 11 lcy) for efficiency and sent to the Kettleman Hills Hazardous Waste Management Facility for Class I disposal as TSCA-regulated waste. The second truckload of non-TSCA soils (Areas A and B - 18 lcy) was also sent to the Kettleman Hills Hazardous Waste Management Facility for Class I disposal. The waste profiles are in Appendix C, and the hazardous waste manifests are provided in Appendix D.

Table 2-8 summarizes the material handling for SWMU 17.1 as well as the other SWMUs involved in this corrective action. This table provides an accounting of the remediation material/soils that were disposed of at either the Unit I CAMU or an appropriate off-site facility.

2.2 SWMU 24.5-1: OIL DISPOSAL AREA NO. 1

2.2.1 Location

Site L-A is located in the southeast portion of the UPI plant, as shown in Figure 2. It is located south of the Burlington Northern and Santa Fe (BNSF) railroad tracks and the Sheet and Tin Mill, east of the incoming Water Filter Plant, west of Loveridge Road, and north of the Pittsburg-Antioch Highway. Site L-A covers an area of approximately 135 acres. Waste oils from plant operations were disposed of at three confirmed locations within the north-central portion of Site L-A. SWMU 24.5-1 was the only Oil Disposal Area SWMU with confirmed PCB concentrations. SWMU 24.5-1 is located within the southeastern quadrant of Site L-A, and based on the CMS (URS, 2000) configuration, the area of SWMU 24.5-1 prior to remediation was estimated to be approximately 0.18 acres.

2.2.2 Background and Site Description

Surface conditions consisted of oily waste with some areas covered with soil. Most areas were covered with vegetation. COIs included PCBs, oil and grease, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals.

Based on the evaluation of analytical data presented in the CMS Work Plan (URSGWC, 1999), oily waste was planned for remediation because it was observed to be exposed at the ground surface and contained elevated concentrations of metals and PCBs. Concentrations of arsenic were reported above the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic (160 mg/kg) and the RFI screening criterion (construction worker health-based risk level [HBL]) for arsenic (230 mg/kg). The highest reported concentration of arsenic in oily waste was 408 mg/kg. The estimated quantity of remediation materials/soils to be generated from SWMU 24.5-1 was approximately 1,000 cubic yards.

2.2.3 Remediation

2.2.3.1 Remediation Plan

Remediation at SMWU 24.5-1 was intended to remove soils with PCB concentrations above the self-implementing soil cleanup levels, as stated in the TSCA regulations for PCBs (40 CFR Sections 750 and 761 [the MEGA Rule]), and to remove soils with arsenic concentrations above the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic (160 mg/kg) and the RFI screening criterion (construction worker HBL) for arsenic (230 mg/kg). The first goal of the PCB remediation was to achieve the low-occupancy area criterion (current and future use of SMWU 24.5-1 meets this definition) of less than 25 mg/kg, as stated in the MEGA Rule. The secondary goal was to achieve the high-occupancy criterion of less than 1 mg/kg, if possible, as stated in the MEGA Rule. The goal of the arsenic remediation was to achieve the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic (160 mg/kg).

Within SWMU 24.5-1, oily waste was exposed at the surface at some locations. Other locations were covered with soil and vegetation. The overburden soils were planned for excavation, stockpile, and use as backfill material. Oily waste had been detected to a maximum depth of 7 feet (MARK, 1998). The oily waste materials/soils were planned for excavation, stockpile, classification sampling and analyses, and future disposal at Kettleman Hills Hazardous Waste Management Facility.

After remediation and confirmation sampling were completed, the excavation area was to be backfilled with soil from the immediate vicinity of the excavation to the elevations and grades of surrounding soils.

2.2.3.2 Remediation Activities

Prior to excavation, plant plans were reviewed and each excavation location was screened for buried structures or utilities. The excavation was approximately 0.83 acres in lateral extent (Figure 3). Approximately 10,600 bcy were excavated from SWMU 24.5-1, which included approximately 3,500 bcy of overburden soil and approximately 7,100 bcy of PCB-impacted oily waste material.

The excavation started in an area with exposed oil at the surface in what was expected to be the middle of the excavation. The excavation was moved north to investigate the extent of the contamination. After finding the northern excavation boundary, the eastern and western excavation boundaries were also found in the northern area. At this point, the excavation was larger than the initial estimates of previous investigations. The excavation proceeded south, expanded in the east and west directions and continued up to the primary east-west access road. The overall approximate dimensions of the completed excavation were 120 feet (east and west) by 300 feet (north and south), with depths ranging 6 to 14 feet bgs.

Overburden soils were stockpiled around the excavation for future backfilling. Oily waste was stockpiled on the southern and eastern boundaries of the excavation. Excavated remediation material/soils were place on plastic sheeting, bermed, and covered with plastic sheeting (plastic sheets were taped together and secured in place) until transported to an appropriate disposal facility.

The quantity of overburden soils stockpiled in the immediate vicinity of the excavation was insufficient to backfill the excavation. Additional backfill soils were obtained from various Site L-A sources, including (1) slag stockpiles; (2) soil stockpiles; and (3) excess levee materials from along Kirker Creek.

Copies of the daily field reports that URS prepared as part of construction monitoring documentation are provided in Appendix A.

2.2.4 Remediation Confirmation

2.2.4.1 Remediation Confirmation Plan

Visual confirmation was to be used to confirm that arsenic concentrations in the soils remaining after the remediation area were below the site-specific soil clean up level calculated for the industrial/commercial worker for arsenic (160 mg/kg). Oily waste is easily distinguished from area soils and underlying native soils. Underlying native soils at SWMU 24.5-1 contained oil and grease but did not require remediation based on evaluations conducted during the RFI (MARK, 1998).

To verify that PCB concentrations in the soils remaining after remediation were below the PCB self implementing soil cleanup level for low-occupancy areas (25 mg/kg) and below the PCB self-implementing soil cleanup level for high-occupancy areas (1 mg/kg), confirmation sampling as specified in 40 CFR Section 761.280 was to be conducted. A grid system of approximately 360 soil samples was estimated to be needed for the confirmation sampling in *Notice – Implementation of On-Site Cleanup and Disposal of PCB Remediation Material/Soil, USS-POSCO Industries, Pittsburg, California* (URS, 2001b). The sampling points were to be 1.5 meters (approximately 5 feet) apart in both the north-south and the east-west directions.

At each sample location, confirmation soil samples were to be collected in clean brass tubes (2 inches in diameter by 6 inches in length) by using a tube-lined core sampler (or equivalent sampling device). The samples were to be submitted to a DHS-certified laboratory for analysis. The samples would be analyzed for PCBs in accordance with USEPA Method 3500B/3500C or USEPA Method 3500B/3500C for chemical extraction of PCBs and USEPA Method 8082 to analyze the extracts for PCBs. Every eight samples were to be combined in the laboratory to produce eight-point composite samples prior to analysis. Sample concentrations were to be reported on a dry weight basis.

The need for further remediation would be evaluated according to the analytical results. If the analytical results, based on a statistical evaluation of the upper 95 percent confidence interval (SW-846), are below the target level for PCB (1 mg/kg) then no further remediation would be warranted. DTSC approved the use of the upper confidence interval at 95 percent, as presented in *Notice – Self-Implementation of On-Site Cleanup and Disposal of PCB Remediation Material/Soil, USS-POSCO Industries, Pittsburg, California* (URS, 2001b) and *Application for a Part B Permit (Revision 3), USS-POSCO Industries, Pittsburg, California* (URS, 2002a). If the analytical results, based on a statistical evaluation, are above the target level for PCB, then an additional 1 foot of soil would be excavated from the sector(s) that are causing the statistical evaluation to exceed the target level for PCB. After additional soil removal, an additional confirmation soil sample would be collected (as described above) from the sector(s) from which additional soil was removed. Further remediation would be evaluated based on the analytical

results. Further remediation would be warranted if the analytical results, based on a statistical evaluation, are above the target level for PCB. This process would be repeated until analytical results, based on a statistical evaluation, are below the target cleanup level for PCB.

2.2.4.2 *Remediation Confirmation Sampling*

A visual inspection of the area was performed after remediation completion to verify that oily-containing materials were removed from the site. No oily materials were found on site during visual inspection, thus meeting the cleanup criteria for site-specific soil cleanup level for the industrial/commercial worker for arsenic (160 mg/kg).

A total of 1,857 discrete samples (238 composite samples) were collected from the excavation, following PCB confirmation sampling procedures as specified in 40 CFR Section 761.280. Sample locations are shown on Figure 5. Approximately every eight discrete samples within a specified grid were combined in the laboratory to produce an eight-point composite sample prior to analysis. All samples were sent to Sequoia Analytical under chain-of-custody procedures for analysis. A total of 1,242 first round samples (163 composite samples) were collected and another 615 re-excavation area samples (75 composites) were collected from areas where the first round analytical results were above cleanup levels.

Based on an upper 95% confidence interval statistical evaluation performed per SW-846 (Appendix E), the final confirmation sampling results for PCB concentrations in the soils remaining after remediation are below the PCB self-implementing soil cleanup level for high-occupancy areas of 1 mg/kg. A summary of the confirmation sample analyses is presented on Table 2-2. The statistical evaluation of the final confidence intervals for PCBs is provided in Table E1a of Appendix E. The analytical laboratory data reports are provided in Appendix B.

2.2.5 Waste Quantities and Classification

2.2.5.1 *Remediation Material/Soil Waste Classification*

2.2.5.1.1 *Oily Waste Soils*

To verify that the remediation materials/soils from this SWMU were not RCRA hazardous waste, remediation material/soil samples were collected. The sampling frequency was based on the selection of a sample from approximately every 100 lcy of remediation materials/soils. A total of 29 samples were collected from the oily waste stockpiles. After the first 29 samples, Kettleman Hills Waste Management Facility agreed that the data collected were consistent and no more sampling was needed on the rest of the oily waste.

Based on analyses performed during previous investigations, the remediation material/soil samples were submitted to Sequoia Analytical for the Toxicity Characteristic Leachate Procedure (TCLP) and for PCB analysis for federal classification (i.e., RCRA and TSCA). The samples were extracted for soluble metals in accordance with USEPA Test Method 1311 for TCLP. TCLP analysis included metals: arsenic, chromium, and lead in accordance with USEPA Method 6010. PCB analyses were in accordance with USEPA Method 3500B/3500C for chemical extraction of PCBs and USEPA Method 8082 to analyze the extracts for PCBs. The analytical results are summarized on Table 2-3 (PCB) and Table 2-4 (metals).

After performing a statistical analysis (i.e., USEPA SW-846) of the PCB results, all oily waste stockpiles were shown to be below the TSCA regulatory level of 50 mg/kg for PCBs and were not considered to be a TSCA-regulated waste (see Table 2-3). The statistical evaluation of the classification for PCBs is provided in Table E1b of Appendix E.

After performing the statistical analysis of the upper 95 percent confidence interval (i.e., USEPA SW-846) for TCLP and STLC metals, the oily waste stockpiles were shown to have concentrations below the RCRA hazardous waste level of 5.0 milligrams per liter (mg/l) for each of the metals and subsequently were not considered RCRA hazardous waste. The statistical evaluation of the classification for lead is provided in Table E1c of Appendix E.

Three samples (S24.5-1-CLASS-S14, S24.5-1-CLASS-S15, and S24.5-1-CLASS-S17) were randomly selected for analysis by Soluble Threshold Limit Concentration (STLC) extraction and evaluation for California classification. Based on elevated concentrations of COIs identified in previous investigations, STLC for soluble arsenic, cadmium, copper, lead, and nickel were analyzed in accordance with USEPA Method 6010.

STLC analysis resulted in the oily waste stockpile being considered a California hazardous waste after the analytical results for the three samples were above 5.0 mg/l for soluble lead. A summary of the classification soil analytical data for metals is presented on Table 2-4. The analytical laboratory data reports are provided in Appendix B.

2.2.5.1.2 Re-excavated Underlying Native Soils

To verify that the re-excavated underlying native soil from this SWMU was not a RCRA, TSCA, or California hazardous waste and could be disposed of at a Class II landfill, soil samples were collected. The sampling frequency was based on selecting a sample from approximately every 100 lcy of soil. A total of 20 samples were collected from the re-excavated underlying native soil waste stockpiles and analyzed for total California Code of Regulations (CCR) Title 22 metals, total recoverable petroleum hydrocarbons, and PCBs.

The samples were extracted for total metals in accordance with USEPA Method 3050 for Total Threshold Limit Concentration (TTLC) and analyzed in accordance with USEPA Method 6010.

PCB analysis was conducted in accordance with Method 3500B/3500C for chemical extraction of PCBs and USEPA Test Method 8082 to analyze the extracts for PCBs. The re-excavated underlying native soil stockpiles were shown to have concentrations below the TSCA regulatory level of 50 mg/kg for PCBs and were not considered to be a TSCA-regulated waste (see Table 2-5).

A summary of the TRPH and Title 22 metal results is presented in Table 2-6. Seven samples were re-analyzed for further classification by STLC or TCLP for arsenic, lead, and zinc. The additional analyses were performed because the total metal concentrations either exceeded the STLC criteria by a minimum factor of 10, or exceeded the TCLP criteria by a minimum factor of 20. The samples were extracted for soluble metals in accordance with USEPA Method 1311 for TCLP and by the Wet Extraction Method for STLC and analyzed in accordance with USEPA Method 6010. The results are presented in Table 2-7.

All TCLP results were below hazardous waste regulatory levels for all metals and were not considered RCRA-hazardous wastes. Three samples were above the STLC California hazardous waste level for lead; the three sampling sectors represented by these samples were separated and

off-hauled as California-only hazardous waste (see Table 2-7). The materials from other sampling sectors were all below STLC California hazardous waste levels, and were off-hauled as non-hazardous waste.

The analytical laboratory data reports are provided in Appendix B.

2.2.5.2 Waste Quantities

All oily waste soils from SWMU 24.5-1 were disposed of off-site. The disposal quantity amounted to approximately 7,100 lcy of PCB-impacted oily waste (non-RCRA, non-TSCA) classified as California-only hazardous waste and 1,400 lcy of PCB-impacted oily waste soils (non-RCRA, non-TSCA) classified as non-hazardous waste. The California-only hazardous waste was sent to the Kettleman Hills Hazardous Waste Management Facility for Class I disposal (waste profiles are provided in Appendix C, and hazardous waste manifests are provided in Appendix D). The non-hazardous soils were sent off-site to the Republic Service Vasco Road Landfill (Livermore, California) for Class II disposal. A summary of the distribution of PCB-impacted materials/soils excavated from SWMU 24.5-1 is provided in Table 2-8.

SWMUs 3, 24.1, 24.3, 24.5 (excluding 24.5-1), and 24.8 were grouped together because it was believed that these areas were not impacted by PCBs. With the exception of SWMU 3 (Main Plant), the Site L-A SWMUs were historically used to dispose of TWTP sludges, oily wastes, and lead-impacted material. Section 3 describes the corrective action remediation of the non-PCB SWMUs. Corrective action was performed at each SWMU in general conformance with the *Remediation Confirmation Sampling and Analysis Plan (Revision 1), USS-POSCO Industries, Pittsburg, California* (URS, 2001a) and *Application for a Part B Permit (Revision 3), USS-POSCO Industries, Pittsburg, California* (URS, 2002a). Activities are shown in the photo documentation provided in Appendix F.

Weekly construction meetings were held at UPI to discuss the corrective action remediation and Unit I CAMU construction. The meetings were attended by representatives of UPI, WRS, REI, and URS. Summaries of the weekly construction meetings are provided in Appendix G.

3.1 SWMU 3: CAUSTIC NEUTRALIZATION AREA

3.1.1 Location

This SWMU is located in the east-central portion of the Main Plant east of Power Substation #2 and north of the Sheet and Tin Mill, as shown on Figure 2. SWMU 3 covers an area of approximately one-half acre.

3.1.2 Site Description

Prior to remediation, portions of the SWMU area were covered with gravel and plastic sheeting. Soil was exposed at the surface in the remaining areas.

Chemicals of interest included: arsenic, cadmium, iron, lead, nickel, and zinc, total petroleum hydrocarbons (as gasoline [TPH-g] and diesel [TPH-d]), and oil and grease (O&G).

Based on an evaluation of analytical data presented in the Corrective Measures Study Workplan (URSGWC, 1999), soils at this SWMU were planned for remediation because lead concentrations in soils exceeded a RFI screening criterion [construction worker health-based risk level (HBL)] for lead [1,200 milligrams per kilogram (mg/kg)], and because it was practical to do so (i.e., the SWMU is small and lacks impediments to remediation).

3.1.3 Remediation

3.1.3.1 Remediation Plan

Based on the lead concentrations in SWMU soils, three areas were planned for excavation. The areas were identified as Areas A, B, and C. The original area extent of this SWMU is shown in Figure 2.

Area A was estimated to be approximately 30 feet by 30 feet. The top 1 foot of soil within Area A was planned for excavation, stockpile, and backfill. The next 3 feet of soil (1 foot to 4 feet bgs) was to be excavated and stockpiled for remediation (i.e., disposal in the on-site Unit I CAMU). The estimated quantity of remediation materials/soils to be generated from Area A was

reported in *Remediation Confirmation Sampling and Analysis Plan, USS-POSCO Industries, Pittsburg, California* (URS, 2001a) to be approximately 120 lcy.

Area B was estimated to be approximately 60 feet by 60 feet. The top 1.5 feet of soil (0 to 1.5 feet bgs) was planned to be excavated and stockpiled for remediation (i.e., disposal in the on-site Unit I CAMU). Soils containing total petroleum hydrocarbons (TPH) and O&G were expected in this area but were not planned for remediation (MARK, 1998). The estimated quantity of remediation materials/soils to be generated from Area B was reported in *Remediation Confirmation Sampling and Analysis Plan, USS-POSCO Industries, Pittsburg, California* (URS, 2001a) to be approximately 240 lcy.

Area C was approximately 60 feet by 60 feet. The top 3.5 feet of soil (0 to 3.5 feet bgs) was planned to be excavated and stockpiled for remediation (i.e., disposal in the on-site Unit I CAMU). Soils containing TPH and O&G were expected in this area but were not planned for remediation. The estimated quantity of remediation materials/soils to be generated from Area C was reported in *Remediation Confirmation Sampling and Analysis Plan, USS-POSCO Industries, Pittsburg, California* (URS, 2001a) to be approximately 560 lcy.

After remediation was completed, the excavations were to be backfilled with soil to the elevations and grades of the surrounding soils. In areas where the surrounding soils were covered with gravel, the excavations were to be finished with gravel.

3.1.3.2 Remediation Activities

Prior to excavation, UPI plant plans were reviewed and the areas planned for remediation screened for buried structures or utilities. Remediation activities consisted of excavation of Areas A, B, and C, stockpiling of remediation material/soil, confirmation sampling and analysis, backfill, remediation material/soil classification sampling and analysis, and disposal. Excavated remediation material/soils were place on plastic sheeting, bermed, and covered with plastic sheeting (plastic sheets were taped together and secured in place) until transported to an appropriate disposal facility. The lateral extent of remedial excavation is shown on Figures 3 and 6. Copies of the daily field reports that URS prepared as part of construction monitoring documentation are provided in Appendix A.

Area A was excavated to the approximate dimensions of 30 feet by 30 feet by an average thickness of 3 feet (the upper 1 foot of soil was clean overburden that was reused for backfill). The estimated quantity of in-place soil excavated from Area A was approximately 100 bcy. This material was stockpiled adjacent to the excavation, covered, and sampled for specific COIs in accordance with *Remediation Confirmation Sampling and Analysis Plan (Revision 1), USS-POSCO Industries, Pittsburg, California* (URS, 2002c).

Area B was excavated in an "L" shaped pattern to the approximate dimensions of 60 feet (long dimension) and 30 feet (short dimension) by 60 feet (perpendicular to long and short dimensions). The southwest corner of Area B was not excavated, which resulted in the "L" shape configuration, as an existing high-voltage electrical tower limited construction access. The average excavation depth was estimated to be 1.5 feet below grade. The estimated quantity of in-place soil excavated from Area B was approximately 200 bcy. This material was stockpiled adjacent to the excavation, covered, and sampled for specific COIs in accordance with

Remediation Confirmation Sampling and Analysis Plan (Revision 1), USS-POSCO Industries, Pittsburg, California (URS, 2002c).

Area C was excavated immediately to the east of Area B to the approximate dimensions of 60 feet by 60 feet. The average depth of excavation was estimated to be 3.5 feet below grade. The estimated quantity of in-place soil excavated from Area C was approximately 500 bcy. This material was stockpiled adjacent to the excavation, covered, and sampled for specific COIs in accordance with *Remediation Confirmation Sampling and Analysis Plan (Revision 1), USS-POSCO Industries, Pittsburg, California* (URS, 2002c).

The total estimated quantity of in-place soil excavated from SWMU 3, consisting of Areas A, B, and C, was approximately 800 bcy. This SWMU was backfilled with clean soils from an off-site source located south of Site L-A between the Pittsburg-Antioch Highway and California Avenue as part of the City of Pittsburg Kirker Creek widening project.

3.1.4 Remediation Confirmation

3.1.4.1 Remediation Confirmation Plan

To verify that lead concentrations in soils remaining after remediation were below the RFI screening criterion [construction worker health-based risk level (HBL)] for lead (1,200 mg/kg) [reference: *Remediation Confirmation Sampling Plan and Analysis Plan (Revision 1), USS-POSCO Industries, Pittsburg, California* (URS, 2002c)]:

- An estimated five soil samples were to be collected from randomly-selected locations within Area A (one from the bottom and four from the sides of the excavation).
- An estimated seven soil samples were to be collected from randomly-selected locations within Area B (four from the bottom and three from the sides of the excavation, as the common side with Area C had been excavated).
- An estimated eight soil samples were to be collected from randomly-selected locations within Area C (four from the bottom and four from the sides of the excavation).

Sampling frequency was to be based on selecting a sample for approximately every 1,000 square feet of surface area with a minimum of one sample per excavation panel (i.e., bottom or side of the excavation). To select the sampling locations, each panel was to be divided into sectors that correspond to the number of samples to be collected from the panel based on the square footage of panel surface area. Each sector was then to be divided into six subsectors. One subsector from each sector was then to be randomly selected for sampling by a toss of a single die.

At each sampling location, confirmation samples was to be collected using an aluminum tube-lined drive sampler (or equivalent sampling device) or by placing representative samples into a wide-mouth sample container using a hand trowel.

The soil samples were to be submitted to the laboratory for analysis. The samples were to be analyzed for total lead in accordance with USEPA Method 6010.

The need for further remediation was to be evaluated according to the analytical results. If the analytical results, based on a statistical evaluation of the upper 95 percent confidence interval (SW-846), were below the construction worker HBL for lead (1,200 mg/kg), then no further

remediation would be warranted. DTSC approved the use of the upper confidence interval at 95 percent for use on metal-impacted SWMUs, as presented in *Remediation Confirmation Sampling and Analysis Plan, USS-POSCO Industries, Pittsburg, California* (URS, 2001a) and *Application for a Part B Permit (Revision 3), USS-POSCO Industries, Pittsburg, California* (URS, 2002a). If the analytical results, based on a statistical evaluation, were above the site-specific soil cleanup level for lead, then an additional 1 foot of soil was to be excavated from the sector(s) that were causing the statistical evaluation to exceed the site-specific soil cleanup level for lead. After additional soil removal, an additional confirmation soil sample was to be collected (as described above) from the sector(s) from which additional soil was removed. Further remediation was to be evaluated based on the analytical results. Further remediation was warranted if the analytical results, based on a statistical evaluation, were above the site-specific soil cleanup level for lead. This process was to be repeated until analytical results, based on a statistical evaluation, are below the site-specific soil cleanup level for lead.

3.1.4.2 Remediation Confirmation Sampling and Analysis

SWMU 3 was sampled and analyzed to confirm contaminant removal in accordance with the Remediation Confirmation Plan (Section 3.1.4.1). Confirmation soil sampling consisted of obtaining 21 floor and side wall soil samples and transporting them to STL in Pleasanton, California, under chain-of-custody procedures for the analysis of total lead (USEPA Method 6010). The sample locations are shown on Figure 6. The distribution of samples was as follows:

- Area A: 5 soil samples
- Area B: 8 soil samples
- Area C: 8 soil samples

Sample locations were randomly selected as described in Section 3.1.3.1. The confirmation results are summarized in Table 3-1, and the analytical laboratory reports are provided in Appendix B. Results were determined to be below the RFI screening criterion (construction worker HBL) for lead (1,200 mg/kg), and no further remediation was performed. Analytical data were evaluated statistically (Table E2, Appendix E) in accordance with the *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods: USEPA SW-846* [USEPA, 1986 (1994 and 1995)].

During remedial excavation of Area A, an unknown tar-like material was exposed along the side walls of the east and west ends of the excavation area. Excavation along the west side wall was terminated before remediation was complete due to the proximity of Substation No. 2. This area will be included in the UPI Grading/Excavation Permit Program.

Less than 100 cubic yards of additional soil was excavated and stockpiled as a result of the finding of the tar-like material. Six additional side wall soil samples were collected and transported to STL under chain-of-custody procedures for the analysis of total copper based on the results of the classification sampling and analysis (Section 3.1.5). The analytical results for copper were reported to be between 17 and 180 mg/kg, and as a consequence, no further remediation was performed.

3.1.5 Waste Quantities and Classification

Eleven discrete soil samples of remediation material/soil were collected from the remediation material/soil stockpile in accordance with the sampling and analysis protocols presented in *Remediation Confirmation Sampling and Analysis Plan, USS-POSCO Industries, Pittsburg, California* (URS, 2001a). These soils were submitted to STL for the analysis of TCLP-lead (USEPA Method 1311/3010A/6010) and TCLP-chromium (USEPA Method 1311/3010A/6010). Grab samples were collected in laboratory supplied glass jars at a frequency of approximately one per 100 cubic yards. The classification analytical results were reported below the laboratory detection levels for both analytes (i.e., TCLP-chromium, TCLP-lead) in the 11 soil samples, as presented in Table 3-1. Copies of the laboratory analytical reports are provided in Appendix B.

One side wall sample of the tar material was collected for the suite of laboratory analyses based on the RFI analytical criteria. The analyses included:

- Title 22 California Assessment Manual (CAM) 17 Metals (in lieu of Priority Pollutant Metals)
- USEPA Method 8260B: VOCs
- USEPA Method 8270C: SVOCs
- USEPA Method 8015M: Total Extractable Petroleum Hydrocarbons (TEPH).

The analytical results of the tar-like material analyses are summarized on Tables 3-1 and 3-2. The analytical results for VOCs, and SVOCs were below the laboratory detection levels. The result for TEPH as motor oil was reported to be 140,000 mg/kg and TEPH as diesel was reported to be 20,000 mg/kg. The results for CAM 17 metals were reported below TTLC levels with the exception of lead (1,100 mg/kg) and copper (27,000 mg/kg).

The tar-like material was also submitted to STL for analysis of TCLP-lead because the total lead concentration exceeded the TCLP value by a factor of 20. No TCLP criteria exist for copper. The results were reported to be below the laboratory detection level. Based on the above classification sampling and analyses, the SWMU 3 stockpile materials/soils were cleared for Unit I CAMU disposal. It is estimated that approximately 1,100 lcy of materials (Sections A, B, and C combined) were transported to and disposed of in the Unit I CAMU. No materials were transported off-site for disposal.

3.2 SWMU 24.1: DRIED SLUDGE DISPOSAL AREAS

3.2.1 Locations

Three dried sludge disposal areas, collectively identified as SWMU 24.1, are located in the western and central portions of Site L-A, as shown on Figure 2. Dried wastewater treatment sludge from the Site L-B former sludge drying beds was placed within the western portion of Site L-A. The individual SWMU designations reported in the CMS (URS, 2000) and the corresponding estimated areas prior to remediation were:

- SWMU 24.1-1: Dried Sludge Disposal Areas North - 2 acres
- SWMU 24.1-2: Dried Sludge Disposal Areas South - 8 acres

- SWMU 24.1-3: Dried Sludge Disposal Areas East - 3.5 acres.

The location and lateral extent of each SWMU were based on information obtained from previous investigations, including *Waste Characterization Program, Waste Disposal Site L-A* (Draft Report), (Dames and Moore, 1984), *Water Quality, Solid Waste Assessment Test* (MARK, 1990), and *Final Report, RCRA Facility Investigation, USS-POSCO Industries, Pittsburg, California* (MARK, 1998).

3.2.2 Site Description

Prior to remediation, surface conditions consisted of sludge with some areas covered with soil. Most areas were covered with vegetation.

COIs included arsenic, chromium, lead, zinc, TPH, and O&G.

Dried sludge and underlying fill materials (SWMU 24.1-1 only) located at Site L-A were planned for remediation because the arsenic concentrations exceed the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic (160 mg/kg) and the RFI screening criterion (construction worker HBL) for arsenic (230 mg/kg). The highest reported concentration of arsenic in sludge was 1,200 mg/kg and in underlying fill soils was 440 mg/kg. It was estimated that approximately 81,000 cubic yards of dried sludge would be excavated from SWMUs 24.5-1, 24.5-2, and 24.5-3 as part of the corrective action.

3.2.3 Remediation

3.2.3.1 Remediation Plan

Dried sludge from areas SWMU 24.1-1, SWMU 24.1-2, and SWMU 24.1-3 were to be removed and placed in the on-site Unit I CAMU. Because dried sludge was historically discharged to the ground surface, the volume of backfill needed to fill the remedial excavations was estimated to be minimal. General grading in the vicinity of the SWMU 24.1 was planned, and as necessary, with surrounding soils after dried sludge removal.

Underlying fill soil was to be removed to the extent it contains arsenic at concentrations exceeding the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic (160 mg/kg). Only one sample from underlying fill soils from prior investigations was found with arsenic concentrations above 160 mg/kg: the SWMU 24.1-1 sample collected during the Waste Characterization Program (Dames & Moore, 1984). The SWMU 24.1-1 sample was taken from the northeast quadrant of the SWMU 24.1-1 dried sludge disposal area. The fill material sample collected and analyzed at 1 foot below the dried sludge reported an arsenic concentration of 440 mg/kg. The native soil sample collected at 2 feet below the dried sludge at the same sampling location reported an arsenic concentration of 17 mg/kg (below the approved background concentration for arsenic at the UPI plant [24 mg/kg]). Fill material underlying the dried sludge was to be removed and stockpiled for remediation (i.e., disposal in the on-site Unit I CAMU). The northeast quadrant of SWMU 24.1-3 was estimated to be approximately 0.5 acres. At an assumed depth of fill of 1 foot, approximately 800 cubic yards of fill material was estimated for remediation.

3.2.3.2 Remediation Activities

UPI plant plans were reviewed and the areas planned for remediation screened for buried structures or utilities. Remediation activities consisted of excavation of material/soils within SWMUs 24.1-1, 24.1-2, and 24.1-3, visual confirmation of the presence of dried sludge, backfill, and disposal. Excavated remediation material/soils were place on plastic sheeting, bermed, and covered with plastic sheeting (plastic sheets were taped together and secured in place) until transported to an appropriate disposal facility. The lateral extent of remedial excavation is shown on Figures 7 and 8. Copies of the daily field reports that URS prepared as part of construction monitoring documentation are provided in Appendix A.

A summary of the SWMU areas and the estimated dried sludge excavation quantities based on the field survey data is presented below:

SWMU 24.1 Designations	Excavation Area (acres)	Approximate Excavation Quantities (lcy)
24.1-1	3.73	26,800
24.1-2	8.46	40,900
24.1-3	6.42	44,800
Totals	**18.61**	**112,500**

3.2.3.2.1 SWMU 24.1-1 (Dried Sludge Disposal Area North)

Prior to sludge remedial excavation and removal, approximately 10,000 cubic yards of non-sludge overburden soils were excavated, stockpiled, and reused as backfill material. Remediation activities consisted of remedial excavation of dried sludge, visual confirmation of dried sludge removal, backfill, and Unit I CAMU disposal.

Excavation of dried sludge was conducted in an area of approximately 3.7 acres to depths ranging from 3 to 10 feet. The final excavation configuration is bound by the primary east-west access road to the south, the incoming water filter plant to the west, the wooded area to the north and east.

A thin seam of fill material sandwiched between a top layer of dried sludge and a bottom layer of native soils was excavated, segregated, and sampled for confirmation and classification. The COIs in the fill material were arsenic, chromium, and lead.

The removal of the dried sludge was visually confirmed on the west and northwest excavation side walls. A thin seam of sludge (12 inches or less) was left in place along the northeast, east, and south excavation side walls at depths ranging from 4 to 8 feet below existing grade. The wooded area to the east of SWMU 24.1-1 prevented further excavation along the northeastern and eastern portions of the excavation. Further excavation to the south would have taken the primary east-west access road out of service. The seams of dried sludge were sampled and analyzed for the COI (arsenic), as discussed below.

This SWMU was backfilled with non-SWMU imported soils from Site L-A and from an off-site source located south of Site L-A between the Pittsburg-Antioch Highway and California Avenue (part of the City of Pittsburg Kirker Creek widening project).

3.2.3.2.2 SWMU 24.1-2 (Dried Sludge Disposal Area South)

Remedial activities consisted of remedial excavation of dried sludge, visual confirmation of dried sludge removal, backfill, and Unit I CAMU disposal. Excavation of dried sludge was conducted in an area of approximately 8.5 acres to depths ranging from 4 to 10 feet. The final remedial excavation configuration is within the area bound by the primary east-west access road to the north, the UPI parking lot to the west, Kirker Creek to the south, and a secondary north-south-oriented haul road to the east.

A thin seam of dried sludge was left in place at 3 locations within SWMU 24.1-2, including:

- Underneath a nitrogen gas pipeline at the far south end of SWMU 24.1-2: The nitrogen pipeline, which was installed by the City of Pittsburg in 2002, runs the entire length of Site L-A in an east-west direction. The seam of dried sludge was sampled and analyzed for the COI (arsenic).
- At the north end of SWMU 24.1-2: This seam is located underneath the primary east-west access road in the northeast corner of the site. Dried sludge was not removed from underneath the access road because it would have taken the road out of service for an extended period of time. Dried sludge from underneath the primary east-west access road was sampled and analyzed for the COI (arsenic).
- Underneath a thick layer of soil and debris, estimated to be 4 to 6 feet in depth, in the northeast corner of the SWMU: Dried sludge from underneath the debris layer was sampled and analyzed for the COI (arsenic).

This SWMU was backfilled with non-SWMU soils from Site L-A and an off-site source located south of Site L-A between the Pittsburg-Antioch Highway and California Avenue (part of the City of Pittsburg Kirker Creek widening project).

3.2.3.2.3 SWMU 24.1-3 (Dried Sludge Disposal Area East)

Remedial activities consisted of remedial excavation of dried sludge, visual confirmation of dried sludge removal, backfill, and Unit I CAMU disposal. Excavation of dried sludge was conducted in an area of approximately 6.4 acres to depths ranging from 4 to 10 feet. The final remedial excavation configuration is within an area bound by the primary east-west access road to the south, the wooded area to the west, the railroad right-of-way and SWMU 24.5-3 to the north, and a secondary north-south-oriented haul road to the east. No dried sludge materials were left in place in SWMU 24.1-3, as visually confirmed by URS field staff.

Excavation of SWMU 24.1-3 uncovered three distinct materials that were treated separately from dried sludge, and included:

- Drums of unknown material were discovered at the northeast end of SWMU 24.1-3. The drums were excavated, stockpiled, and segregated from other remediation material/soil; sampled; and analyzed for the full suite of RFI analyses, as discussed below. The location of this area is shown on Figure 3.
- A new oil disposal area identified as SWMU 24.5-5 (i.e., Oil Disposal Area 5) was discovered in the north/northeast corner of SWMU 24.1-3. See Section 3.4 for information regarding remediation of SWMU 24.5-5. The location of this area is shown on Figure 3.

- Several small lead scale disposal areas, collectively identified as SWMU 24.3-5, were observed along the central east end of SWMU 24.1-3. As many as 16 separate small-quantity (less than 5 cubic yards per occurrence) lead scale disposal areas were excavated, stockpiled, and segregated; sampled; and analyzed for lead, as discussed in Section 3.3. The location of this area is shown on Figure 3.

This SWMU was backfilled with clean soils from Site L-A and an off-site source located south of Site L-A between the Pittsburg-Antioch Highway and California Avenue (part of the City of Pittsburg Kirker Creek widening project).

3.2.4 Remediation Confirmation

3.2.4.1 Remediation Confirmation Plan

Visual confirmation was to be used to verify the removal of the dried sludge within all SWMU 24.1-1, -2, and –3 areas. The dried sludge is characterized by its reddish brown color, and easily distinguished from other soils. Visual confirmation was also to be used to confirm the removal of the fill material, which typically contains gravel and/or rubble (e.g., brick fragments).

3.2.4.2 Remediation Confirmation and Analysis

For dried sludge left in place in SWMUs 24.1-1 and 24.1-2, confirmation soil sample locations are shown on Figure 7. The confirmation analytical results are summarized in Tables 3-1 and 3-2, and the analytical laboratory reports are provided in Appendix B.

3.2.4.2.1 SWMU 24.1-1 (Dried Sludge Disposal Area North)

Dried sludge was found significantly beyond its estimated lateral extent to the northeast, east, and south. Excavation was terminated along the eastern extent of the wooded area (between SWMUs 24.1-1 and 24.1-2) to prevent a major disturbance of this area and because the Unit I CAMU was near capacity. Dried sludge was also left in place along the south end of the SWMU, underneath the primary east-west access road. In those areas where dried sludge was left in place, soil samples were collected along the excavation side walls at a frequency of one sample per 1,000 lineal feet of side wall. Eleven side wall soil samples were collected and transported to STL under chain-of-custody procedures for the analyses of total arsenic. Samples were combined in the laboratory into 6 composite samples designated S24.1-1-SWS-01, S24.1-1-SWS-02A,B, S24.1-1-SWE-01A,B, S24.1-1 SWE-02A,B, S24.1-1 SWN-01A,B, and S24.1-1 SWN-02A,B.

The results of the dried sludge analyses for total arsenic were reported as being between 82 mg/kg and 160 mg/kg. These in-place results were evaluated using the 95 percent upper confidence interval statistical analysis per SW-846 (with updates in 1994 and 1995). The statistical analysis is provided in Table E3 of Appendix E. The results indicated that the upper 95 percent confidence interval was below the site-specific soil cleanup level for arsenic (160 mg/kg), and no further remediation was warranted.

3.2.4.2.2 SWMU 24.1-2 (Dried Sludge Disposal Area South)

In those areas where dried sludge was left in place, soil samples were collected along the excavation side walls at a frequency of one sample per 1,000 lineal feet. Four soil samples were collected and transported to STL under chain-of-custody procedures for the analyses of total arsenic. Samples were combined in the laboratory into 2 composite samples (S24.1-2 SWN-01A,B and S24.1-2 SWE-01A,B). The results of this SWMU analysis are summarized on Tables 3-1 and 3-2. Total arsenic concentrations were reported to be 97 and 140 mg/kg, respectively. These concentrations are below the site-specific soil cleanup level for total arsenic (160 mg/kg).

Four dried sludge samples (S24.1-2-BR-01 through -04) were collected along the exposed face of the roadway that encased the existing buried nitrogen pipeline parallel to Kirker Creek. The samples were transported under chain-of-custody procedures to STL for analyses. The four discrete dried sludge samples (S24.1-2-BR-01 through -04) that were collected along the exposed roadway cut were combined in the laboratory to produce one four-point composite sample, which was analyzed for total arsenic. The results for the dried sludge samples collected along the road were reported to be below the final site-specific soil cleanup level for total arsenic (160 mg/kg).

3.2.4.2.3 SWMU 24.1-3 (Dried Sludge Disposal Area East)

Dried sludge was not sampled at SWMU 24.1-3 because visual inspection was used to confirm dried sludge removal. Using this method, the dried sludge was confirmed to have been removed. The analytical data obtained for the drums were used for classification purposes (see Section 3.2.5). The confirmation analyses for the two other unanticipated remediation areas identified in SWMU 24.1-3 are discussed below with SWMUs 24.3 and 24.5, respectively.

3.2.5 Waste Quantities and Classification

The combined quantity of remediation material/soil excavated from SWMUs 24.1-1, 24.1-2, and 24.1-3 that was disposed of in the Unit I CAMU was approximately 112,500 lcy. This volume includes dried sludge and the fill material from SWMU 24.1-1, but excludes all drum waste.

- **SWMU 24.1-1:** Within the course of excavating SWMU 24.1-1, a thin layer of a fill material was observed between 4 to 8 feet bgs. Samples of this fill were collected at the same frequency as for the dried sludge seam. Eight soil samples (S24.1-1-FILL-01 through S24.1-1-FILL-08) of the fill were collected from the side walls, transported to STL under chain-of-custody procedures, and analyzed for TCLP-arsenic, TCLP-chromium, and TCLP-lead. The analytical results of the 8 fill samples were reported as being below the laboratory detection levels.
- **SWMU 24.1-2:** One field-composited soil sample (S24.1-2-US-01) was collected from below the remediated dried sludge in unidentified non-native fill at the far south end of the SWMU. The sampled was transported to STL under chain of custody procedures, and analyzed for CAM 17 metals. The analytical results were reported below site-specific cleanup criteria.

- **SWMU 24.1-3:** The stockpile of 55-gallon drums (SWMU 24.1-3) and miscellaneous debris that was discovered in the northeast end of the SWMU amounted to approximately 16 lcy. The material inside the drums was sampled, transported to STL under chain-of-custody procedures, combined in the laboratory to produce two four-point composite samples (based on like material), and analyzed for the RFI analytical criteria, which included the following: 1) Priority Pollutants Metals (USEPA Method 6010B/7471A), 2) VOCs (USEPA Method 8260B), 3) SVOCs (USEPA Method 8270C), and 4) PCBs (USEPA Method 8082).

  Eight soil samples (S24.1-3-DRUM-01 through S24.1-1-DRUM-08) of the drum material were collected, transported to STL under chain-of-custody procedures, combined in the laboratory into 2 composite samples (S24.1-3 DRUM-01-04 and S24.1-3 DRUM-05-08), and analyzed for Priority Pollutant Metals. The results of the Priority Pollutant Metals analysis for composite sample S24.1-3-DRUM-05-08 (see Table 3-2) indicated elevated levels (20 x the TCLP concentration) of arsenic, chromium, and lead (no TCLP concentration criteria exist for copper and nickel). To further characterize this material, TCLP extractions were performed on composite sample S24.1-3-DRUM-05-08 for the analyses of arsenic, chromium and lead. The TCLP results were reported (see Table 3-1) to be below RCRA hazardous level for arsenic, at the RCRA hazardous level for chromium, and above the RCRA hazardous level for lead. The results of the VOC, SVOC, and PCB analyses are provided on Table 3-1.

The classification analytical results are summarized on Tables 3-1 and 3-2. All drum waste was transported in two loads to Kettleman Hills Hazardous Waste Management Facility for Class I disposal (one load as RCRA waste and one load as non-RCRA waste). Analytical laboratory reports are provided in Appendix B. Table 2-8 presents the material-handling summary for SWMU 24.1. This table provides an accounting of the remediation material/soil that were disposed of at either the Unit I CAMU or an appropriate off-site disposal facility. The waste profiles and hazardous waste manifests are provided in Appendices C and D, respectively.

3.3 SWMU 24.3: LEAD SCALE DISPOSAL AREAS

3.3.1 Locations

Six Lead Scale Disposal Areas, collectively identified as SWMU 24.3, are located in the central and eastern portions of Site L-A, as shown on Figure 2. SWMUs 24.3-1, -2, -3, -4, and –6 were identified in the CMS Workplan (URS, 1999). As explained within this section, SWMU 24.3-5 was identified during remediation activities. The individual SWMU designations reported in the CMS Workplan (URS, 1999) and the corresponding estimated areas prior to remediation were:

- SWMU 24.3-1: Lead Scale Disposal Area No. 1 - 0.04 acres
- SWMU 24.3-2: Lead Scale Disposal Area No. 2 - 0.009 acres
- SWMU 24.3-3: Lead Scale Disposal Area No. 3 - 0.02 acres
- SWMU 24.3-4: Lead Scale Disposal Area No. 4 - 0.03 acres
- SWMU 24.3-6: Lead Scale Disposal Area No. 6 - 0.03 acres.

The locations and lateral extent of each SWMU were based on information obtained from previous investigations, including *Waste Characterization Program, Waste Disposal Site L-A* (Draft Report) (Dames and Moore, 1984), *Water Quality, Solid Waste Assessment Test, Site L-A, USS-POSCO Industries, Pittsburg, California* (MARK, 1990), and *Final Report, RCRA Facility Investigation, USS-POSCO Industries, Pittsburg, California* (MARK, 1998). Previous reports identified SWMU 24.3-6 as SWMU 24.3 (East), and SWMU 24.3-1, -2, -3, and – 4 as SWMU 24.3 (Central). SWMU 24.3-5 was discovered near SWMU 24.3 (Central), and is considered to be part of this grouping.

3.3.2 Site Description

Prior to remediation, the lead scale at each SWMU location was covered with a minimum of 1 foot of soil or slag. The only COI was lead.

- Based on the evaluation of analytical data presented in the Corrective Measures Study Workplan (URSGWC, 1999), lead scale located at Site L-A, and specifically within the 6 individual SWMU 24.3 areas, was planned for remediation because lead concentrations exceeded the site-specific soil cleanup level calculated for the industrial/commercial worker for lead (5,500 mg/kg) and the RFI screening criteria (construction worker HBL) for lead (1,200 mg/kg).

3.3.3 Remediation

3.3.3.1 Remediation Plan

The lateral extent of the lead scale at each location was not known and was not anticipated to be the same at any two locations. Overburden (soil and slag) at each location was planned to be removed to expose lead scale.

An initial excavation of overburden within an area of approximately 30 feet by 30 feet was to be made at each location. The excavated overburden was to be stockpiled and later used as backfill material. Exposed lead scale was to be excavated and stockpiled for disposal (i.e., lead scale from SWMU 24.3-6 could have been disposed in the Unit I CAMU provided that it met requirements for California regulated waste, while lead scale from SWMUs 24.3-1, -2, -3, and –4 was to be disposed off-site). Should the lateral limits of lead scale extend outside of the initial excavation area, additional overburden was to be excavated until no visual evidence of lead scale existed. The quantity of remediation materials/soils that was to be generated from each lead scale excavation was estimated to be approximately 40 cubic yards, or a total of 200 cubic yards from the five known lead scale locations.

After remediation was complete, confirmation sampling and analysis was to be performed at each excavation prior to backfilling. SWMU 24.3 excavations were backfilled with soil located in the immediate vicinity of each excavation to the elevations and grades of the surrounding soils.

3.3.3.2 Remediation Activities

Prior to excavation, UPI plant plans were reviewed and the areas planned for remediation screened for buried structures or utilities. Remediation activities consisted of excavation of material/soil from each SWMU 24.3 area, stockpiling, confirmation sampling and analysis, backfill, classification sampling and analysis, and disposal. Excavated remediation material/soils were place on plastic sheeting, bermed, and covered with plastic sheeting (plastic sheets were taped together secured in place) until transported to an appropriate disposal facility. The lateral extent of remedial excavation is shown in Figure 3. Copies of the daily field reports that URS prepared as part of construction monitoring documentation are provided in Appendix A.

A summary of the SWMU areas and the estimated excavation quantities based on field survey data is presented below:

SWMU 24.3 Designations	Excavation Area (acres)	Approximate Excavation Quantities (lcy)
24.3-1	0.01	15
24.3-2	0.04	100
24.3-3	0.02	100
24.3-4	0.03	50
24.3-5	0.88	300
24.3-6	0.03 (estimated)	100 (estimated)
Totals	**1.33**	**665**

3.3.3.2.1 SWMUs 24.3-1, 24.3-2, 24.3-3, 24.3-4

Remediation activities at SWMUs 24.3-1, 24.3-2, 24.3-3, and 24.3-4 consisted of excavation to remove lead scale, stockpiling, confirmation sampling and analysis, backfill, and disposal. Lead scale was initially identified in the field as a black sand-like material. This material was excavated until no lead scale was observed in the excavation. Lead scale material/soil was then stockpiled on plastic sheeting segregated from other stockpiles and covered (see *Remediation Confirmation Sampling and Analysis Plan (Revision 1), USS-POSCO Industries, Pittsburg, California)* (URS, 2002c).

The location of SWMU 24.3-1 may be in question because only 1 out of a total of 11 discrete soil samples reported total lead concentrations that are indicative of lead scale. Eleven analytical soil samples were collected in the general proximity of the SWMU 24.3-1 location, as shown in the CMS. The only location to indicate the presence of lead scale was the one from which sample S24.3-L2B-SCALE-09 was obtained. This deposit of lead scale represented less than 5 cubic yards of material, and was added to the SWMU 24.3-4 stockpile for characterization and disposal. To take a conservative approach, an additional 10 cubic yards of material was excavated and added to the SWMU 24.3-4 stockpile (see Section 3.3.4.3 for confirmation sampling and analysis).

Remediation activities at SWMU 24.3-5 (discovered within SWMU 24.1-3) proceeded as discussed above for SWMUs 24.3-1 through 24.3-4.

The SWMU 24.3 sites were backfilled with clean soils from Site L-A, and an off-site source located south of Site L-A between the Pittsburg-Antioch Highway and California Avenue (part of the City of Pittsburg Kirker Creek widening project).

3.3.3.2.2 SWMU 24.3-5

One previously unidentified lead scale disposal area, identified as SWMU 24.3-5, was discovered during remediation of SWMU 24.1-3. This SWMU consisted of 12 small-quantity deposits of lead scale along the eastern-most limits of SWMU 24.1-3. These lead scale deposits were grouped together as SWMU 24.3-5. Once the SWMU 24.3-5 deposits were visually identified, remediation and confirmation sampling proceeded as planned for all lead scale disposal areas in accordance with *Remediation Confirmation Sampling Plan and Analysis Plan (Revision 1), USS-POSCO Industries, Pittsburg, California* (URS, 2002c).

This SWMU was backfilled with clean soils from Site L-A and an off-site source located south of Site L-A between the Pittsburg-Antioch Highway and California Avenue (part of the City of Pittsburg Kirker Creek widening project).

3.3.3.2.3 SWMU 24.3-6

SWMU 24.3-6 was entirely contained within SWMU 24.8. Remediation material/soil from SWMU 24.8 (including SWMU 24.3-6) was excavated, confirmation and classification sampling and analysis performed, and the excavation backfilled with imported fill from the City of Pittsburg Kirker Creek widening project. See Section 3.5 for details of the SWMU 24.8 remediation, analytical data and disposal.

3.3.4 Remediation Confirmation

3.3.4.1 Remediation Confirmation Plan

To verify that lead concentrations in the soils remaining after remediation were below the RFI construction worker screening level health-based risk level (HBL) (1,200 mg/kg) [reference: *Remediation Confirmation Sampling Plan and Analysis Plan (Revision 1), USS-POSCO Industries, Pittsburg, California* (URS, 2002c)], an estimated five soil samples were to be collected from randomly-selected locations within each lead scale location (one from the bottom and four from the sides of the excavation). Sampling frequency was to be based on one sample for approximately every 1,000 square feet of surface area, with a minimum of one sample per excavation panel (i.e., bottom or side of the excavation). To select the sampling locations, each panel was to be divided into sectors that correspond to the number of samples to be collected from the panel based on the square footage of panel surface area. Each sector was to be divided into six subsectors. One of the six subsectors from each sector was to be randomly selected for sampling by a toss of a single die.

At each sampling location, confirmation samples were to be collected by using an aluminum tube-lined drive sampler (or equivalent sampling device) or by placing representative samples into a wide-mouth sample container using a hand trowel.

The soil samples were to be submitted to a DHS-certified laboratory for analysis. The samples were to be analyzed for lead in accordance with USEPA Method 6010.

The need for further remediation was to be evaluated based on the analytical results. If the analytical results, as determined by the approved statistical evaluation for the upper 95 percent confidence interval, were below the HBL (1,200 mg/kg) then no further remediation would be warranted. If the analytical results based on the statistical evaluation was above the site-specific soil cleanup level for lead, then an additional 1 foot of soil was to be excavated from the sector(s). After additional soil removal, an additional confirmation soil sample(s) was to be collected (as described above) from the affected sector(s). Further remediation would be warranted if the analytical results, based on the statistical evaluation, were above the site-specific soil cleanup level for lead. This process was to be repeated until the analytical results for the entire SWMU, based on the statistical evaluation, were below the site-specific soil cleanup level for lead.

3.3.4.2 Deviations from the Remediation Confirmation Plan

One deviation from the Remediation Confirmation Plan was identified during the preparation of this Report. The site-specific risk based soil cleanup level for lead calculated for the industrial/commercial worker (5,500 mg/kg) was inadvertently used as the target cleanup criteria in place of the construction worker HBL (1,200 mg/kg). Based on confirmation sampling and analysis, this deviation affects SWMUs 24.3-3, 24.3-4, and 24.3-5 as discussed below in Section 3.3.4.3. It is estimated that less than 300 cubic yards of material/soil with lead concentrations exceeding the construction worker HBL remain on-site underneath a two-foot layer (minimum) of clean cover soil.

Because lead scale deposits are potentially located at random within SWMU 24.2 (Open Hearth Furnace Slag Disposal Area), a Site Specific Health and Safety Plan (SSHSP) is required to be prepared prior to any grading and/or excavation work within SWMU 24.2 for construction worker protection. Both a deed restriction and the UPI Grading/Excavation Permit Program will specify the requirement that a SSHSP be prepared prior to any future grading or excavation in SWMU 24.2. SWMUs 24.3-3, 24.3-4, and 24.3-5 are located within the footprint of SWMU 24.2.

3.3.4.3 Remediation Confirmation and Analysis

The Lead Scale Disposal Areas were sampled and analyzed to confirm contaminant removal in accordance with the Remedial Confirmation Plan (Section 3.3.4.1). The confirmation soil sample locations for SWMUs 24.3-1 through 24.3-5 are shown in Figure 8 and the confirmation soil sample location for SWMU 24.3-6 is shown in Figure 10. Soil samples were collected in each SWMU 24.3 location with the exception of SWMU 24.3-5, which is explained in Section 3.3.3.2.1. The confirmation analytical results are summarized in Tables 3-1 and 3-2, and the analytical laboratory reports are provided in Appendix B.

A summary of the confirmation sampling and analyses is provided below by SWMU.

- **SWMU 24.3-1:** URS collected 11 lead scale soil samples (S24.3-L2B-SCALE-01 through S24.3-L2B-SCALE-11) and transported them under chain-of-custody procedures to STL for analysis of total lead (USEPA Method 6010B). The range of total lead concentrations

reported was 52 mg/kg (S24.3-L2B-SCALE-07) to 49,000 mg/kg (S24.3-L2B-SCALE-09). Nine of 11 reported sample results for lead were reported at or below 360 mg/kg. The highest sample result for lead (49,000 mg/kg) was over 27 times higher than the next highest sample result of 1,800 mg/kg (S24.3-L2B-SCALE-01). As discussed above, the one sample (S24.3-L2B-SCALE-09) that indicated the presence of lead scale amounted to less than 5 lcy.

No further confirmation sampling and analysis of the S24.3-L2B-SCALE-09 location occurred because of the limited quantity of lead scale observed, and because the material underlying the lead scale was dried sludge from SWMU 24.1-3, which was removed as part of the SWMU 24.1-3 remediation. Other than the S24.3-L2B-SCALE-09 sample, all results were below the site-specific soil cleanup level, and no further remediation was warranted.

- **SWMU 24.3-2:** URS collected 5 lead scale samples (S24.3-S02-CONF-01 through S24.3-S02-CONF-05) and transported them under chain-of-custody procedures to STL for analysis of total lead (USEPA Method 6010B). The range of total lead concentrations reported was 51 mg/kg (S24.3-S02-CONF-03) to 720 mg/kg (S24.3-S02-CONF-01). All results were below the site-specific soil cleanup level for lead (5,500 mg/kg) and the HBL (1,200 mg/kg), and no further remediation was warranted.
- **SWMU 24.3-3:** URS collected 5 lead scale samples (S24.3-S07-CONF-01 through S24.3-S07-CONF-05) and transported them under chain-of-custody procedures to STL for analysis of total lead (USEPA Method 6010B). The range of total lead concentrations reported was 27 mg/kg (S24.3-S07-CONF-03) to 8,300 mg/kg (S24.3-S07-CONF-02). Four of the 5 sample results for lead were reported at or below 400 mg/kg. This data set was evaluated using the DTSC-approved 95 percent upper confidence interval statistical analysis per SW-846. The statistical analysis is provided in Table E4 of Appendix E. The results indicated that the upper 95 percent confidence interval was below the site-specific soil cleanup level for lead (5,500 mg/kg), and no further remediation was warranted.
- **SWMU 24.3-4:** URS collected 5 lead scale samples (S24.3-S15-CONF-01 through S24.3-S15-CONF-05) and transported them under chain-of-custody procedures to STL for analysis of total lead (USEPA Method 6010B). The range of total lead concentrations reported was 5.5 mg/kg (S24.3-S15-CONF-05) to 5,700 mg/kg (S24.3-S15-CONF-02 and S24.3-S15-CONF-02). This data set was evaluated using the 95 percent upper confidence interval statistical analysis per SW-846. The statistical analysis is provided in Table E5 of Appendix E. The results indicated that the upper 95 percent confidence interval was below the site-specific soil cleanup level, and no further remediation was warranted.
- **SWMU 24.3-5:** URS initially collected 16 lead scale samples (S24-SCALE-01-04 through S24-SCALE-13-16, S24.3-1-CONF-01-05 through S24.3-16-CONF-01-05) and transported them under chain-of-custody procedures to STL, where they were combined in the laboratory to produce four composite samples, and analyzed for total lead (USEPA Method 6010B). The range of total lead concentrations reported was 7,600 mg/kg to 18,000 mg/kg. Thus, additional remedial excavation and sampling were performed. The second round of confirmation sampling generated 12 four-point composite samples, which were analyzed for total lead (USEPA Method 6010B). The concentrations ranged from 150 mg/kg (S24.3-10-CONF-01-05) to 11,000 mg/kg (S24.3-04-CONF-01-05). This data set was evaluated using the 95 percent upper confidence interval statistical analysis per SW-846. The statistical analysis is provided in Table E6 of Appendix E. The results indicated that the

upper 95 percent confidence interval was below the site-specific soil cleanup level, and no further remediation was warranted.

- **SWMU 24.3-6:** No confirmation sampling and analysis was performed at this site, as discussed in Section 3.3.3.2.3.

3.3.5 Waste Quantities and Classification

Classification soil samples were collected at a frequency of one sample per 100 cubic yards of stockpiled soil for SWMUs 24.3-2, 24.3-3, 24.3-4, and 24.3-5. No classification samples were collected from SWMU 24.3-1 because the limited amount of lead scale from this location was added to the SWMU 24.3-4 stockpile. No classification samples were collected from SWMU 24.3-6 because this material was remediated with SWMU 24.5-1. The classification soil samples were transported under chain-of custody procedures to STL for the analysis of TCLP-lead (USEPA Method 3010A/6010B).

- **SWMU 24.3-1:** Less than 15 lcy were generated as part of the remediation of SWMU 24.3-1. This quantity was added to the RCRA waste from SWMU 24.3-4, which was sent to Kettleman Hills Hazardous Waste Management Facility for Class I disposal.
- **SWMUs 24.3-2 and 24.3-3:** The analytical results from 5 confirmation samples (per SWMU) indicated elevated lead levels above 20 times the TCLP concentration. A single classification sample was collected from each of SWMUs 24.3-2 and 24.1-3 and analyzed for TCLP-lead. The results indicated that stockpile soils from SWMUs 24.3-2 and 24.3-3 were below the RCRA waste classification limit for lead (5 mg/l), and as a consequence, approximately 100 lcy from each SWMU (200 lcy combined) were disposed in the Unit I CAMU.
- **SWMU 24.3-4:** The analytical results from 5 confirmation samples indicated elevated lead levels above 20 times the TCLP concentration. The classification result for SWMU 24.3-4 was reported as 8.6 mg/l, which is above the RCRA waste classification limit. This material was classified as a RCRA waste requiring treatment and Class I disposal. Approximately 50 lcy of SWMU 24.3-4 remediation material/soils were subsequently transported to Kettleman Hills Hazardous Waste Management Facility for Class I disposal. The waste profiles and hazardous waste manifests are provided in Appendices C and D, respectively.
- **SWMU 24.3-5:** The analytical results from 16 confirmation samples indicated elevated lead levels above 20 times the TCLP concentration. Two classification samples were collected from each of SWMU 24.3-5 and analyzed for TCLP-lead. The results indicated that stockpile soils from SWMU 24.3-5 were below the RCRA waste classification limit for lead (5 mg/l), and as a consequence, approximately 300 lcy were disposed of in the Unit I CAMU.

The classification analytical results are summarized in Tables 3-1 and 3-2, and the analytical laboratory reports are provided in Appendix B. Table 2-8 presents the material-handling summary for SWMU 24.3. This table provides an accounting of the remediation material/soils that were disposed of at either the Unit I CAMU or an appropriate off-site facility.

3.3.5.1 Deviations from the Remediation Disposal Plan

One deviation from the Remediation Disposal Plan was identified during the preparation of this Report:

- Lead scale from Lead Scale Disposal Areas (Central) was to be disposed off-site as stipulated in the Corrective Action Consent Agreement. In the case of SWMUs 24.3-2, -3, and –5, remediation material/soil was inadvertently disposed in the Unit I CAMU (combined quantity approximately 500 lcy, all classified as non-RCRA).

DTSC suggested that that lead scale from Lead Scale Disposal Areas (Central) be disposed off-site because sufficient groundwater data downgradient of the Lead Scale Disposal Areas (Central) does not exist to demonstrate that lead scale had not impacted groundwater quality. However, the inclusion of this relatively small quantity of non-RCRA hazardous lead impacted soil in the Unit I CAMU will not affect Site L-B goundwater quality. The Unit I CAMU is an engineered facility designed to inhibit the migration of moisture below the cap, which consists of (from top to bottom) a 2-foot vegetative soil layer, geocomposite drain, and low-permeability geosynthetic clay liner. The Unit I CAMU is a permitted, regulated and monitored facility. Downgradient groundwater from wells M-02, M-03, M-04, M-04S, M-04D, M-05 is monitored at three depth intervals to provide assurance that the lead scale in the Unit I CAMU will not impact groundwater.

3.4 SWMU 24.5: OIL DISPOSAL AREAS

3.4.1 Location

Four Oil Disposal Areas, collectively identified as SWMU 24.5, are located in the central and eastern portions of Site L-A, as shown on Figure 2. Waste oils from plant operations were disposed of at locations within the north-central portion of Site L-A (Figure 2).

The individual SWMU designations reported in the CMS (URS, 2000) and the corresponding estimated areas prior to remediation were:

- SWMU 24.5-1: Oil Disposal Area No. 1 - This area is located within the southeastern portion of Site L-A and covers approximately 0.08 acres.
- SWMU 24.5-3: Oil Disposal Area No. 3 - This area is located within the north-central portion of Site L-A and covers approximately 0.2 acres.
- SWMU 24.5-4: Oil Disposal Area No. 4 - This area is located within the west-central portion of Site L-A and covers approximately 0.1 acres.

The document titled *Remediation Confirmation Sampling and Analysis Plan (Revision 1), USS-POSCO Industries, Pittsburg, California* (URS, 2002c) addresses oily waste from SWMU 24.5-3 and SWMU 24.5-4, but does not address SWMU 24.5-1 and SWMU 24.5-5. SWMU 24.5-1 contained PCBs and was remediated in accordance with the TSCA regulations, *Notice – Self-Implementation of On-Site Cleanup and Disposal of PCB Remediation Material/Soil, USS-POSCO Industries, Pittsburg, California* (URS, 2001b), and *Application for a Part B Permit (Revision 3), USS-POSCO Industries, Pittsburg, California* (URS, 2002a). SWMU 24.5-1 is

addressed in Section 2.2. SWMU 24.5-5 was not discovered until remediation of SWMU 24.1-3 was in progress, and is addressed below.

3.4.2 Site Description

Prior to remediation, surface conditions consisted of oily waste with some areas covered with soil. Most areas were covered with vegetation.

COIs included: O&G, VOCs, SVOCs, and metals.

Prior to the RFI, two investigations had been conducted to evaluate the conditions within Site L-A. The reports resulting from these investigations include the following:

- *Waste Characterization Program, Waste Disposal Site L-A*, Draft Report (Dames and Moore, 1984)
- *Water Quality, Solid Waste Assessment Test, USS-POSCO Industries, Pittsburg, California* (MARK 1990)

Based on the evaluation of analytical data presented in the CMS Workplan (URSGWC, 1999), oily waste located at Site L-A was planned for remediation because:

- Oil was exposed on the ground surface with concentrations of arsenic above the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic (160 mg/kg), and the RFI screening criterion (construction worker HBL) for arsenic (230 mg/kg).

The highest reported concentration of arsenic in the oily waste was 408 mg/kg.

3.4.3 Remediation

3.4.3.1 Remediation Plan

Within the SWMU 24.5-3 area, oily waste is exposed on the surface at some locations. Other locations are covered with soil and vegetation. This overburden would be excavated, stockpiled, and later used as backfill material. Oily waste has been detected to a maximum depth of 10 feet. Oily waste would be excavated and stockpiled for remediation (i.e., disposal in the on-site Unit I CAMU). The estimated quantity of remediation materials/soils that would be generated from SWMU 24.5-3 is approximately 4,000 lcy (estimated bank yardage increased by 20 percent). Should the excavated overburden appear different than anticipated (from a visual or olfactory perspective), samples of suspect soils would be collected following the procedures identified in Section 3.4.4.2 and analyzed, at a minimum, for arsenic (in accordance with USEPA Method 6010), as arsenic is the chemical exceeding the site specific cleanup level calculated for the industrial/commercial worker for arsenic (160 mg/kg).

SWMU 24.5-4 consists of an oily waste layer of approximately 2 inches thick on the ground surface. Shrubbery within this area would be removed and left on Site L-A. Oily waste and the remaining vegetation would be excavated and stockpiled for remediation (i.e., off-site disposal). The estimated quantity of remediation materials/soils that would be generated from SWMU 24.5-4 is approximately 100 lcy (estimated bank yardage increased by 20 percent).

After remediation is complete, each excavation area would be backfilled with soil located in the immediate vicinity of each excavation to the elevations and grades of surrounding soils.

3.4.3.2 Remediation Activities

Prior to excavation, plant plans were reviewed and/or each excavation location was geophysically screened for buried structures or utilities. Remediation activities consisted of excavation of SWMU 24.5, stockpiling, confirmation sampling and analysis, backfill, and disposal. Excavated remediation material/soils were place on plastic sheeting, bermed, and covered with plastic sheeting (plastic sheets were taped together secured in place) until transported to an appropriate disposal facility. The lateral extent of remedial excavation is shown on Figure 3. Copies of the daily field reports that URS prepared as part of construction monitoring documentation are provided in Appendix A.

A summary of the SWMU areas and estimated excavation quantities based on field survey data is presented below:

SWMU 24.5 Designations	Excavation Area (acres)	Approximate Excavation Quantities (lcy)
24.5-3	0.52	6,660
24.5-4	0.06	30
24.5-5	0.17	1,300
Totals	**0.75**	**8,000**

Note: See Section 2.2 for documentation for SWMU 24.5-1

3.4.3.2.1 SWMU 24.5-3

A significant quantity of overburden soils was removed from SWMU 24.5-3 before remediation of oily waste was implemented. It is estimated that approximately 1,500 cubic yards of overburden soil were excavated, placed in segregated stockpiles, and used for backfill.

Oily waste soils were excavated and stockpiled on plastic sheeting adjacent to the excavation. Remedial excavation and stockpiling progressed until oily waste was no longer visible. Analytical confirmation proceeded as planned for all Oil Disposal Areas in accordance with *Remediation Confirmation Sampling and Analysis Plan (Revision 1), USS-POSCO Industries, Pittsburg, California* (URS, 2002c).

This SWMU was backfilled with clean soils from the overburden source, and from an off-site source located south of Site L-A between the Pittsburg-Antioch Highway and California Avenue (part of the City of Pittsburg Kirker Creek widening project).

3.4.3.2.2 SWMU 24.5-4

Oily waste soils were excavated and stockpiled adjacent to the excavation. Remedial excavation and stockpiling progressed until oily waste was no longer visible. Analytical confirmation proceeded as planned for all Oil Disposal Areas in accordance with *Remediation Confirmation*

Sampling and Analysis Plan (Revision 1), USS-POSCO Industries, Pittsburg, California (URS, 2002c).

This SWMU was backfilled with clean soils from Site L-A.

3.4.3.2.3 SWMU 24.5-5

SWMU 24.5-5 was discovered during the later stages of the remediation of SWMU 24.1-3. Remediation of this SWMU followed the remediation plan for the Oil Disposal Areas, as discussed in Section 3.4.3.1. Oily waste soils were excavated and stockpiled adjacent to the excavation. Remedial excavation and stockpiling progressed until oily waste was no longer visible. Analytical confirmation sampling proceeded as planned for all Oil Disposal Areas in accordance with *Remediation Confirmation Sampling and Analysis Plan (Revision 1), USS-POSCO Industries, Pittsburg, California* (URS, 2002c).

This SWMU was backfilled with clean soils from Site L-A, the overburden source, and an off-site source located south of Site L-A between the Pittsburg-Antioch Highway and California Avenue (part of the City of Pittsburg Kirker Creek widening project).

3.4.4 Remediation Confirmation

3.4.4.1 Remediation Confirmation Plan

To verify that arsenic concentrations in the soils remaining after remediation were below the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic (160 mg/kg), 13 soil samples were to be collected from randomly-selected locations within SWMU 24.5-3 (nine from the bottom and four from the sides of the excavation), and four soil samples were to be collected from randomly-selected locations within SWMU 24.5-4 (all four samples were to be collected from the bottom of the excavation, as there were no planned sides of any significance). Sampling frequency was to be based on selecting one sample for approximately every 1,000 square feet of surface area, with a minimum of one sample per excavation panel (i.e., bottom or side of the excavation). To select the sampling locations, each panel was to be divided into sectors that correspond to the number of samples to be collected from the panel based on the square footage of the panel surface area. Each sector was then to be divided into six subsectors. One subsector from each sector was to then be randomly selected for sampling by a toss of a single die.

At each sampling location, confirmation samples were to be collected by using an aluminum or brass tube-lined drive sampler (or equivalent sampling device) or by placing representative samples into a wide-mouth sample container using a hand trowel.

The soil samples were to be submitted to the laboratory for analysis. The samples were to be analyzed for arsenic in accordance with USEPA Method 6010.

The need for further remediation was to be evaluated based on the analytical results of the confirmation sampling. If the analytical results, based on a statistical evaluation of the upper 95 percent confidence interval per SW-846, were below the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic (160 mg/kg), then no further remediation would be warranted. If the analytical results, based on a statistical evaluation, were

above the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic, then an additional 1 foot of soil was to be excavated from the sector(s) causing the statistical evaluation to exceed the site-specific soil cleanup level for the industrial/commercial worker for arsenic. After additional soil removal, an additional confirmation soil sample(s) was to be collected (as described above) from the sector(s) from which additional soil was removed. The need for further remediation was to be evaluated based on the analytical results of this additional sampling. Further remediation would be warranted if the analytical results, based on a statistical evaluation, were above the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic. This process was to be repeated until the analytical results, based on a statistical evaluation, were below the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic.

The underlying native soils at SWMU 24.5-3 contained O&G but did not require remediation based on evaluations conducted during the RFI (MARK, 1998).

3.4.4.2 Remediation Confirmation and Analysis

The Oil Disposal Areas were sampled and analyzed to confirm contaminant removal in accordance with the Remediation Confirmation Plan (Section 3.4.4.1). The locations of the confirmation soil samples are shown on Figures 8 and 9. A description of the confirmation sampling and analyses is provided below by SWMU. The confirmation analytical results are summarized on Tables 3-1 and 3-2, and the analytical laboratory reports are provided in Appendix B.

- **SWMU 24.5-3:** Visual confirmation was initially used to determine the removal quantity of remediation material/soil. After approximately 4,800 lcy of remediation material/soil was removed and stockpiled, a thin seam of oily soil remained on the east side wall that required remediation. Four confirmation samples were collected from this seam, combined in the laboratory into a single composite sample (S24.5-3-SWE-01-04), transported under chain of custody procedures to STL, and analyzed for CAM 17 metals. The results indicated that all metals were below site-specific clean-up criteria (including state/federal hazardous waste criteria) except for arsenic, which was reported at 180 mg/kg. The seam was excavated with the removal of an additional 1,500 lcy (approximate volume) of material/soil in the easterly direction. The oily seam was visually absent when 22 confirmation samples were collected five weeks after the initial confirmation samples (S24.5-3-SWE-01-04) were collected.

  The confirmation samples were collected at a minimum frequency of one sample per excavation panel, as discussed in Section 3.4.4.1. A total of 22 soil samples were collected for confirmation, transported to STL, and analyzed for total arsenic. The range of total arsenic concentrations reported was 4.1 mg/kg (S24.5-3-CONF-13) to 53 mg/kg (S24.5-3-CONF-05). All results were below the site-specific soil cleanup level for arsenic (160 mg/kg), and no further remedial excavation was warranted.

  After receiving the laboratory results confirming compliance with the site-specific clean-up criteria, 30 confirmation soil samples were collected at surface grade between the stockpile sample location and the SWMU excavation (used by WRS to transport excavation remediation material/soil to stockpile location). These samples were transported to STL under chain of custody procedures for arsenic analysis, and combined in the laboratory into 7 confirmation samples (S24.5-3-CONF-SF-01-04, S24.5-3-CONF-SF-05-08, S24.5-3-CONF-

SF-09-12, S24.5-3-CONF-SF-13-16, S24.5-3-CONF-SF-17-20, S24.5-3-CONF-SF-21-25, and S24.5-3-CONF-SF-26-30). Prior to sample collection, the area was well scraped by the contractor to remove visual staining caused by transporting oily waste to the stockpile location. Sample results reported arsenic concentrations to be equal to or below 31 mg/kg.

- **SWMU 24.5-4:** During the course of excavation, confirmation samples were collected at a minimum frequency of one sample per 1,000 square feet from the bottom of the excavation panel, as discussed in Section 3.4.4.1. A total of four soil samples were collected for confirmation, transported to STL, and analyzed for total arsenic. The range of total arsenic concentrations reported was 11 mg/kg (S24.5-4-CONF-01, -02) to 24 mg/kg (S24.5-4-CONF-04). All results were below the site-specific soil cleanup level for arsenic (160 mg/kg), and no further remedial excavation was warranted.
- **SWMU 24.5-5:** During the course of excavation, confirmation samples were collected at a minimum frequency of one sample per excavation panel, as discussed in Section 3.4.4.1. A total of eight soil samples were collected for confirmation, transported to STL, and analyzed for total arsenic. The range of total arsenic concentrations reported was 10 mg/kg (S24.5-5-CONF-03) to 160 mg/kg (S24.5-5-CONF-08). This data set was evaluated using the 95 percent upper confidence interval statistical analysis per SW-846. The statistical analysis is provided in Table E7 of Appendix E. The results indicated that the upper 95 percent confidence interval was below the site-specific soil cleanup level, and no further remediation was warranted.

3.4.5 Waste Quantities and Classification

Classification soil samples were collected at a frequency of one sample per 100 cubic yards of stockpiled remediation materials/soil for SWMUs 24.5-3, 24.5-4, and 24.5-5. Classification soil samples were transported to STL for the analysis of TCLP-arsenic, TCLP-chromium, TCLP-lead (USEPA Method 1311/3010A/6010B), PCBs (USEPA Method 8080), and the Paint Filter Test (USEPA Method 9095).

The classification analytical results are summarized on Tables 3-1 and 3-2, and the analytical laboratory reports are provided in Appendix B.

- **SWMU 24.5-3:** Forty-five stockpiled remediation materials/soil classification samples were collected from this SWMU. Samples were transported under chain of custody procedures to STL for the analysis of TCLP-arsenic, TCLP-chromium, TCLP-lead, PCB, and paint filter. The results were reported to be below laboratory detection levels for TCLP-arsenic and TCLP-chromium. The range of concentrations for TCLP-lead was reported as below the laboratory detection level to 1.2 mg/kg (S24.5-3-CLASS-45). The concentrations of PCBs were reported as being below the laboratory detection level for all but two samples. The two positive PCB results were 0.11 mg/kg (S24.5-3-CLASS-32) and 0.25 mg/kg (S24.5-3-CLASS-34). All samples passed the paint filter test. Based on these results, 43 individual 100-cubic yard sectors (not including sectors 32 and 34) were classified as non-RCRA waste, and approximately 6,300 lcy of remediation material/soil were disposed in the Unit I CAMU.

  Additional sampling and analytical testing were required to classify sectors 32 and 34 for off-site disposal. Two soil samples from these sectors were transported to STL and analyzed for

Priority Pollutant Metals (Table 3-2) and TEPH (Table 3-1). Based on the metals analytical results, STLC extractions were performed on sector 34 for the analysis of copper and lead, which were elevated above the STLC concentration criteria by over a factor of 10. The results of these analyses are presented in Tables 3-1 and 3-2. Based on the results of this second classification set, sector 32 (approximately 200 lcy) was transported off-site for Class II disposal (non-hazardous) at Altamont Landfill and sector 34 (approximately 160 lcy) was transported off-site for Class I disposal (non-RCRA waste) at Kettleman Hills Hazardous Waste Management Facility.

Thirty surface soil samples were collected at grade along the route between the SWMU 24.5-3 excavation and the remediation materials/soil stockpile location. Samples were transported to STL, combined in the laboratory into six 4-point composite samples and one 5-point composite sample (S24.5-3-CONF-SF-01-04, 05-08, -09-12, -13-16, -17-20, -21-25, and –26-30), and analyzed for total arsenic (USEPA Method 6010B). The results were all reported at or below 31 mg/kg.

- **SWMU 24.5-4:** Two stockpiled remediation materials/soil classification samples were collected from this SWMU. Samples were transported under chain of custody procedures to STL for the analysis of TCLP-arsenic, TCLP-chromium, TCLP-lead, PCB, and paint filter. The metals results were reported to be below laboratory detection levels for all three analytes, and PCBs were reported at a concentration of 0.25 mg/kg in one of the two samples (sample S25.5-4 CLASS-01). The samples passed the paint filter test.

  Because of the presence of PCBs, additional sampling and analytical testing were required to classify stockpiled remediation materials/soil for off-site disposal. CAM 17 metals and STLC-lead analyses (based on total metal concentrations) were performed. An elevated concentration of total lead (72 mg/kg) prompted the analysis of STLC-lead to further classify this material. These results are presented on Tables 3-1 and 3-2. Based on this analysis and the presence of PCB (sample S24.5-4-CLASS-01), approximately 30 lcy of remediation material/soils from SWMU 24.5-4 were transported off-site for Class II disposal (non-hazardous) at Altamont Landfill.

- **SWMU 24.5-5:** Nineteen stockpiled remediation materials/soil classification samples were collected from this SWMU, transported to STL under chain-of-custody procedures for analysis TCLP-arsenic, TCLP-chromium, TCLP-lead, PCBs, and paint filter test. The TCLP-arsenic and TCLP-chromium concentrations were reported to be below the laboratory detection levels. TCLP-lead concentrations were reported above laboratory detection levels for three samples, which ranged in concentration from 0.55 mg/l to 0.76 mg/l. PCB was reported in one sample (S24.5-5-CLASS-11) at a concentration of 0.9 mg/kg. The samples passed the paint filter test. Also, sample S24.5-5-CLASS-11 was analyzed for Priority Pollutant Metals because of the presence of PCBs and, thus, the need for off-site disposal. The results of the Priority Pollutant Metals analysis indicated elevated levels (10 x the STLC concentration) of arsenic, chromium, lead, and nickel. To further characterize this material as non-hazardous, STLC extractions were performed for the analyses of arsenic, chromium, lead, and nickel. The results were reported to be below the regulatory levels for hazardous waste classification.

  Eighteen 100-cubic yard sampling sectors were cleared for disposal in the Unit I CAMU. Because sample S24.5-5-CLASS-11 tested positive for PCB, the sampling sector represented

by this sample was disposed off-site as non-hazardous, non-TSCA waste at the Altamont Landfill (approximately 200 lcy). As a rule, all remediation soils that tested positive for PCBs were disposed of off-site at appropriate TSD facilities, regardless of concentration. The remaining quantity of remediation material/soil estimated at approximately 1,100 lcy were disposed in the Unit I CAMU.

Table 2-8 presents the material-handling summary for SWMU 24.5. This table provides an accounting of the remediation material/soils that were disposed of at either the Unit I CAMU or an appropriate off-site facility.

3.5 SWMU 24.8: LEAD IMPACTED AREA

3.5.1 Location

The Lead Impacted Area is located in the east-central portion of Site L-A (Figure 2), adjacent to SWMU 24.5-1. SWMU 24.3-6 is contained entirely within SWMU 24.8. Based on an assessment of the CMS (URS, 2000) configuration, the SWMU 24.8 area was estimated to be approximately 0.41 acres prior to remediation.

3.5.2 Site Description

Prior to remediation, surface conditions consisted of exposed soil. The only COI was lead. Based on the RFI investigation, the source of the lead impacted soil is not known.

Based on the evaluation of analytical data presented in the CMS Workplan (URSGWC, 1999), lead-impacted soil located at Site L-A was planned for remediation because the lead concentrations exceeded the site-specific soil cleanup level calculated for the industrial/commercial worker for lead (5,500 mg/kg). The highest reported concentration of lead in soil was 25,500 mg/kg. Lead concentrations also exceeded the RFI screening criterion (construction worker HBL) for lead (1,200 mg/kg).

3.5.3 Remediation

3.5.3.1 Remediation Plan

Based on the lead concentrations in SWMU soils, an area of approximately 165 feet by 145 feet was planned for excavation.

Because fill soils covering the lead-impacted soils were not anticipated to be easily distinguished from the lead-impacted soils, cover soils would also be excavated for remediation. The depth of excavation was anticipated to range from approximately 7 to 11 feet bgs. Targeted soils (i.e., cover fill soils, lead-impacted soils and lead scale located at RFI sample location S24.2-S20 at SWMU 24.3-6) were to be excavated and stockpiled for remediation (i.e., disposal in the on-site Unit I CAMU). The quantity of remediation materials/soils that was estimated to be generated was 7,500 cubic yards.

After remediation was complete, the excavation area was planned for backfill with soil located in the immediate vicinity of the excavation to the elevations and grades of the surrounding soils.

3.5.3.2 Remediation Activities

Prior to excavation, UPI plant plans were reviewed and the area planned for remediation screened for buried structures or utilities. Remediation activities consisted of excavation of material/soil at SWMU 24.8, stockpiling of remediation material/soil, confirmation sampling and analysis, backfill, classification sampling and analysis, and disposal. Excavated remediation material/soils were place on plastic sheeting, bermed, and covered with plastic sheeting (plastic sheets were taped together and secured in place) until transported to an appropriate disposal facility. The lateral extent of remedial excavation is shown on Figure 3. Copies of the daily field reports that URS prepared as part of construction monitoring documentation is provided in Appendix A. The limits of excavation were approximately 0.62 acres, and the excavation quantity was estimated to be approximately 7,000 bcy.

Slag and SWMU soils were excavated and stockpiled at a nearby location. Remedial excavation and stockpiling progressed until confirmation analyses indicated that in-pace soils were below the site-specific soil cleanup level for lead (5,500 mg/kg).

3.5.4 Remediation Confirmation

3.5.4.1 Remediation Confirmation Plan

Visual inspection was used to confirm the removal of the lead-impacted soils from the floor of the excavation. The lead-impacted soils contained slag fragments and were easily distinguished from the underlying native soils.

To verify that the lead concentrations in the soils remaining after remediation (within the sides of the excavation) was below the RFI construction worker screening level health-based risk level (HBL) (1,200 mg/kg) [reference: *Remediation Confirmation Sampling Plan and Analysis Plan (Revision 1), USS-POSCO Industries, Pittsburg, California* (URS, 2002c)], eight soil samples were to be collected from randomly-selected locations on the side panels. Sampling frequency was to be based on a frequency of one sample for approximately every 1,000 square feet of surface area, with a minimum of one sample per excavation panel (i.e., side of the excavation). To select the sampling locations, each panel was to be divided into sectors that correspond to the number of samples to be collected from the panel based on the square footage of panel surface area. Each sector was to be divided into six subsectors. One subsector from each sector was to be randomly selected by a toss of a single die.

At each sampling location, confirmation samples were to be collected from the excavation bucket by using an aluminum tube-lined drive sampler or by placing representative samples of the collected soils into a wide-mouth sample container using a hand trowel.

The soil samples were to be submitted to the analytical laboratory for analysis. The samples were to be analyzed for lead in accordance with USEPA Method 6010.

The need for further remediation was to be determined based on the analytical results. If the analytical results, based on the upper 95 percent confidence level statistical evaluation, were below the RFI construction worker screening level health-based risk level (HBL) (1,200 mg/kg), then no further remediation would be warranted. If the analytical results, based on a statistical evaluation of the upper 95 percent confidence interval (SW-846), were above the site-specific soil cleanup level for lead (5,500 mg/kg), then an additional 1 foot of soil was to be excavated

from the sector(s). After additional soil removal, confirmation soil sample(s) were to be collected (as described above) from the sector(s) from which additional soil was removed. Further remediation would be warranted if the analytical results, based on the statistical evaluation, were above the site-specific soil cleanup level for lead. This process was to be repeated until analytical results, based on the statistical evaluation, were below the site-specific soil cleanup level for lead.

3.5.4.2 Deviations from the Remediation Confirmation Plan

One deviation from the Remediation Confirmation Plan was identified relative to SWMU 24.8 during the preparation of this Report:

- The site-specific risk based soil cleanup level for lead calculated for the industrial/commercial worker (5,500 mg/kg) was inadvertently used as the target cleanup criteria in place of the construction worker HBL (1,200 mg/kg). It is estimated that less than 100 cubic yards of material/soil with lead concentrations exceeding the construction worker HBL remain on-site underneath several feet of clean cover soil.

  Because lead scale deposits are potentially located at random within SWMU 24.2 (Open Hearth Furnace Slag Disposal Area), a Site Specific Health and Safety Plan (SSHSP) is required to be prepared prior to any grading and/or excavation work within SWMU 24.2 for construction worker protection. Both a deed restriction and the UPI Grading/Excavation Permit Program will specify the requirement that a SSHSP be prepared prior to any future grading or excavation in SWMU 24.2. SWMU 24.8 is located within the footprint of SWMU 24.2.

3.5.4.3 Remediation Confirmation and Analysis

The confirmation soil sample locations are shown on Figure 10. The confirmation analytical results are summarized in Tables 3-1 and 3-2, and the analytical laboratory reports are provided in Appendix B.

Analytical confirmation sampling proceeded as planned for SWWMU 24.8, in accordance with *Remediation Confirmation Sampling and Analysis Plan (Revision 1), USS-POSCO Industries, Pittsburg, California* (URS, 2002c). Nine confirmation samples were collected, transported to STL, and analyzed for total lead (USEPA Method 6010). The results of the confirmation sampling and analysis ranged from 21 mg/kg to 14,000 mg/kg. Eight of 9 sample results for lead were reported at or below 940 mg/kg.

The total lead results were statistically analyzed in accordance with USEPA SW846 for the upper 95 percent confidence interval and the concentrations were found to be below the site-specific soil cleanup level for lead (5,500 mg/kg). The statistical analysis is provided in Table E8 of Appendix E. The results of the statistical analysis indicated that further remediation was not warranted. The excavation was backfilled with clean soils from Site L-A and an off-site source associated with the City of Pittsburg Kirker Creek widening project.

3.5.5 Waste Quantities and Classification

The estimated quantity of material excavated from SWMU 24.8 (including SWMU 24.3-6) was 8,100 lcy. Classification soil samples were collected at a frequency of one sample per 100 cubic

yards of stockpiled remediation materials/soil. The classification soil samples were transported to STL for analysis of TCLP-lead (USEPA Method 3010A/6010B), the listed chemical in *Remediation Confirmation Sampling and Analysis Plan (Revision 1), USS-POSCO Industries, Pittsburg, California* (URS, 2002c). URS collected 16 samples on June 20, 2003, 20 samples on June 27, 2003, and 45 samples on June 30, 2003. The 81 discrete stockpiled remediation materials/soil samples were composited in sets of four, except for the last composite, which is a set of five. The composite sample TCLP-lead results were statistically analyzed in accordance with USEPA Method 846 SW846 for the upper 95 percent confidence interval and found to be below the RCRA TCLP criteria of 5 mg/l. The statistical analysis is provided in Table E9 of Appendix E. The SWMU stockpiled remediation materials/soil was cleared for disposal in the Unit I CAMU based on the results of the classification sampling and analysis.

Environmental monitoring was an integral part of the corrective action construction, and was incorporated into the permits regulated by DTSC and the Bay Area Air Quality Management District (BAAQMD). DTSC and the BAAQMD prepared a list of permit conditions to minimize environmental impacts on neighboring residences and businesses and to comply with the California Environmental Quality Act guidelines. The permit conditions are listed in Table 4-1 of *Application for a Part B Permit (Revision 3), USS-POSCO Industries, Pittsburg, California* (URS, 2002a).

4.1 AIR MONITORING

The majority of the environmental monitoring permit conditions were concerned with dust control mitigation during construction. URS monitored corrective action remediation and Unit I CAMU construction to verify compliance with the permit conditions. URS field personnel were on-site daily on a full time basis to observe construction activities. Specific dust control mitigation measures that were performed by WRS and observed by URS included:

- Construction areas and haul/access roads: Were watered at least twice daily.
- Haul trucks: Trucks hauling soil, sand, and other loose materials maintained at least 2 feet of freeboard. Loads that were transported from Site L-A to Site L-B were watered with an overhead spray system constructed over a concrete decontamination pad at the west end of Site L-A. Loads that were transported from SWMU 3 to Site L-B were hand-watered and/or covered. Haul truck and heavy equipment wheels and tires were manually washed on decontamination pads before leaving Site L-A and before leaving Site L-B (Unit I CAMU) to remove soil and debris.
- Haul roads: Water was sprayed over paved and unpaved haul roads (beyond Site L-A) a minimum of three times daily. All paved haul roads were swept daily after working hours.
- Loveridge Road: The southbound lanes of Loveridge Road (from the Site L-A entrance/exit point on Loveridge Road to the Pittsburg-Antioch Highway) were swept at the end of each day (with water sweepers) during the off-haul of remediation soils.
- Inactive construction areas: These areas were managed with either an application of (non-toxic) soil stabilizers in inactive construction areas (previously disturbed areas that had been inactive for ten days or more) or equivalent means (such as watering disturbed areas to maintain adequate moisture content).
- Remediation stockpiles: These piles were covered or watered twice daily.
- Traffic speed: Haul trucks were limited to speeds on paved/unpaved roads to 15 miles per hour. Maximum speed for any vehicle on-site was 20 miles per hour.
- Hydroseeding: Remediated SWMUs at Site L-A and the Unit I CAMU were hydroseeded at the completion of construction activities.
- Suspension of excavation and grading activities: Construction activities were immediately suspended when wind speed (instantaneous gusts) exceeded 25 miles per hour. This condition occurred once during construction activities. A summary of the wind speed monitoring data is presented in Table 4-1. URS field personnel determined the wind speeds using hand-held anemometers that were calibrated to the on-site weather station at the Unit I

CAMU construction office or to UPI's weather station. URS personnel recorded the daily wind speeds, and these records are provided in the daily field notes in Appendix A. Construction was temporarily suspended the afternoon of June 18, 2003, at SWMU 24.8 as a result of an exceedance of the instantaneous wind speed criteria.

- Construction limitations: Active areas subject to excavation, grading, and other construction activities were limited to two SWMUs or approximately 10 acres and the Unit I CAMU at any one time.
- Site Health and Safety Officer: WRS had a Site Health and Safety Officer on-site at all times; this person was responsible for implementing the project construction Site Specific Health and Safety Plan (SSHSP) and implementing dust mitigation measures. URS and WRS shared responsibility for implementing dust control mitigation measures.
- Air monitoring equipment: WRS monitored airborne dust with selected field staff using personal air sampling pumps with sampling cassettes. WRS arranged for the cassettes to be transported to an analytical laboratory for analyses. Mr. Steve Oller (Site Health and Safety Officer for WRS) reviewed the data, and based on the data reduced the personal protective equipment requirements from Level C to Level D. This change is documented in memoranda issued by WRS on May 26, 2003, and June 18, 2003 [see Engineer Daily Report Nos. 5 (05/27/03) and 21 (06/18/03) in Appendix A].

4.1.1 Mitigation Measures for Heavy Equipment:

WRS implemented the following mitigation measures to minimize the impacts of heavy equipment use:

- Minimized idling time
- Maintained properly tuned equipment
- Limited the hours of operation of heavy-duty equipment and/or the amount of equipment in use.

4.2 STORMWATER INFILTRATION

4.2.1 SWMU 24.5-1

Self-directed remediation construction activities occurred at SWMU 24.5-1 between November 2001 and February 2002. Stormwater runoff accumulated in the remedial excavation, making it necessary to remove and dispose of the water in accordance with state and federal regulations. Stormwater was pumped into two 21,000-gallon storage tanks (the estimated volume of water was 27,500 gallons).

The stormwater pumped into the two tanks was sampled, transported under chain-of-custody procedures to Sequoia for analyses of PCBs (USEPA Method 8082), Title 22 Metals (USEPA Test Method 6010), and a 96-hour bioassay hazardous waste toxicity test (22 CCR). The analytical results are summarized in Table 4-2. The analytical results for both tanks were below the hazardous waste levels for PCBs and metals and the samples passed the fish bioassay test.

The analytical results were within UPI's National Pollutant Discharge Elimination System (NPDES) permit conditions, and the water was released to the TWTP.

4.2.2 SWMU 24.5-5

The excavation of SWMU 24.5-5 was followed by an unusually intense summer storm that partially filled the excavation with approximately 2,000 gallons of water. Samples of water from this excavation were collected, transported under chain-of-custody procedures to STL, and analyzed for PCBs (USEPA Method 8082). The results were reported to be below the laboratory detection level (Table 4-2). The water was subsequently used for dust control mitigation at SWMU 24.1-3 and nearby areas.

TABLE C-1
Summary of Waste and Confirmation Analytical Results - SWMUs 24.1, 24.3, 24.5, and 24.8
USS-POSCO Industries, Pittsburg, California

			Metals (mg/kg)					TCLP Metals (mg/l)			STLC Metals (mg/l)				Organic Analyses (mg/kg)			
SWMU	Sample Identification	Reference	CAM 17 Metals	Total Arsenic	Total Chromium	Total Lead	Total Zinc	Arsenic (TCLP)	Chromium (TCLP)	Lead (TCLP)	Arsenic (STLC)	Chromium (STLC)	Lead (STLC)	Zinc (STLC)	VOC	SVOC	TPH	PCB
24.1	**WASTE ANALYSES**																	
	Sludge	SWAT	--	5-1200	21-2900	14-150	40-690	--	--	--	0.037-11	5.7-100	0.62-21	27-220	--	--	--	--
	Underlying Fill	SWAT	--	<1-440	8.4-390	3.6-360	19.5-830	ND	ND	ND	--	--	--	--	--	--	--	--
	S24.1-2-US-01[5]	REM	see Table 2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
24.1-1	**CONFIRMATION ANALYSES**																	
	S24.1-1-SWS-01	REM	--	160	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.1-1-SWS-02A,B	REM	--	100	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.1-1-SWE-01A,B	REM	--	82	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.1-1-SWE-02A,B	REM	--	120	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.1-1-SWN-01A,B	REM	--	97	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.1-1-SWN-02A,B	REM	--	110	--	--	--	--	--	--	--	--	--	--	--	--	--	--
24.1-2	**CONFIRMATION ANALYSES**																	
	S24.1-2-BR-01-04[3]	REM	--	42	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.1-2-SWN-01A,B	REM	--	140	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24-1-2-SWE-01A,B	REM	--	97	--	--	--	--	--	--	--	--	--	--	--	--	--	--
24.2	**WASTE ANALYSES**																	
	MB-106-3	SWAT	--	--	--	120	--	--	--	--	--	--	27.0	--	--	--	--	--
	MB-107-2	SWAT	--	--	--	93	--	--	--	--	--	--	130.0	--	--	--	--	--
	MB-108-1	SWAT	--	--	--	32	--	--	--	--	--	--	0.4	--	--	--	--	--
	MB-109-2A	SWAT	--	--	--	110	--	--	--	--	--	--	87.0	--	--	--	--	--
	S24.2-SW01	RFI	--	--	--	157	--	--	--	--	--	--	--	--	--	--	--	--
	S24.2-SW02	RFI	--	--	--	1320	--	--	--	--	--	--	--	--	--	--	--	--
	S24.2-SW03	RFI	--	--	--	355	--	--	--	--	--	--	--	--	--	--	--	--
	S24.2-SW04	RFI	--	--	--	596	--	--	--	--	--	--	--	--	--	--	--	--
	S24.2-SW06	RFI	--	--	--	272	--	--	--	--	--	--	--	--	--	--	--	--
	S24.2-SW07	RFI	--	--	--	1500	--	--	--	--	--	--	--	--	--	--	--	--
	S24.2-SW08	RFI	--	--	--	394	--	--	--	--	--	--	--	--	--	--	--	--
	S24.2-SW09	RFI	--	--	--	323	--	--	--	--	--	--	--	--	--	--	--	--
	S24.2-SW10	RFI	--	--	--	459	--	--	--	--	--	--	--	--	--	--	--	--
	S24.2-SW14	RFI	--	--	--	107	--	--	--	--	--	--	--	--	--	--	--	--
	S24.2-SW15	RFI	--	--	--	1490	--	--	--	--	--	--	--	--	--	--	--	--
	S24.2-SW16	RFI	--	--	--	468	--	--	--	--	--	--	--	--	--	--	--	--
	S24.2-SW17	RFI	--	--	--	39.4	--	--	--	--	--	--	--	--	--	--	--	--
	S24.2-SW19	RFI	--	--	--	24.6	--	--	--	--	--	--	--	--	--	--	--	--
24.3	**WASTE ANALYSES**																	
	Lead Scale	SWAT, RFI, REM	--	--	--	52-87000	--	--	--	ND-8.6	--	--	0.34-83	--	--	--	--	--
24.3-2	**CONFIRMATION ANALYSES**																	
	S24.3-SO2-CONF-01	REM	--	--	--	720	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-SO2-CONF-02	REM	--	--	--	56	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-SO2-CONF-03	REM	--	--	--	51	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-SO2-CONF-04	REM	--	--	--	110	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-SO2-CONF-05	REM	--	--	--	600	--	--	--	--	--	--	--	--	--	--	--	--
24.3-3	**CONFIRMATION ANALYSES**																	
	S24.3-S07-CONF-01	REM	--	--	--	260	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-S07-CONF-02	REM	--	--	--	8300	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-S07-CONF-03	REM	--	--	--	27	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-S07-CONF-04	REM	--	--	--	400	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-S07-CONF-05	REM	--	--	--	330	--	--	--	--	--	--	--	--	--	--	--	--
24.3-4	**CONFIRMATION ANALYSES**																	
	S24.3-S15-CONF-01	REM	--	--	--	2800	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-S15-CONF-02	REM	--	--	--	2800	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-S15-CONF-03	REM	--	--	--	1600	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-S15-CONF-04	REM	--	--	--	5700	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-S15-CONF-05	REM	--	--	--	5.5	--	--	--	--	--	--	--	--	--	--	--	--
24.3-5	**CONFIRMATION ANALYSES**																	
	S24.3-1-CONF-01-05	REM	--	--	--	6400	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-2-CONF-01-04	REM	--	--	--	890	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-3-CONF-01-05	REM	--	--	--	440	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-4-CONF-01-05	REM	--	--	--	270	--	--	--	--	--	--	--	--	--	--	--	--
	S24-3-5-CONF-01-05	REM	--	--	--	6600	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-67-CONF-01-07	REM	--	--	--	11000	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-8-CONF-01-05	REM	--	--	--	1600	--	--	--	--	--	--	--	--	--	--	--	--

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			Metals (mg/kg)					TCLP Metals (mg/l)			STLC Metals (mg/l)				Organic Analyses (mg/kg)			
SWMU	Sample Identification	Reference	CAM 17 Metals	Total Arsenic	Total Chromium	Total Lead	Total Zinc	Arsenic (TCLP)	Chromium (TCLP)	Lead (TCLP)	Arsenic (STLC)	Chromium (STLC)	Lead (STLC)	Zinc (STLC)	VOC	SVOC	TPH	PCB
	S24.3-9-CONF-01-04	REM	--	--	--	3100	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-10-CONF-01-05	REM	--	--	--	150	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-11-CONF-01-04	REM	--	--	--	2000	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-14-CONF-01-05	REM	--	--	--	4900	--	--	--	--	--	--	--	--	--	--	--	--
	S24.3-16-CONF-01-05	REM	--	--	--	360	--	--	--	--	--	--	--	--	--	--	--	--
24.4	**WASTE ANALYSES**																	
	CW-1	SWAT	--	8.4	41.4	8	120	--	--	--	--	--	--	--	--	--	--	--
	CW-2	SWAT	--	5.2	19	13.2	127	--	--	--	--	--	--	--	--	--	--	--
	CWS-1	SWAT	--	<5.0	14	13	67	--	--	--	--	--	--	--	--	--	--	--
	CWS-2	SWAT	--	23	75	<5.0	68	--	--	--	--	--	--	--	--	--	--	--
	CWS-3	SWAT	--	17	16	<5.0	24	--	--	--	--	--	--	--	--	--	--	--
24.5	**WASTE ANALYSES**																	
	Oily Waste	SWAT, RFI	see Table 2	--	--	--	--	ND	ND	ND-0.76	--	<0.1-2.2	ND-540	1.9-980	Acetone = 0.28 Ethyl benzene = 2.5 Benzene = 0.74 2-Butanone = 0.54 Carbon disulfide = 0.044 4-methl-2-pentanone = 6.8 Toluene = 1.3, Xylenes = 23	Bis(2-ethylhexyl)phthalate = 0.88 Naphthalene = 34 2-methylnaphthalene = 41 Di-n-buthylphthalate = 11	O&G=up to 200,000	ND-88
24.5-3	**CONFIRMATION ANALYSES**																	
	S24.5-3-CONF-01	REM	--	7.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-02	REM	--	6.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-03	REM	--	9.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-04	REM	--	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-05	REM	--	7.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-06	REM	--	6.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-07	REM	--	8.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-08	REM	--	5.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-09	REM	--	9.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-10	REM	--	7.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-11	REM	--	5.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-12	REM	--	4.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-13	REM	--	4.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-14	REM	--	5.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-15	REM	--	9.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-16	REM	--	7.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-17	REM	--	8.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-18	REM	--	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-19	REM	--	30	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-20	REM	--	18	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-21	REM	--	53	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-22	REM	--	34	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-SF-01-04	REM	--	26	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-SF-05-08	REM	--	28	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-SF-09-12	REM	--	31	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-SF-13-16	REM	--	22	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF SF-17-20	REM	--	24	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-SF-21-25	REM	--	28	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-3-CONF-SF-26-30	REM	--	24	--	--	--	--	--	--	--	--	--	--	--	--	--	--
24.5-4	**CONFIRMATION ANALYSES**																	
	S24.5-4-CONF-01	REM	--	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-4-CONF-02	REM	--	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-4-CONF-03	REM	--	18	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-4-CONF-04	REM	--	24	--	--	--	--	--	--	--	--	--	--	--	--	--	--
24.5-5	**CONFIRMATION ANALYSES**																	
	S24.5-5-CONF-01	REM	--	43	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-5-CONF-02	REM	--	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-5-CONF-03	REM	--	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-5-CONF-04	REM	--	13	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-5-CONF-05	REM	--	14	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-5-CONF-06	REM	--	120	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-5-CONF-07	REM	--	15	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	S24.5-5-CONF-08	REM	--	160	--	--	--	--	--	--	--	--	--	--	--	--	--	--
24.6	**WASTE ANALYSES**																	
	Bioremediation Soils	RFI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<10-1300	--

TABLE C-1
Summary of Waste and Confirmation Analytical Results - SWMUs 24.1, 24.3, 24.5, and 24.8
USS-POSCO Industries, Pittsburg, California

			Metals (mg/kg)					TCLP Metals (mg/l)			STLC Metals (mg/l)				Organic Analyses (mg/kg)			
SWMU	Sample Identification	Reference	CAM 17 Metals	Total Arsenic	Total Chromium	Total Lead	Total Zinc	Arsenic (TCLP)	Chromium (TCLP)	Lead (TCLP)	Arsenic (STLC)	Chromium (STLC)	Lead (STLC)	Zinc (STLC)	VOC	SVOC	TPH	PCB
24.7	**SOIL ANALYSES**																	
	S24.7-1-S01	RFI	see Table 2	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND
	S24.7-1-S02	RFI	see Table 2	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND
	S24.7-1-S03	RFI	see Table 2	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND
	S24.7-2-S02	RFI	see Table 2	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND
	S24.7-2-S03	RFI	see Table 2	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND
	S24.7-2-SW01	RFI	see Table 2	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND
	S24.7-3-S01	RFI	see Table 2	--	--	--	--	--	--	--	--	--	--	--	Acetone = 0.042	Bis(2-ethylhexyl)phthalate = 0.88	ND	ND
	S24.7-3-S02	RFI	see Table 2	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND
	S24.7-3-S03	RFI	see Table 2	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND
	S24.7-4-S01	RFI	see Table 2	--	--	--	--	--	--	--	--	--	--	--	Benzo(a)pyrene = 0.37 Benzo(b)fluoranthene = 0.40 Benzo(g,h,I)perylene = 0.77	Indeno(1,2,3-cd)pyrene = 0.61	O&G = 280	ND
	S24.7-4-S02	RFI	see Table 2	--	--	--	--	--	--	--	--	--	--	--	Acetone = 0.051	ND	ND	ND
	S24.7-4-S03	RFI	see Table 2	--	--	--	--	--	--	--	--	--	--	--	ND	ND	O&G = 19	ND
	S24.7-4-S04	RFI	see Table 2	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND
24.8	**WASTE ANALYSES**																	
	Lead Impacted Soils	RFI	--	--	--	261-25,100	--	--	--	ND-8..3	ND	--	--	--	--	--	--	--
24.8	**CONFIRMATION ANALYSES**																	
	S24.8-CONF-01	RFI	--	--	--	14000	--	--	--	--	--	--	--	--	--	--	--	--
	S24.8-CONF-02	RFI	--	--	--	110	--	--	--	--	--	--	--	--	--	--	--	--
	S24.8-CONF-03	RFI	--	--	--	750	--	--	--	--	--	--	--	--	--	--	--	--
	S24.8-CONF-04	RFI	--	--	--	310	--	--	--	--	--	--	--	--	--	--	--	--
	S24.8-CONF-05	RFI	--	--	--	21	--	--	--	--	--	--	--	--	--	--	--	--
	S24.8-CONF-06	RFI	--	--	--	28	--	--	--	--	--	--	--	--	--	--	--	--
	S24.8-CONF-07	RFI	--	--	--	610	--	--	--	--	--	--	--	--	--	--	--	--
	S24.8-CONF-08	RFI	--	--	--	940	--	--	--	--	--	--	--	--	--	--	--	--
	S24.8-CONF-09	RFI	--	--	--	220	--	--	--	--	--	--	--	--	--	--	--	--

NOTES:

1 Reference - SWAT = Water Quality Solid Waste Assessment Test, Site L-A, dated February 1990
2 Reference - RFI = RCRA Facility Investigation, dated April 1998
3 Reference - REM = Corrective Measures Completion Report, dated May 2004
4 Non-native, non-dry sludge identified in the field (unknown material sampled)
5 Samples collected from nitrogen gas line berm (sludge within berm). Berm marks the southern extent of SWMU 24.1-2.
6 TCLP - Toxicity Characteristic Leaching Procedure (USEPA Method 1311/6010)
7 VOC - Volatile Organic Compounds (USEPA Method 8240/8260)
8 SVOC - Semi-Volatile Organic Compounds (USEPA Method 8270)
9 PCB - Polychlorinated Biphenyl (USEPA Method 8082)
10 TPH - Total Petroleum Hydrocarbons (USEPA Method 8015 Modified)
11 CAM 17 Metals by CCR Title 22

TABLE C-2
Summary of Waste/Soil Analyses for Metals - SWMUs 24.1, 24.2, 24.5, 24.7
USS-POSCO Industries, Pittsburg, California

SWMU	Sample	Reference	Mercury (mg/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
24.1-2	S24.1-2-US-01[4]	REM	0.053	<2.0	4.7	130	<0.50	0.85	3.9	1.2	6	1.3	<1.0	4.0	<2.0	<1.0	<1.0	15	8.3
24.2	Slag	SWAT, RFI	<0.1-0.12	<1.0	4.5-39	35-120	<1-1.9	<1-10	60-1100	9-15	46-100	32-1500	<1.0	29-52	<1.0	<1.0	<1.0	57-810	74-480
24.5	Oily Waste	SWAT, RFI, REM	<0.1-1.1	<2.0-22	<1.0-408	26-100	<0.40-0.43	<0.50-28	20-773	4.4-70	15-2530	13-16800	14	25.5-743	<1.0	<1.0-6.1	<1.0-13	6.2-340	0.16-12700
24.7	S24.7-1-S01	RFI	<0.10	<6.0	5.2	--	0.61	<0.50	22.5	--	25.5	9.0	--	21.9	<1.0	<1.0	<5.0	--	61.3
24.7	S24.7-1-S02	RFI	<0.10	<6.0	7.0	--	0.61	<0.50	23.1	--	24.1	8.1	--	20.6	<1.0	<1.0	<5.0	--	52.9
24.7	S24.7-1-S03	RFI	<0.10	<6.0	<5.0	--	0.37	<0.50	12.5	--	14.5	5.0	--	13.1	<1.0	<1.0	<5.0	--	33
24.7	S24.7-2-S02	RFI	<0.10	<6.0	<5.0	--	0.61	<0.50	32.7	--	18.5	6.2	--	30.3	<1.0	<1.0	<5.0	--	35.4
24.7	S24.7-2-S03	RFI	<0.10	<6.0	<5.0	--	0.58	<0.50	28	--	18.1	7.1	--	25.2	<1.0	<1.0	<5.0	--	33.7
24.7	S24.7-2-SW01	RFI	<0.10	<6.0	<5.0	--	0.56	<0.50	32.3	--	19.0	8.0	--	28.9	<1.0	<1.0	<5.0	--	39.6
24.7	S24.7-3-S01	RFI	<0.10	<6.0	<5.0	--	0.57	<0.50	16.1	--	16.8	10.2	--	17.9	<1.0	<1.0	<5.0	--	25.5
24.7	S24.7-3-S02	RFI	<0.10	<6.0	<5.0	--	0.61	<0.50	23.9	--	20.9	6.8	--	27.2	<1.0	<1.0	<5.0	--	44.2
24.7	S24.7-3-S03	RFI	<0.10	<6.0	<5.0	--	0.59	<0.50	25.6	--	18.8	6.5	--	27.5	<1.0	<1.0	<5.0	--	40.8
24.7	S24.7-4-S01	RFI	0.19	<24	26	--	<0.80	3.9	321	--	416	311	--	60.6	<1.0	<4.0	<5.0	--	424
24.7	S24.7-4-S02	RFI	<0.10	<6.0	5.1	--	0.33	<0.50	12.2	--	16.1	6.1	--	14.6	<1.0	<1.0	<5.0	--	37.1
24.7	S24.7-4-S03	RFI	<0.10	<6.0	<5.0	--	0.34	<0.50	13.9	--	15.6	9.1	--	17.1	<1.0	<1.0	<5.0	--	35.3
24.7	S24.7-4-S04	RFI	<0.10	<6.0	<5.0	--	0.31	<0.50	10.2	--	13.2	9.4	--	12.9	<1.0	<1.0	<5.0	--	37.3

Notes:

1 Reference - SWAT = Water Quality Solid Waste Assessment Test, Site L-A, dated February 1990
2 Reference - RFI = RCRA Facility Investigation, dated April 1998
3 Reference - REM = Corrective Measures Completion Report, dated May 2004
4 Reference - SWMU = Solid Waste Management Unit
5 Non-native, non-dry sludge identified in the field (unknown material sampled)
6 mg/kg = milligram per kilogram (concentration)

ATCHISON TOPEKA AND SANTA FE RAILWAY

COLUMBIA STREET

PITTSBURG – ANTIOCH HIGHWAY

LOVERIDGE ROAD

RECREATION AREA (SOFTBALL FIELD)

INCOMING WATER FILTER/TREATMENT PLANT

DRIED SLUDGE DISPOSAL AREA NORTH (SWMU No. 24.1-1)

DRIED SLUDGE DISPOSAL AREA SOUTH (SWMU No. 24.1-2)

APPROXIMATE LIMITS OF WOODED AREA (CANAL WATER TREATMENT SLUDGE DISPOSAL AREA) (SWMU No. 24.4)

OIL DISPOSAL AREA (SWMU No. 24.5-3)

SUBREGION 1 (SWMU No. 24.7-1)

SUBREGION 2 (SWMU No. 24.7-2)

SUBREGION 3 (SWMU No. 24.7-3)

SUBREGION 4 (SWMU No. 24.7-4)

OIL DISPOSAL AREA (SWMU No. 24.5-5)

LEAD SCALE DISPOSAL AREA (SWMU No. 24.3-2)

LEAD SCALE DISPOSAL AREA (SWMU No. 24.3-1)

BIOREMEDIATION AREA (SWMU No. 24.6)

OIL DISPOSAL AREA (SWMU No. 24.5-4)

LEAD SCALE DISPOSAL AREA (SWMU No. 24.3-3)

LEAD SCALE DISPOSAL AREA (SWMU No. 24.3-5)

LEAD IMPACTED AREA (SWMU No. 24.8)

LEAD SCALE DISPOSAL AREA (SWMU No. 24.3-6)

DRIED SLUDGE DISPOSAL AREA EAST (SWMU No. 24.1-3)

LEAD SCALE DISPOSAL AREA (SWMU No. 24.3-5)

LEAD SCALE DISPOSAL AREA (SWMU No. 24.3-4)

OIL DISPOSAL AREA (SWMU No. 24.5-1)

OPEN HEARTH FURNACE SLAG DISPOSAL AREA (SWMU No. 24.2)

SITE L–A (24)

LEGEND:

- LEGAL BOUNDARY OF USS–POSCO INDUSTRIES PROPERTY
- MONITORING WELL
- SOIL BORING
- SOIL SAMPLE POINT
- TEST PIT
- RFI TEST PIT AND SOIL SAMPLE LOCATION – SEE NOTE 3 FOR REFERENCE DOCUMENT
- REMEDIATION CONFIRMATION SOIL SAMPLE LOCATION
- REMEDIATION CONFIRMATION SURFACE SOIL SAMPLE LOCATION
- REMEDIATED SWMU

THIS DRAWING REFLECTS THE LOCATIONS OF SOIL AND GROUNDWATER SAMPLING AS SHOWN IN THE FOLLOWING DOCUMENTS:

1. WATER QUALITY SOLID WASTE ASSESSMENT TEST, SITE L–A, FEBRUARY 1990, MARK GROUP
2. DRAFT REPORT, WASTE CHARACTERIZATION PROGRAM, WASTE DISPOSAL SITE L–A, APRIL 1984, DAMES AND MOORE
3. FINAL REPORT, RCRA FACILITY INVESTIGATION, APRIL 1998, MARK GROUP

SCALE

–150' 0 150' 300' 600'

1" = 150'

REILLY ENGINEERING, INC. 5597 Morningside Drive Clayton, CA 94517-1027 (925)672-3800	USS–POSCO INDUSTRIES, PITTSBURG, CA SAMPLING LOCATIONS	DATE: 2/06/2009 FIGURE: C–1

X:\x_env_waste\USS-POSCO\Site LA SMP-HASP\Draft_02.06.09\Drawings\Sampling Locations.dwg 2-06-09 12:21:32 PM Shanthi_Sambathkumar

Appendix D
Excerpts from 2002 Remediation Confirmation Sampling and Analysis Plan and 2001 PCB Sampling and Analysis Plan

Appendix D-1: Excerpts from 2002 Remediation Confirmation Sampling and Analysis Plan

Appendix D-2: Excerpts from 2001 PCB Sampling and Analysis Plan

Appendix D-1:	Excerpts from 2002 *Remediation Confirmation Sampling and Analysis Plan* (Note: Referenced figures and appendices are not provided.)

2.1 SWMU NO. 24.1: SITE L-A - DRIED SLUDGE DISPOSAL AREAS

2.1.1 Location

Site L-A is located in the southeast portion of the plant as shown in Figure 1-2. It is located south of the BNSF Railway (BNSF) tracks and the Sheet and Tin Mill, east of the incoming Water Filter Plant, west of Loveridge Road, and north of the Pittsburg-Antioch Highway. Site L-A covers an area of approximately 135 acres. Dried sludge from the Site L-B Former Sludge Drying Beds was placed within the western portion of Site L-A. There are three separate dried sludge disposal areas (refer to Figure 1-2):

- Dried Sludge North (DSN) covers approximately 2 acres;
- Dried Sludge South (DSS) covers approximately 8 acres; and
- Dried Sludge East (DSE) covers approximately 3 acres.

2.1.2 Surface Conditions and Concentrations in Dried Sludge and Underlying Soil

Surface conditions consist of sludge with some areas covered with soil. Most areas are covered with vegetation.

COIs include: arsenic, chromium, lead, zinc, TPH and oil and grease (O&G).

Two investigations have been conducted previously to evaluate the conditions within Site L-A. Reports of these investigations include the following:

- Dames & Moore, Draft Report, *Waste Characterization Program, Waste Disposal Site L-A*, April 3, 1984 (Dames & Moore 1984); and
- MARK, *Water Quality Solid Waste Assessment Test (SWAT)*, February 1990 (MARK 1990).

The SWAT was an extensive investigation of the waste placed on Site L-A and of the underlying soil beneath the waste. The SWAT resulted in defining the vertical and lateral extent of most of the waste disposal areas within Site L-A.

During the Waste Characterization Program, dried sludge and underlying soil samples were collected from 3 locations (DSS, DSN and DSE) within the SWMU. During the SWAT, dried sludge and underlying soil samples were collected from 6 locations (MB-101 through MB-106) within the SWMU. Locations are shown on Figure 2-2. Logs of each sampling location are provided in Appendix B for reference.

Based on an evaluation of analytical data, the dried sludge and underlying soils located at Site L-A are planned for remediation because arsenic concentrations exceed the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic (160 ppm) and the RFI

screening criterion (construction worker HBL) for arsenic (230 ppm). The highest reported concentration of arsenic in sludge is 1,200 ppm and in underlying soils is 440 ppm.

2.1.3 Remediation Plan

Dried sludge from areas DSS, DSN and DSE (approximately 81,000 cubic yards) would be removed and placed in the on Site Unit I CAMU. Because, dried sludge was historically discharged to the ground surface, an excavation requiring backfill would not be created due to the removal of the dried sludge. General grading in the vicinity would be conducted, if necessary, to smooth the grade of surrounding soils with the grade of soils remaining after dried sludge removal. Prior to dried sludge removal, plant plans would be reviewed and/or the dried sludge disposal areas would be geophysically screened for buried structures or utilities.

Underling soil would also be removed to the extent it contains arsenic at concentrations exceeding the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic (160 ppm). Only one sample of underling soils was detected with arsenic concentrations above 160 ppm, the DSN sample collected during the Waste Characterization Program (Dames & Moore 1984). As shown in Figure 2-2, the DSN sample was taken from the northeast quadrant of the DSN dried sludge disposal area. The sample collected and analyzed at 1 foot below dried sludge reported an arsenic concentration of 440 ppm. The 1-foot sample is described in the trench log (refer to the DSE trench log in Appendix B) as fill material approximately 1 foot thick. The native soil sample collected at 2 feet below dried sludge at the same sampling locating reported an arsenic concentration of 17 ppm [below the approved background concentration for arsenic at the UPI Plant (24 ppm)]. Fill material underlying the dried sludge in the northeast quadrant would, therefore, be removed and stockpiled for remediation (i.e., disposal in the on Site Unit I CAMU). The northeast quadrant of DSE is approximately 0.5 acres. At an assumed depth of fill of 1 foot, approximately 800 cubic yards of fill material would be remediated.

2.1.4 Sampling and Analysis Plan

2.1.4.1 Remediation Confirmation

Visual confirmation would be used to confirm the removal of the dried sludge. It is red in color and easily distinguished from other soils. Visual confirmation would also be used to confirm the removal of the fill material, which typically contains gravel and/or rubble (e.g., brick fragments).

2.1.4.2 RCRA Hazardous Waste Classification

Dried sludge from the Site L-B Former Sludge Drying Beds has been disposed on Site L-B (Unit I) as a California-only hazardous waste.

Based on arsenic, chromium and lead concentrations in the fill material underlying the dried sludge, there is a potential for the fill material from this SWMU to be classified as RCRA hazardous waste (i.e., total concentrations of arsenic, chromium and lead greater than 20 times the RCRA hazardous TCLP criteria for these metals [each at 5 milligrams per liter (mg/L)]). To verify that the fill material is not RCRA hazardous waste, eight fill material samples would be

collected from randomly-selected locations of stockpiled fill material. Sampling frequency is based on selecting a sample approximately every 100 cubic yards of fill material.

Remediation material/soil would be stockpiled to a height of approximately six feet. To select the sampling locations, the surface area of the stockpile would be divided in 10 sectors. Each sector would be divided into six subsectors. One subsector from each sector would then be randomly selected by a toss of a single die. The depth of the sample would also be randomly selected by a toss of a single die.

Samples from remediation material/soil stockpiles would be obtained from the desired depth using a manual hand-auger or the excavation bucket. Samples would be collected from the desired depths in each boring or from the excavation bucket by driving an aluminum tube-lined drive sampler (or equivalent sampling device), or by placing representative samples into a wide-mouth sample container using a hand trowel.

The fill material samples would be submitted to the laboratory for TCLP extraction and analysis. The samples would be extracted for soluble arsenic, chromium and lead in accordance with EPA Test Method 1311 and then analyzed for arsenic, chromium and lead in accordance with USEPA Test Method 6010.

If the analytical results, based on a statistical evaluation (refer to Section 3-12), are below the TCLP criteria for arsenic, chromium and lead (each at 5 mg/L), then the remediation material/soil would be classified as non RCRA hazardous waste suitable for disposal in the Unit I CAMU. If the analytical results, based on a statistical evaluation, are above the TCLP criteria for arsenic, chromium or lead, then the sector(s) of fill material causing the statistical evaluation to exceed the TCLP criteria would be segregated and disposed as RCRA hazardous waste (or further divided and sampled to minimize the generation of RCRA hazardous waste). The remaining sectors would be classified as non RCRA hazardous waste suitable for disposal in the Unit I CAMU.

2.2 SWMU NO. 24.3: SITE L-A - LEAD SCALE DISPOSAL AREAS

2.2.1 Location

Site L-A is located in the southeast portion of the plant as shown in Figure 1-2. It is located south of the BNSF railroad tracks and the Sheet and Tin Mill, east of the incoming Water Filter Plant, west of Loveridge Road, and north of the Pittsburg-Antioch Highway. Site L-A covers an area of approximately 135 acres. Lead scale (a silverish black fine sand-sized material) from the Former Wire Mill was placed at discrete locations within the north-central portion of Site L-A. With the conclusion of work conducted during the RFI, there are now five identified locations containing lead scale (refer to Figure 1-2).

2.2.2 Surface Conditions and Concentrations in Lead Scale

At each location, the lead scale is covered with a minimum of 1 foot of soil or slag. The only COI is lead.

Prior to the RFI, two investigations had been conducted to evaluate the conditions within Site L-A. Reports of these investigations include the following:

- Dames & Moore, Draft Report, *Waste Characterization Program, Waste Disposal Site L-A*, April 3, 1984 (Dames & Moore 1984); and
- MARK, *Water Quality Solid Waste Assessment Test (SWAT)*, February 1990 (MARK 1990).

The SWAT was an extensive investigation of the waste placed on Site L-A and of the underlying soil beneath the waste. The SWAT resulted in defining the vertical and lateral extent of most of the waste disposal areas within Site L-A.

During the Waste Characterization Program, lead scale samples were collected from 1 location (L-2B) within the SWMU. During the SWAT, additional lead scale samples were collected from the same location. The area of lead scale disposal was described in the SWAT as co-mingled with slag and dried sludge. The range of lead concentrations reported was 870 ppm to 87,000 ppm.

During the RFI (MARK 1998), four additional lead scale locations were identified (S24.2-S07: a 1-foot seam at 3 feet bgs), S24.2-S15: a 6-inch seem at 6 feet bgs, S24.2-S20: a 1.5-foot seem at 2 feet bgs, and S24.3-S02: minor amounts at 3 feet bgs]. The highest lead concentration detected in lead scale during the RFI was 7,630 ppm. Locations are shown on Figure 2-2. Logs of each sampling location are provided in Appendix C for reference. The lead scale deposit, S24.2-S20, is, hereafter, referred to as Lead Scale Disposal Areas (East). The remaining four lead scale deposits are, hereafter, referred to as Lead Scale Disposal Areas (Central).

Based on an evaluation of analytical data presented in the Corrective Measures Study Workplan (URSGWC 1999), lead scale located at Site L-A is planned for remediation because lead concentrations exceed the site-specific soil cleanup level calculated for the industrial/commercial worker for lead (5,500 ppm) and the RFI screening criterion (construction worker HBL) for lead (1,200 ppm) and because it is practical to do so (i.e., the SWMU is small and lacks impediments to remediation).

2.2.3 Remediation Plan

The lateral extent of the lead scale at each location is not known and is not anticipated to be the same at any two locations. Overburden (soil and slag) at each location would, therefore, be removed to expose the lead scale. Prior to excavation, plant plans would be reviewed and/or each excavation location would be geophysically screened for buried structures or utilities.

An initial excavation of overburden within an area of approximately 30 feet by 30 feet would be made at each location. Overburden would be excavated, stockpiled and later used as backfill material. Exposed lead scale would be excavated and stockpiled for remediation (i.e., lead scale from Lead Scale Disposal Areas (East) would be disposed in the on Site Unit I CAMU while lead scale from Lead Scale Disposal Areas (Central) would be disposed off Site). Should the lateral limits of lead scale extent outside of the initial excavation area, additional overburden would be excavated. The estimated quantity of remediation material/soil that would be generated from each lead scale excavations is approximately 40 cubic yards, or a total of 200 cubic yards from the five known lead scale locations. Should the excavated overburden appear different than anticipated (from a visual or olfactory perspective), samples of suspect soils would be collected

following the procedures identified in Section 2.3.4.2 and analyzed, at a minimum, for lead (in accordance with USEPA Test Method 6010), the chemical exceeding RFI screening criteria.

After remediation is completed, each excavation area would be backfilled with soil located in the immediate vicinity of each excavation to the elevations and grades of surrounding soils.

2.2.4 Sampling and Analysis Plan

2.2.4.1 Remediation Confirmation

To verify that lead concentrations in soils remaining after remediation are below the construction worker HBL for lead (1,200 ppm), five soil samples would be collected from randomly-selected locations within each lead scale locations (one from the bottom and four from the sides of the excavation). Sampling frequency is based on selecting a sample approximately every 1,000 square feet of surface area with a minimum of one sample per excavation panel (i.e., bottom or side of the excavation). To select the sampling locations, each panel would be divided in sectors that correspond to the number of samples to be collected from the panel based on the square footage of panel surface area. Each sector would then be divided into six subsectors. One subsector from each sector would then be randomly selected by a toss of a single die.

At each sampling location, confirmation samples would be collected by driving an aluminum tube-lined drive sampler (or equivalent sampling device) or by placing representative samples into a wide-mouth sample container using a hand trowel.

The soil samples would be submitted to the laboratory for analysis. The samples would be analyzed for lead in accordance with USEPA Test Method 6010.

The need for further remediation would be evaluated based upon the analytical results. If the analytical results, based on a statistical evaluation (refer to Section 3.12), are below the construction worker HBL for lead (1,200 ppm), then no further remediation would be warranted. If the analytical results, based on a statistical evaluation, are above the construction worker HBL for lead, then an additional foot of soil would be excavated from the sector(s) causing the statistical evaluation to exceed the construction worker HBL for lead. After additional soil removal, an additional confirmation soil sample would be collected (as described above) from the sector(s) from which additional soil was removed. Further remediation would be evaluated based upon the analytical results. Further remediation would be warranted if the analytical results, based on a statistical evaluation, are above the construction worker HBL for lead. This process would be repeated until analytical results, based on a statistical evaluation, are below the construction worker HBL for lead.

2.2.4.2 RCRA Hazardous Waste Classification

Based on the lead concentrations in lead scale, there is a potential for remediation material/soil from this SWMU to be classified as RCRA hazardous waste [i.e., total lead concentrations greater than 20 times the RCRA hazardous TCLP criteria for lead (5 mg/L)]. To verify that the remediation material/soil is not RCRA hazardous waste, four remediation material/soil samples (one from each location: L-2B, S24.2-S07, S24.2-S15 and S24.3-S02; lead scale located at S24.2-S20 would be remediated with SWMU 24.8) would be collected from randomly-selected

locations of stockpiled lead scale. Sampling frequency is based on selecting a sample approximately every 100 cubic yards of lead scale.

Remediation material/soil would be stockpiled adjacent to each excavation and to a height of approximately one foot. To select the sampling locations, the surface area of each stockpile would be divided in sectors, corresponding to the number of samples to be collected. Each sector would be divided into six subsectors.

At each sampling location, remediation material/soil samples would be collected by driving a tube-lined core sampler (or equivalent sampling device) or by placing representative samples into a wide-mouth sample container using a hand trowel.

The remediation material/soil samples would be submitted to the laboratory for TCLP extraction and analysis. The samples would be extracted for soluble lead in accordance with EPA Test Method 1311 and then analyzed for lead in accordance with USEPA Test Method 6010.

If the analytical results, based on a statistical evaluation, are below the TCLP criteria for lead (5 mg/L), then the remediation material/soil would be classified as non RCRA hazardous waste suitable for disposal in the Unit I CAMU. If the analytical results, based on a statistical evaluation, are above the TCLP criteria for lead, then the sector(s) of remediation material/soil causing the statistical evaluation to exceed the TCLP criteria for lead would be segregated and disposed as RCRA hazardous waste (or further divided and sampled to minimize the generation of RCRA hazardous waste). The remaining sectors would be classified as non RCRA hazardous waste suitable for disposal in the Unit I CAMU.

2.3 SWMU NO. 24.5: SITE L-A - OIL DISPOSAL AREAS

2.3.1 Location

Site L-A is located in the southeast portion of the plant as shown in Figure 1-2. It is located south of the BNSF railroad tracks and the Sheet and Tin Mill, east of the incoming Water Filter Plant, west of Loveridge Road, and north of the Pittsburg-Antioch Highway. Site L-A covers an area of approximately 135 acres. Waste oils from plant operations were disposed at three confirmed locations within the north-central portion of Site L-A (refer to Figure 1-2):

- Oil Disposal Area No. 1 (ODA #1) is located within the southeastern portion of Site L-A and covers approximately 0.08 acre (3,600 square feet).
- ODA #3 is located within the north-central portion of Site L-A and covers approximately 0.2 acre (9,000 square feet).
- ODA #4 is located within the west-central portion of Site L-A and covers approximately 0.1 acre (4,000 square feet).

This SAP addresses oily waste from ODA #3 and ODA #4 but does not address ODA #1 because remediation material/soil from ODA #1 would contain PCBs (refer to Section 1.3).

2.3.2 Surface Conditions and Concentrations in Oily Waste

Surface conditions consist of oily waste with some areas covered with soil. Most areas are covered with vegetation.

COIs include: O&G, VOCs, SVOCs, and metals (priority pollutant metals).

Prior to the RFI, two investigations had been conducted to evaluate the conditions within Site L-A. Reports of these investigations include the following:

- Dames & Moore, Draft Report, *Waste Characterization Program, Waste Disposal Site L-A*, April 3, 1984 (Dames & Moore 1984); and
- MARK, *Water Quality Solid Waste Assessment Test (SWAT)*, February 1990 (MARK 1990).

The SWAT was an extensive investigation of the waste placed on Site L-A and of the underlying soil beneath the waste. The SWAT resulted in defining the vertical and lateral extent of most of the waste disposal areas within Site L-A.

During the SWAT, oily waste samples were collected from two locations (ODA-3-1 and ODA-3-2) within the SWMU. During the RFI (MARK 1998), oily waste and underlying soil samples were collected from one additional location (S24.5-3-S03) within the SWMU. Locations are shown on Figure 2-2. Logs of each RFI sampling location are provided in Appendix D for reference.

Based on an evaluation of analytical data presented in the Corrective Measures Study Workplan (URSGWC 1999), oily waste located at Site L-A is planned for remediation because it is currently exposed at the ground surface with concentrations of arsenic above the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic (160 ppm) and the RFI screening criterion (construction worker HBL) for arsenic (230 ppm). The highest reported concentration of arsenic in oily waste is 408 ppm.

2.3.3 Remediation Plan

Prior to excavation, plant plans would be reviewed and/or each excavation location would be geophysically screened for buried structures or utilities.

Within the ODA #3 area, oily waste is exposed at the surface at some locations. Other locations are covered with soil and vegetation. This overburden would be excavated, stockpiled and later used as backfill material. Oily waste has been detected to a maximum depth of 10 feet. Oily waste would be excavated and stockpiled for remediation (i.e., disposal in the on Site Unit I CAMU). The estimated quantity of remediation material/soil that would be generated from ODA #3 is approximately 4,000 loose cubic yards (estimated bank yardage increased by 20 percent). Should the excavated overburden appear different than anticipated (from a visual or olfactory perspective), samples of suspect soils would be collected following the procedures identified in Section 2.4.4.2 and analyzed, at a minimum, for arsenic (in accordance with USEPA Test Method 6010), the chemical exceeding RFI screening criteria.

ODA #4 consists of an oily waste layer of approximately 2 inches thick on the ground surface. Shrubbery within this area would be removed and left on Site L-A. Oily waste and remaining vegetation would be excavated and stockpiled for remediation (i.e., disposal off Site). The

estimated quantity of remediation material/soil that would be generated from ODA #4 is approximately 100 loose cubic yards (estimated bank yardage increased by 20 percent).

After remediation is completed, each excavation area would be backfilled with soil located in the immediate vicinity of each excavation to the elevations and grades of surrounding soils.

2.3.4 Sampling and Analysis Plan

2.3.4.1 Remediation Confirmation

To verify that arsenic concentrations in soils remaining after remediation are below the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic (160 ppm), 13 soil samples would be collected from randomly-selected locations within ODA #3 (nine from the bottom and four from the sides of the excavation), and four soil samples would be collected from randomly-selected locations within ODA #4 (four from the bottom of the excavation, there would be no sides of any significance). Sampling frequency is based on selecting a sample approximately every 1,000 square feet of surface area with a minimum of one sample per excavation panel (i.e., bottom or side of the excavation). To select the sampling locations, each panel would be divided in sectors that correspond to the number of samples to be collected from the panel based on the square footage of panel surface area. Each sector would then be divided into six subsectors. One subsector from each sector would then be randomly selected by a toss of a single die.

At each sampling location, confirmation samples would be collected by driving an aluminum tube-lined drive sampler (or equivalent sampling device) or by placing representative samples into a wide-mouth sample container using a hand trowel.

The soil samples would be submitted to the laboratory for analysis. The samples would be analyzed for arsenic in accordance with USEPA Test Method 6010.

The need for further remediation would be evaluated based upon the analytical results. If the analytical results, based on a statistical evaluation (refer to Section 3.12), are below the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic (160 ppm), then no further remediation would be warranted. If the analytical results, based on a statistical evaluation, are above the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic, then an additional foot of soil would be excavated from the sector(s) causing the statistical evaluation to exceed the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic. After additional soil removal, an additional confirmation soil sample would be collected (as described above) from the sector(s) from which additional soil was removed. Further remediation would be evaluated based upon the analytical results. Further remediation would be warranted if the analytical results, based on a statistical evaluation, are above the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic. This process would be repeated until analytical results, based on a statistical evaluation, are below the site-specific soil cleanup level calculated for the industrial/commercial worker for arsenic.

Underlying native soils at ODA #3 do contain O&G but do not require remediation based on evaluations conducted during the RFI, (MARK 1998).

2.3.4.2 RCRA Hazardous Waste Classification

Based on the arsenic, chromium and lead concentrations in oily waste, there is a potential for remediation material/soil from this SWMU to be classified as RCRA hazardous waste [i.e., total arsenic, chromium and lead concentrations greater than 20 times the RCRA hazardous TCLP criteria for arsenic, chromium and lead (each at 5 mg/L)]. To verify that the remediation material/soil from this SWMU is not RCRA hazardous waste, 41 remediation material/soil samples (40 from ODA #3 and 1 from ODA #4) would be collected from randomly-selected locations of stockpiled remediation material/soil. Sampling frequency is based on selecting a sample approximately every 100 cubic yards of remediation material/soil.

Remediation material/soil would be stockpiled adjacent to each excavation and to a height of approximately six feet (ODA #3) and one foot (ODA #4). To select the sampling locations, the surface area of each stockpile would be divided in sectors, corresponding to the number of samples to be collected (a sample approximately every 100 cubic yards). Each sector would be divided into six subsectors. One subsector from each sector would then be randomly selected by a toss of a single die. The depth of the sample (ODA #3 only) would also be randomly selected by a toss of a single die.

In the case of ODA #3, samples from remediation material/soil stockpiles would be obtained from the desired depth using a manual hand-auger or the excavation bucket. Samples would be collected from the desired depths in each boring or from the excavation bucket by driving an aluminum tube-lined drive sampler (or equivalent sampling device) or by placing representative samples into a wide-mouth sample container using a hand trowel. In the case of ODA #4, samples would be collected by driving an aluminum tube-lined drive sampler (or equivalent sampling device) or by placing representative samples into a wide-mouth sample container using a hand trowel.

The remediation material/soil samples would be submitted to the laboratory for TCLP extraction and analysis. The samples would be extracted for soluble arsenic, chromium and lead in accordance with EPA Test Method 1311 and then analyzed for arsenic, chromium and lead in accordance with USEPA Test Method 6010. To confirm the absence of PCBs and free liquids in the oily waste, remediation material/soil samples would also be submitted to the laboratory for PCB and free liquids analysis in accordance with EPA Test Methods 8082 and 9095, respectively.

If the analytical results, based on a statistical evaluation, are below the TCLP criteria for arsenic, chromium and lead (each at 5 mg/L) and non detect for PCBs and free liquids, then the remediation material/soil from ODA #3 would be classified as non RCRA hazardous waste and suitable for disposal in the Unit I CAMU (remediation material/soil from ODA #4 would be disposed off Site regardless). If the ODA #3 analytical results, based on a statistical evaluation, are above the TCLP criteria for arsenic, chromium or lead or PCBs or free liquids are detected, then the sector(s) of remediation material/soil causing the statistical evaluation to exceed the criteria would be segregated and disposed off Site (or further divided and sampled to minimize the generation of waste requiring off Site disposal). The remaining sectors would be classified as non RCRA hazardous waste and suitable for disposal in the Unit I CAMU.

Should analytical results demonstrate that remediation material/soil contains PCBs at concentrations greater than 1 ppm, then confirmation sampling and analysis of the remediation area(s) would be performed in accordance with 40 CFR, Section 761.61.

2.4 SWMU NO. 24.8: SITE L-A - LEAD IMPACTED AREA

2.4.1 Location

Site L-A is located in the southeast portion of the plant as shown in Figure 1-2. It is located south of the BNSF railroad tracks and the Sheet and Tin Mill, east of the incoming Water Filter Plant, west of Loveridge Road, and north of the Pittsburg-Antioch Highway. Site L-A covers an area of approximately 135 acres. The Lead Impacted Area is located in the east-central portion of Site L-A (refer to Figure 1-2). This SWMU covers an area of approximately 18,000 square feet.

2.4.2 Surface Conditions and Concentrations in Soil

Surface conditions consist of exposed soil. The only COI is lead.

During the RFI (MARK 1998), soil samples were collected from 16 locations (S24.2-S20 and S24.2-S20A through S24.2-S20O) within the SWMU. Locations are shown on Figure 2-3. Logs of each sampling location are provided in Appendix E for reference.

Based on an evaluation of analytical data presented in the Corrective Measures Study Workplan (URSGWC 1999), lead impacted soil located at Site L-A is planned for remediation because lead concentrations exceed the site-specific soil cleanup level calculated for the industrial/commercial worker for lead (5,500 ppm) and the RFI screening criterion (construction worker HBL) for lead (1,200 ppm). The highest reported concentration of lead in soil is 25,500 ppm.

2.4.3 Remediation Plan

Based on the lead concentrations in SWMU soils, an area of approximately 165 feet by 145 feet is planned for excavation (refer to Figure 2-3). Prior to soil excavation, plant plans would be reviewed and/or each excavation location would be geophysically screened for buried structures or utilities.

Because fill soils covering the lead impacted soils cannot be easily distinguished from the lead impacted soils, cover soils would also be excavated for remediation. The average depth of the lead impacted soils is 8.5 feet. Targeted soils (i.e., cover fill soils, lead impacted soils and lead scale located at RFI sample location S24.2-S20) would be excavated and stockpiled for remediation (i.e., disposal in the on Site Unit I CAMU). The estimated quantity of remediation material/soil that would be generated is 7,500 cubic yards.

After remediation is completed, the excavation area would be backfilled with soil located in the immediate vicinity of the excavation to the elevations and grades of surrounding soils.

2.4.4 Sampling and Analysis Plan

2.4.4.1 Remediation Confirmation

Visual confirmation would be used to confirm the removal of the lead impacted soils from the floor of the excavation. The lead impacted soils contain slag fragments and are, therefore, easily distinguished from underlying native soils.

To verify that lead concentrations in soils remaining after remediation (within the sides of the excavation) are below the construction worker HBL for lead (1,200 ppm), eight soil samples would be collected from randomly-selected locations on the side panels. Sampling frequency is based on selecting a sample approximately every 1,000 square feet of surface area with a minimum of one sample per excavation panel (i.e., side of the excavation). To select the sampling locations, each panel would be divided in sectors that correspond to the number of samples to be collected from the panel based on the square footage of panel surface area. Each sector would then be divided into six subsectors. One subsector from each sector would then be randomly selected by a toss of a single die.

At each sampling location, confirmation samples would be collected from the excavation bucket by driving an aluminum tube-lined drive sampler (or equivalent sampling device) or by placing representative samples of the collected soils into a wide-mouth sample container using a hand trowel.

The soil samples would be submitted to the laboratory for analysis. The samples would be analyzed for lead in accordance with USEPA Test Method 6010.

The need for further remediation would be evaluated based upon the analytical results. If the analytical results, based on a statistical evaluation (refer to Section 3.12), are below the construction worker HBL for lead (1,200 ppm), then no further remediation would be warranted. If the analytical results, based on a statistical evaluation, are above the construction worker HBL for lead, then an additional foot of soil would be excavated from the sector(s) causing the statistical evaluation to exceed the construction worker HBL for lead. After additional soil removal, an additional confirmation soil sample would be collected (as described above) from the sector(s) from which additional soil was removed. Further remediation would be warranted if the analytical results, based on a statistical evaluation, are above the construction worker HBL for lead. This process would be repeated until analytical results, based on a statistical evaluation, are below the construction worker HBL for lead.

2.4.4.2 RCRA Hazardous Waste Classification

Based on the lead concentrations in the impacted soils, there is a potential for remediation material/soil from this SWMU to be classified as RCRA hazardous waste [i.e., total lead concentrations greater than 20 times the RCRA hazardous TCLP criteria for lead (5 mg/L)]. To verify that the remediation material/soil is not RCRA hazardous waste, 75 remediation material/soil samples would be collected from randomly-selected locations of stockpiled lead scale. Sampling frequency is based on selecting a sample approximately every 100 cubic yards of lead scale.

Remediation material/soil would be stockpiled to a height of approximately six feet. To select the sampling locations, the surface area of the stockpile would be divided in sectors, corresponding to the number of samples to be collected (a sample approximately every 100 cubic yards). Each sector would be divided into six subsectors. One subsector from each sector would then be randomly selected by a toss of a single die. The depth of the sample would also be randomly selected by a toss of a single die.

Samples from remediation material/soil stockpiles would be obtained from the desired depth using a manual hand-auger or the excavation bucket. Samples would be collected from the

desired depths in each boring or from the excavation bucket by driving an aluminum tube-lined drive sampler (or equivalent sampling device) or by placing representative samples into a wide-mouth sample container using a hand trowel.

The remediation material/soil samples would be submitted to the laboratory for TCLP extraction and analysis. Every four samples would be composited into one prior to analysis. The samples would be extracted for soluble lead in accordance with EPA Test Method 1311 and then analyzed for lead in accordance with USEPA Test Method 6010.

If the analytical results, based on a statistical evaluation, are below the TCLP criteria for lead (5 mg/L), then the remediation material/soil would be classified as non RCRA hazardous waste suitable for disposal in the Unit I CAMU. If the analytical results, based on a statistical evaluation, are above the TCLP criteria for lead, then the individual samples, from the composited sector(s) of remediation material/soil causing the statistical evaluation to exceed the TCLP criteria for lead, would be analyzed and evaluated. The sectors with individual sample results above the TCLP criteria for lead would be segregated and disposed as RCRA hazardous waste (or further divided and sampled to minimize the generation of RCRA hazardous waste). The remaining sectors would be classified as non RCRA hazardous waste suitable for disposal in the Unit I CAMU.

Appendix D-2: Excerpts from 2001 PCB *Sampling and Analysis Plan* (Note: Referenced figures and appendices are not provided.)

2.1 SWMU NO. 24.5: SITE L-A - OIL DISPOSAL AREAS

2.1.1 Location

Site L-A is located in the southeast portion of the plant as shown in Figure 1-2. It is located south of the BNSF tracks and the Sheet and Tin Mill, east of the incoming Water Filter Plant, west of Loveridge Road, and north of the Pittsburg-Antioch Highway. Site L-A covers an area of approximately 135 acres. Waste oils from plant operations were disposed at three confirmed locations within the north-central portion of Site L-A (refer to Figure 1-2):

- Oil Disposal Area No. 1 (ODA #1) is located within the southeastern portion of Site L-A and covers approximately 0.08 acre (3,600 square feet).
- ODA # 3 is located within the north-central portion of Site L-A and covers approximately 0.2 acre (9,000 square feet).
- ODA # 4 is located within the west-central portion of Site L-A and covers approximately 0.1 acre (4,000 square feet).

This Notice addresses oily waste from ODA #1 but does not address ODA #3 and ODA #4 because remediation material/soil from ODA #3 and ODA #4 would not contain PCBs (refer to Section 1.3).

2.1.2 Surface Conditions and Concentrations in Oily Waste

Surface conditions consist of oily waste with some areas covered with soil. Most areas are covered with vegetation.

COIs include: PCBs, O&G, VOCs, SVOCs, and metals (priority pollutant metals).

Prior to the RFI (MARK 1998), two investigations had been conducted to evaluate the conditions within Site L-A. Reports of these investigations include the following:

- Dames & Moore, Draft Report, *Waste Characterization Program, Waste Disposal Site L-A*, April 3, 1984 (Dames & Moore 1984); and
- MARK, *Water Quality Solid Waste Assessment Test (SWAT)*, February 1990 (MARK 1990).

The SWAT was an extensive investigation of the waste placed on Site L-A and of the underlying soil beneath the waste. The SWAT resulted in defining the vertical and lateral extent of most of the waste disposal areas within Site L-A.

During the Waste Characterization Program, oily waste samples were collected from eight locations along the centerline of the SWMU and also along the middle west side of the SWMU (at test pit OP1/TP1), where the oily waste was found to be the deepest (5 feet). During the RFI, oily waste and underlying soil samples were collected from two additional location (S24.5-1-S02

and S24.5-1-S03) within the SWMU. Locations of test pit OP1/TP1 and the RFI sampling locations are shown on Figure 2-5. Refer to Appendix C for laboratory analytical data reports. Logs of the three sampling location are provided in Appendix D for reference.

Current and foreseeable use of Site L-A and the oily waste disposal area meets the definition of a low occupancy area. UPI has decided to proceed with the RCRA Corrective Action Process using the PCB self-implementing soil cleanup level of 25 ppm and if possible, a level of 1 ppm. A deed restriction would be required limiting use of this area to those uses that meet the definition of low occupancy if the level of 1 ppm cannot be achieved.

Based on an evaluation of analytical data conducted during the Corrective Measures Study (URS 2000), soils at this SWMU are planned for remediation because PCB concentrations in soils exceed the PCB self-implementing soil cleanup level of 25 ppm. The highest PCB concentration of 88 ppm was recorded at RFI sampling location S24.5-1-S02.

2.1.3 Remediation Plan

Prior to excavation, plant plans would be reviewed and/or the excavation location would be geophysically screened for buried structures or utilities. PCB field screening tests would be used to assist in the remediation effort.

Within the ODA #3 area, oily waste is exposed at the surface at some locations. Other locations are covered with soil and vegetation. This overburden would be excavated, stockpiled and later used as backfill material. Oily waste has been detected to a maximum depth of 7 feet. Oily waste would be excavated and directed to the Kettleman Hills Hazardous Waste Facility for disposal. The estimated quantity of remediation material/soil that would be generated from ODA #1 is approximately 1,040 cubic yards (includes a fluff factor of 20 percent).

After remediation and confirmation sampling are completed, the excavation area would be backfilled with soil located in the immediate vicinity of the excavation to the elevations and grades of surrounding soils.

Should higher PCB concentrations be detected during remediation, excavated material/soil would still be directed to the Kettleman Hills Hazardous Waste Facility, which is permitted to receive PCB soils up to 1,000 ppm. Should additional material/soil need remediation, UPI would also direct the additional material/soil to the Kettleman Hills Hazardous Waste Facility.

2.1.3.1 Remediation Schedule

The anticipated implementation schedule is the summer/fall of 2001.

2.1.4 Sampling and Analysis Plan

2.1.4.1 Remediation Confirmation

To verify that PCB concentrations in soils remaining after remediation are, first, below the PCB self-implementing soil cleanup level for low occupancy areas (25 ppm) and, second, below the PCB self-implementing soil cleanup level for high occupancy areas (1 ppm), confirmation

sampling as specified in 40 CFR, Section 761.280 would be conducted. Approximately 360 soil samples would be collected from a grid system with sampling points 1.5 meters apart.

At each sampling location, confirmation samples would be collected from the excavation bucket by driving a tube-lined core sampler (or equivalent sampling device).

The soil samples would be submitted to the laboratory for analysis. The samples would be analyzed for PCBs in accordance with USEPA Test Method 3500B/3540C or Method 3500B/3550B for chemical extraction of PCBs and Method 8082 to analyze the extracts for PCBs. Every eight samples would be composited into one prior to analysis. Sample concentrations would be reported on a dry weight basis.

The need for further remediation would be evaluated based upon the analytical results. If the analytical results, based on a statistical evaluation (refer to Section 3.12), are below the soil cleanup level for high occupancy areas (1 ppm), then no further remediation would be warranted.

If the analytical results, based on a statistical evaluation, are above the soil cleanup level for high occupancy areas (1 ppm) but below the soil cleanup level for low occupancy areas (25 ppm), UPI would decide to either: (1) deed restrict the area for low occupancy use, or (2) excavate additional soil. If UPI chooses to excavate additional soil, the individual grid point samples, from the composited grid point(s) samples causing the statistical evaluation to exceed 1 ppm, would first be analyzed to narrow the excavation area. An additional foot of soil would be excavated from the area of inference (as defined in 40 CFR, Section 761.280) of the grid point(s) causing the statistical evaluation to exceed 1 ppm. After additional soil removal, additional confirmation soil samples would be collected (as described above) from the area(s) from which additional soil was removed. Further remediation would be evaluated based upon the analytical results. Further remediation would be warranted if the analytical results, based on a statistical evaluation, are above 1 ppm. This process would be repeated until analytical results, based on a statistical evaluation, are below 1 ppm or UPI chooses to deed restrict the area for low occupancy use.

If the analytical results, based on a statistical evaluation, are above the soil cleanup level for low occupancy areas (25 ppm), then the individual grid point samples, from the composited grid point(s) samples causing the statistical evaluation to exceed 25 ppm, would first be analyzed to target further excavation efforts. An additional foot of soil would be excavated from the area of inference (as defined in 40 CFR, Section 761.280) of the grid point(s) causing the statistical evaluation to exceed 25 ppm. After additional soil removal, additional confirmation soil samples would be collected (as described above) from the area(s) from which additional soil was removed. Further remediation would be evaluated based upon the analytical results. Further remediation would be warranted if the analytical results, based on a statistical evaluation, are above 25 ppm. This process would be repeated until analytical results, based on a statistical evaluation, are below 25 ppm.

2.1.4.2 Written Certification

A written certification, signed by UPI (property owner) and URS Corporation (firm managing the cleanup), that all sampling plans, sample collection procedures, sample preparation procedures, extraction procedures, and instrumental/chemical analysis procedures used to evaluate the remediation effort at the SWMU, would be placed on file at UPI, and would be available for USEPA inspection is provided in Appendix B.

2.1.4.3 RCRA Hazardous Waste Classification

Based on metal concentrations in ODA #3 oily waste (Dames & Moore 1984), remediation material/soil from this SWMU would not be classified as RCRA hazardous waste (i.e., total metal concentrations are less than 20 times the RCRA hazardous TCLP criteria for metals). No additional analysis is, therefore, warranted.

Appendix E

Excerpts from 1999 *Final Derivation of Site-Specific Soil Cleanup Levels*

Final Derivation of Site-Specific Soil Cleanup Levels

Submitted to:

U.S. Steel
Pittsburgh, PA

USS POSCO
Pittsburg, CA

June 17, 1999

McLaren/Hart, Inc.

SCIENCE : STRATEGY : TECHNOLOGY : SOLUTIONS

A

FIGURES

TABLE 6

FINAL SITE-SPECIFIC SOIL CLEANUP LEVELS (MG/KG)
UPI FACILITY
PITTSBURG, CALIFORNIA

Chemical	Industrial/Commercial Worker
Arsenic	160[a,b]
Benzene	9.1[a,b]
Lead	5,500[c,d]
Nickel	6,000[a,b]
cPAHs[e]	6.3[a,b]
PCBs	65[a,b]

a The 5th percentile soil cleanup level is presented based on the results of the Monte Carlo analysis.
b Based on carcinogenic health effects.
c Based on noncarcinogenic health effects.
d Based on the modified Cal-EPA Lead Spread model.
e The potentially carcinogenic PAHs are represented by benzo(a)pyrene (see Section 5.4). The other potentially carcinogenic PAHs include: benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-c,d)pyrene.
cPAHs Potentially carcinogenic polyaromatic hydrocarbons.
PCBs Polychlorinated biphenyls.

Appendix A

Revised Health-Based Levels (HBLs)

Table A-1: Revised Health-Based Screening Levels for Chemicals in Soil – Metals (a) RFI USS-POSCO Industries Pittsburg, California				
	Health-Based Levels (mg/kg)			
	Industrial/Commercial Worker		Construction Worker	
Analyte	HBL_n(b)	HBL_c(c)	HBL_n(b)	HBL_c(c)
Antimony	375	NA	76	NA
Arsenic	refer to Table 5	Refer to Table 5	NC	NC
Beryllium	33,700	25	61,500	1,100
Cadmium	1140	190	1,000	3,820
Chromium	4,500 (d)	NA	4,500(d)	NA
Chromium VI	4,690	5.1	948	97
Cobalt	272	NA	37	NA
Copper	34,800	NA	7,040	NA
Lead	refer to Table 5	NA	NC	NA
Mercury	280	NA	57	NA
Nickel	refer to Table 5	refer to Table 5	NC	NC
Selenium	4,690	NA	948	NA
Silver	4,690	NA	948	NA
Thallium	137	NA	242	NA
Vanadium	272	NA	37	NA
Zinc	100,000(d)	NA	56,900	NA

Notes:

(a) Health-based risk levels were revised only for carcinogenic chemicals to adjust the target risk level from 10^{-6} to 10^{-5} as described in Section 4.0, unless otherwise noted. In addition, the lowest value for each chemical under each scenario was selected as the screening HBL.

(b) Health-based risk level for non-carcinogens.

(c) Health-based risk level for carcinogens.

(d) At the request of Cal-EPA, the U.S. EPA Region IX preliminary remediation goal (PRG) was used as the screening HBL because the previous values exceeded 100,000 mg/kg and are no longer representative of soil (DiZio, pers. comm., 1999).

NA Referenced volume not available and/or applicable.

NC Not calculated.

mg/kg milligrams per kilogram

Table A-2: Revised Health-Based Screening Levels for Chemicals in Soil - Volatile Organic Compounds (a) RFI USS-POSCO Industries Pittsburg, California				
	Soil Screening Value (mg/kg)			
	Industrial/Commercial Worker		Construction Worker	
Analyte	HBLn (b)	HBLc (c)	HBLn (b)	HBLc (c)
Acetone	3,893	NA	22,845	NA
Benzene	refer to Table 5	refer to Table 5	NC	NC
Bromodichloromethane	8,171(d)	7.4	2,152	1,340
Bromoform	8,135(d)	1,640	8,135(d)	8,135(d)
Bromomethane	5	NA	4	NA
Carbon disulfide	24	NA	16	NA
Carbon tetrachloride	325	1.8	753	350
Chlorobenzene	227	NA	1,477	NA
Chloroethane	2,669 (e)	NA	2,669 (e)	NA
Chloroform	4,636	20	1,076	3,800
Chloromethane	NA	130	NA	2,552 (e)
Dibromochloromethane	3,557(d)	1,540	3,557(d)	3,557(d)
1,2-Dichlorobenzene	370(f)	NA	370(f)	NA
1,3-Dichlorobenzene	NA	NA	NA	NA
1,4-Dichlorobenzene	2,696 (e)	70	2,696 (e)	2,696(e)
1,1-Dichloroethane	282	NA	1,911	NA
1,2-Dichloroethane	NA	6.3	NA	1,230
1,1-Dichloroethene	3,735 (e)	9.2	969	1,900
cis-1,2-Dichloroethene	116	NA	758	NA
trans-1,2-Dichloroethene	275	NA	1,776	NA
1,2-Dichloropropane	25	9.2	55	1,770
cis-1,3-Dichloropropene	73	5.4	79	970
trans-1,3-Dichloropropene	74	5.5	81	1,000
Ethylbenzene	230(f)	NA	230(f)	NA
2-Hexanone	NA	NA	NA	NA
Methyl ethyl ketone	15,576	NA	50,975 (e)	NA
Methylene chloride	5,826(e)	70	2,776	5,826(e)

Table A-2: Revised Health-Based Screening Levels for Chemicals in Soil - Volatile Organic Compounds(a) RFI USS-POSCO Industries Pittsburg, California				
	Soil Screening Value (mg/kg)			
	Industrial/Commercial Worker		Construction Worker	
Analyte	HBLn (b)	HBLc (c)	HBLn (b)	HBLc (c)
Methyl isobutyl ketone	1,160	NA	7,214	NA
Styrene	1,700(f)	NA	1,700(f)	NA
1,1,2,2-Tetrachloroethane	NA	100	NA	7,142(e)
Tetrachloroethene	1,137 (e)	9.4	1,137 (e)	1,137(e)
Toluene	520(f)	NA	520(f)	NA
1,1,1-Trichloroethane	1,400(f)	NA	1,400(f)	NA
1,1,2-Trichloroethane	5,531 (e)	150	4,305	5,531(e)
Trichloroethene	NA	50	NA	2,969(d)
Trichlorofluoromethane	4,096 (e)	NA	4,096 (e)	NA
Vinyl acetate	4,178(d)	NA	4,178(d)	NA
Vinyl chloride	NA	0.3	NA	7 (e)
Xylenes	210(f)	NA	210(f)	NA

Notes:

(a) Health-based risk levels were revised only for carcinogenic chemicals to adjust the target risk level from 10^{-6} to 10^{-5} as described in Section 4.0.

(b) Health-based risk level for noncarcinogens.

(c) Health-based risk level for carcinogens.

(d) Calculated soil saturation concentration in accordance with Cal-EPA, 1998 guidance (see spreadsheet in Appendix B).

(e) Soil saturation concentration calculated using California Environmental Protection Agency (Cal-EPA), Department of Toxic Substances Control (DTSC) soil saturation concentration equation (MARK Group, 1996).

(f) At the request of Cal-EPA, the U.S. EPA Region IX Preliminary Remediation Goal (PRG) based on the soil saturation concentration was used as the screening HBL because the previous values exceeded these numbers and are no longer representative of soil, (DiZio, pers. comm., 1999) or the values could not be confirmed from previous HLA report (HLA, 1993).

NA Reference value not available and/or applicable.

NC Not calculated.

mg/kg milligrams per kilogram

Table A-3: Revised Health-Based Screening Levels for Chemicals in Soil - Semi-volatile Organic Compounds (a) RFI USS-POSCO Industries Pittsburg, California				
	Soil Screening Value (mg/kg)			
	Industrial/Commercial Worker		Construction Worker	
Analyte	HBLn (b)	HBLc (c)	HBLn (b)	HBLc (c)
Acenaphthene	315 (d)	NA	315 (d)	NA
Acenaphthylene	197 (d)	NA	197 (d)	NA
Aniline	20,900	560	19,200	52,000(e)
Anthracene	13 (d)	NA	13 (d)	NA
Azobenzene	NA	2.4	NA	1 (d)
Benzidine	340	100	158	14,910
Benzo(a)anthracene	NA	refer to Table 5	NA	NC
Benzo(a)pyrene	NA	refer to Table 5	NA	NC
Benzo(b&k)fluoranthene	NA	refer to Table 5	NA	NC
Benzo(ghi)perylene	4,520	NA	2,090	NA
Benzoic Acid	100,000(f)	NA	100,000(f)	NA
Benzyl Alcohol	33,900	NA	52,100	NA
Bis(2-chloroethoxy)methane	NA	NA	NA	NA
Bis(2-chloroethyl)ether	NA	1.4	NA	190
Bis(2-chloroisopropyl)ether	2,245 (d)	470	2,245 (d)	2,245 (d)
Bis(2-ethylhexyl)phthalate	778(e)	380	778(e)	778(e)
4-Bromophenyl-phenylether	NA	NA	NA	NA
Butylbenzylphthalate	930(f)	NA	930(f)	NA
4-Chloro-3-methylphenol	49,920(e)	NA	49,420(e)	NA
4-Chloroaniline	452	NA	209	NA
2-Chloronaphthalene	644 (d)	NA	644 (d)	NA
2-Chlorophenol	566	NA	2,610	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA
Chyrsene	NA	refer to Table 5	NA	NC
Di-n-butylphthalate	11,300	NA	52,100	NA
Di-n-octylphthalate	2,260	NA	1,040	NA

Table A-3: Revised Health-Based Screening Levels for Chemicals in Soil - Semi-volatile Organic Compounds (a)
RFI
USS-POSCO Industries
Pittsburg, California

Analyte	Soil Screening Value (mg/kg)			
	Industrial/Commercial Worker		Construction Worker	
	HBLn (b)	HBLc (c)	HBLn (b)	HBLc (c)
Dibenzo(a,h)anthracene	NA	refer to Table 5	NA	NC
Dibenzofuran	NA	NA	NA	NA
3,3-Dichlorobenzidine	NA	0.4	NA	370
2,4-Dichlorophenol	339	NA	156	NA
Diethylphthalate	90,500	NA	100,000(f)	NA
Dimethylphthalate	25	NA	55	NA
2,4-Dimethylphenol	2,260	NA	10,400	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA
2,4-Dinitrophenol	226	NA	104	NA
2,4-Dinitrotoluene	227	10	105	1,430
2,6-Dinitrotoluene	113	4.7	521	650
Fluoranthene	4,520	NA	20,900	NA
Fluorene	247 (d)	NA	247 (d)	NA
Hexachlorobenzene	91	1.8	42	250
Hexachlorobutadiene	NA	410	NA	3,470(e)
Hexachlorocyclopentadiene	514	NA	985	NA
Hexachloroethane	113	1,706(e)	525	1,786(e)
Indeno(1,2,3-cd)pyrene	NA	41	NA	2,200
Isophorone	12,433(e)	12,433(e)	12,433(e)	12,433(e)
2-Methylnaphthalene	2,412	NA	1,312	NA
2-Methylphenol	5,660	NA	26,100	NA
4-Methylphenol	566	NA	2,610	NA
N-Nitrosodimethylamine	NA	0.6	NA	90
N-Nitrosodipropylamine	NA	0.5	NA	60
N-Nitrosodiphenylamine	NA	350	NA	909(e)
Naphthalene	605 (d)	NA	605 (d)	NA

Table A-3: Revised Health-Based Screening Levels for Chemicals in Soil - Semi-volatile Organic Compounds (a) RFI USS-POSCO Industries Pittsburg, California				
	Soil Screening Value (mg/kg)			
	Industrial/Commercial Worker		Construction Worker	
Analyte	HBLn (b)	HBLc (c)	HBLn (b)	HBLc (c)
2-Nitroaniline	7	NA	31	NA
3-Nitroaniline	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA
Nitrobenzene	91	NA	350	NA
2-Nitrophenol	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA
Pentachlorophenol	3,400	20	1,580	2,480
Phenanthrene	280 (d)	NA	280 (d)	NA
Phenol	67,900	NA	31,300	NA
Pyrene	3,390	NA	15,600	NA
1,2,4-Trichlorobenzene	823	NA	926	NA
2,4,5-Trichlorophenol	11,300	NA	38,448(e)	NA
2,4,6-Trichlorophenol	NA	50	NA	6,176(e)

Notes:

(a) Health-based risk levels were revised only for carcinogenic chemicals to adjust to the target risk level from 10^{-6} to 10^{-5} as described in Section 4.0.
(b) Health-based risk level for noncarcinogens.
(c) Health-based risk level for carcinogens.
(d) Soil saturation concentration calculated using California Environmental Protection Agency (Cal-EPA), Department of Toxic Substances Control (DTSC) soil saturation concentration equation (MARK Group, 1996).
(e) Calculated soil saturation concentration in accordance with Cal-EPA, 1998 guidance (see spreadsheet in Appendix B).
(f) At the request of Cal-EPA, the U.S. EPA Region IX Preliminary Remediation Goal (PRG) based on the soil saturation concentration was used as the screening HBL because the previous values exceeded these numbers and are no longer representative of soil, (DiZio, pers. comm., 1999) or the values could not be confirmed from previous HLA report (HLA, 1993).

NA Reference value not available and/or applicable.
NC Not calculated.
mg/kg milligrams per kilogram

Appendix F

Dust Control Mitigation Measures for Compliance with BAAQMD CEQA Guidelines

Unit 1 CAMU Construction, USS-POSCO Industries, Pittsburg, California

APPENDIX F
DUST CONTROL MITIGATION MEASURES
COLUMBIA SOLAR PROJECT

SITE L-A GRADING, TRENCHING, AND EXCAVATION ACTIVITIES
USS-POSCO INDUSTRIES
PITTSBURG, CALIFORNIA

1.0 Introduction

This Dust Control Plan (DCP) is an appendix to the Columbia Solar Energy (CSE) Project Soil Management Plan (SMP). It describes the dust control mitigation measures for the earthmoving and post earthmoving construction activities at the portion of Site L-A (Site) at the USS-POSCO Industries (UPI) plant in Pittsburg, California (SMP Figure 1) to be used for the construction of the Columbia Solar Project (Project). The scope of work for earthmoving construction activities includes trenching, excavating, grading, sub-station and inverter foundation installation, and stockpile soil management to prepare the Site for the installation of photovoltaic panels and related equipment and enclosures. The post earthmoving activities include mounting rack, solar panel and wiring installation. This document is designed to comply with the current Bay Area Air Quality Management District (BAAQMD) standards, requirements and regulations and California Health and Safety Code, Sections 41700 and 41701. Refer to the SMP text for additional information on the scope of work (SMP Section 1), Site location and description (SMP Section 2), and Site history (SMP Section 4).

1.1 General Site Information

Project Name and Location: Site L-A Grading, Trenching, and Excavation Activities, 2907 Pittsburg-Antioch Highway, Contra Costa County Assessor's Parcel APN 073-200-021.
Expected Construction Start/End Dates: September 2014 to March 2015
Work Hours: Weekdays, 7 am to 5 pm, no weekend or holiday work planned. If extended hours or weekend work hours are needed, they will be coordinated with the City of Pittsburg.

Contacts:

1. Property Owner: UPI, 900 Loveridge Road, P.O. Box 471, Pittsburg, CA 94565, General Telephone number: 925-439-6728, Fax: 925-439-6706, Contact Freddy Ripoli (925) 303-5071, FAX (925) 439-6706
2. Developer: Columbia Solar Energy, LLC, 1350 Bayshore Highway, Suite 825, Burlingame, CA 94010, General Telephone Number: 650-288-3722, Fax: 650-288-3719, Clay Minchen Contact 650-288-3722, ext. 303.
3. Construction Contractor: McCarthy Building Companies, 2241 Douglas Blvd. Suite 200, Roseville, CA 95661, General Telephone Number: 916-786-3833, Fax: 916-783-3234 Kevin Black Contact 916-949-3783.
4. Environmental Contamination Monitor Contractor: URS Corporation, 1333 Broadway, Suite 800, Oakland, CA 94612, Contact: Joe Morgan, Office: 510-874-3201, Fax: 510-874-3268, Cell: 510-381-4130.

Plot Plan: See attached SMP Figure 2 which includes the following information:

- Project boundaries
- Grading, trenching, and excavation areas
- Staging and storage areas/piles
- Truck routes and parking lots
- Exit points with track-out control
- Onsite water supply location
- Visibly contaminated soil stockpile

1.2 Roles and Responsibilities

Roles and responsibilities for dust control monitoring and implementation of dust control mitigation measures are described below. Refer to the SMP, Section 5 Environmental Contamination Monitoring Organization and Responsibilities, for additional information on owner/developer, construction contractor, and environmental contamination monitor contractor responsibilities during earthmoving activities at the Site.

Owner/Developer
UPI is the Owner of the property and CSE is the Developer for the project. UPI has the overall responsibility for implementing and overseeing the earthmoving construction activities, the soil management activities in accordance with the SMP, the dust control monitoring and mitigation activities in accordance with this document (Appendix F of the SMP), and the health and safety program in accordance with the project health and safety plan (HSP).

Construction Contractor
McCarthy Building Companies (McCarthy) is the construction contractor and is responsible for implementing and overseeing the earthmoving construction activities in accordance with the SMP and HSP. McCarthy is responsible for implementing mitigation measures to control fugitive dust and stop construction activities as warranted based on dust monitoring results and Site conditions.

Environmental Compliance Monitoring Contractor
URS Corporation Americas (URS) is the environmental compliance monitoring contractor and is responsible for the environmental oversight of the Construction Contractor. URS assigned properly qualified and trained personnel to act as oversight and monitoring staff to monitor compliance with the HSP and SMP including dust control mitigation measures described in this document. URS is authorized to stop construction activities should monitoring indicate non-compliance with the HSP or SMP. URS is responsible for the personnel monitoring and the Site perimeter monitoring, sample analysis, data evaluation, California Department of Toxic Substances Control (DTSC) notification of exceedances of action levels, and recordkeeping. URS will maintain a weather station to monitor wind speed and direction. URS will note off Site sources of dust daily and will factor these sources into the exposure evaluations.

2.0 Applicable State and Local Regulations

The following sections summarize state and local regulations related to minimizing and controlling fugitive dust emissions. These sections also discuss the applicable rules and regulations from the BAAQMD and the California Health and Safety Code.

2.1 BAAQMD Rules and Regulations

Two BAAQMD regulations are applicable to this project: Regulation 1, General Provisions and Definitions, and Regulation 6, Particulate Matter.

BAAQMD Regulation 1, Section 1-301, includes the following standard regarding public nuisance:

> No person shall discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance or annoyance to any considerable number of persons or the public; or which endangers the comfort, repose, health or safety of any such persons or the public, or which causes, or has a natural tendency to cause, injury or damage to business or property. For purposes of this section, three or more violation notices validly issued in a 30 day period to a facility for public nuisance shall give rise to a rebuttable presumption that the violations resulted from negligent conduct.

BAAQMD Regulation 1, Section 600, refers to the BAAQMD's Manual of Procedures. The Manual of Procedures includes test procedures, monitoring requirements, enforcement procedures and other relevant information to determine the basis for enforcement action by the BAAQMD. The Manual of Procedures also includes procedures for reading of visible emissions by an observer.

The purpose of BAAQMD Regulation 6, Particulate Matter, is to limit the quantity of particulate matter in the atmosphere through the establishment of limitations on emission rates, concentration, visible emissions and opacity.

Regulation 6, Section 6-1-300, includes the following standards regarding visible emissions:

> Ringelmann No. 1 Limitation: Except as provided in Sections 6-1-303, 6-1-304 and 6-1-306, a person shall not emit from any source for a period or periods aggregating more than three minutes in any hour, a visible emission which is as dark or darker than No. 1 on the Ringelmann Chart, or of such opacity as to obscure an observer's view to an equivalent or greater degree.
>
> Opacity Limitation: Except as provided in Sections 6-1-303, 6-1-304 and 6-1-306, a person shall not emit from any source for a period or periods aggregating more than three minutes in any hour an emission equal to or greater than 20% opacity as perceived by an opacity sensing device, where such device is required by District regulations.

Section 2.2 California Health and Safety Code

California Health and Safety Code regulations pertaining to fugitive emissions are summarized as follows:

Section 41700. Except as otherwise provided in Section 41705, no person shall discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property.

Section 41701. Except as otherwise provided in Section 41704, or Article 2 (commencing with Section 41800) of this chapter other than Section 41812, or Article 2 (commencing with Section 42350) of Chapter 4, no person shall discharge into the atmosphere from any source whatsoever any air contaminant, other than uncombined water vapor, for a period or periods aggregating more than three minutes in any one hour which is: (a) As dark or darker in shade as that designated as No. 2 on the Ringelmann Chart, as published by the United States Bureau of Mines, or (b) Of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in subdivision (a).

3.0 Dust Emission Sources and Control Methods

3.1 Potential Dust Emission Sources

URS anticipates the following potential sources of fugitive dust as part of the construction activities. No demolition is included in the construction activities.

- Grading, trenching, excavation, loading trucks with site soil, unloading trucks of site soil for fill, compaction, and soil management activities
- Mobile equipment on paved and unpaved Site roads

3.2 Dust Control Methods

The Construction Contractor will use the following methods to control fugitive dust emissions during construction activities at the Site.

General:

1. McCarthy's site safety officer will be on Site at all times during earthmoving activities and is responsible for implementing the specific project construction SMP and Health and Safety Plan HSP (signed by a Certified Industrial Hygienist and reviewed by UPI and/or its consultants for completeness) and implementing dust monitoring and mitigation measures.
2. SCA will install appropriate air monitoring equipment that is required by the BAAQMD. SCA will arrange the perimeter monitoring sites with one monitoring station each on the middle of four sides of the roughly rectangular shaped Site. The monitoring station on the west side of the Site will be between the site and the City

Park on the other side of the employee entrance to the UPI Plant. The four perimeter monitoring stations are shown on Figure 2 of the SMP. SCA will monitor a minimum of three representative members of the hazardous waste earth working contractor's crew daily. SCA will send the perimeter and personal monitoring samples to the McCampbell Analytical laboratory daily for expedited analysis. The samples will be analyzed for lead, arsenic, and total dust.

3. SCA will perform fenceline sampling for dust and lead. The perimeter fenceline dust action level will be set at 50 $\mu g/m^3$. The sampling media will be equipped with a size selector cyclone to limit sampling to the respirable fraction. The cyclone requires sampling at 1.7 liters per minute (LPM). The analysis of the filter remains unchanged (NIOSH 500). The perimeter fenceline for lead action level will be set at 1.5 $\mu g/m^3$. The planned sampling protocol (ICP/MS, with a sample volume of >1000 Liter) will provide analytical sensitivity at or below the action level.
4. McCarthy will limit the number of construction areas as well as limit access to those areas to approved personnel with adequate protective equipment.
5. McCarthy will continue dust monitoring during the post earthmoving (above surface) activities to ensure that the dust control is effective during that part of the project construction.
6. CSE will post signs to warn the public and non-construction employees of hazardous activities at the Site. CSE will post the signs around the existing Site perimeter fence and at the entrances to the Site.
7. McCarthy will properly maintain and operate a water truck with authorized operating personnel onsite during all earthmoving activities. UPI will supply water from the on Site water line. (SMP Figure 2). McCarthy will stop dust generating activities if staff, equipment and/or water are not available to control dust emissions.
8. URS will keep records of monitoring earthmoving activities and implementing dust control measures on field logs and will report these activities in the Project Completion Report, which URS will submit on behalf of UPI and CSE. URS will include the dust monitoring results during the post earthmoving activities in its final project report.

Track-out onto Paved Public Road:

9. McCarthy WILL remove any visible track-out on a paved public road at any location where vehicles exit the work site. WILL McCarthy will conduct this work using wet sweeping or a HEPA filter-equipped vacuum device at the end of the work day and at least one time per during the work day, or a total of twice per day. McCarthy will also conduct additional removal if there is visible track out on the off Site paved roadway.
10. McCarthy will install a rumble strip at the truck exit point and/ or an engineered gravel pad and/or 50 feet of pavement at the CSE Site entrance and at the stockpile management area. McCarthy will clean the rumble strip daily at a minimum or more frequently, if soil build up occurs and the removal from the truck tires is inhibited.
11. McCarthy will install sandbags or other erosion control measures to prevent silt runoff to public roadways, as required.

Active Storage Stockpiles:

12. McCarthy will enclose, cover, or keep stockpiles adequately wet (minimum: water three times daily) or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.).

Inactive Areas and Storage Piles:

13. McCarthy will hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas at the end of the earthmoving project, or employ other equivalent means (such as watering/soil binding disturbed areas to maintain adequate moisture content) that are approved by the BAAQMD.

Traffic on Site Unpaved Roads, Parking Lots, and Staging Areas:

14. McCarthy will limit traffic speeds on unpaved roads to 15 miles per hour and post sign limits at each entrance. If vehicular caused dust is significant, McCarthy will reduce the speed limit and post the new speed limit.
15. McCarthy will regularly water all unpaved roads, parking lots, and staging areas sufficiently often to keep the areas adequately wetted (at least three times daily) to prevent the generation of dust above the action levels.

Traffic on Site Paved Roads, Parking Lots, and Staging Areas:

16. McCarthy will sweep daily or more frequently (with water sweepers) all paved access roads, paved parking areas and paved staging areas at the Site, or employ other equivalent means (such as washing off the tires of all trucks and equipment using these roads or areas) as may be approved by the BAAQMD.
17. McCarthy will install rumble strips or a 50 foot long gravel pad for all trucks and equipment traveling on paved access roads. (See item 9 above for more details).

Earth Moving Activities:

18. McCarthy will pre-wet the ground to the depth of anticipated cuts.
19. McCarthy will limit the area subject to excavation, grading, and other earth moving activities.
20. McCarthy will limit personnel entrances into excavations.
21. McCarthy will suspend earth moving operations when wind speeds are high enough to result in dust emissions crossing the property line, despite the application of dust mitigation measures.
22. McCarthy will suspend earth moving activities when winds (instantaneous gusts) exceed 25 miles per hour or operate in a manner such that visible dust emissions from all earth moving activities does not exceed 0.5 on the Ringelmann chart, for a period or periods aggregating more than 3 minutes in any hour.

Off Site Transport:

23. McCarthy will maintain trucks such that no spillage can occur from holes or other openings in cargo compartments and ensure that loads are adequately wet.
24. McCarthy will cover all trucks hauling soil, sand, and other loose materials with tarpaulins, maintain at least two feet of freeboard in all trucks, or employ other

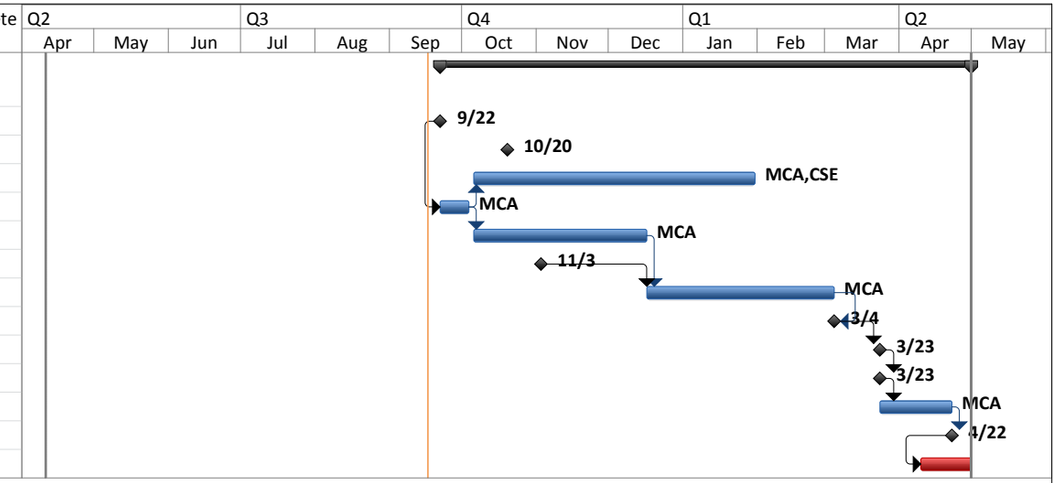
equivalent means (such as watering the top layer of materials exposed to short on Site haul distances) as may be approved by the BAAQMD.

Post Construction Stabilization of Disturbed Areas

25. McCarthy will replant vegetation cover (hydro seed) in disturbed areas as quickly as possible. The infiltration ponds for the site stormwater will be hydro-seeded immediately after construction. McCarthy will hydro-seed the remainder of the project site as the project sub-areas construction is completed. In the interim, McCarthy will control the Site's dust with soil binding application as noted earlier.

Appendix G
MCB Tentative Milestone Schedule

ID		WBS	Task Name	Start	Finish	Duration	Predecessor	% Complete
1		1	**1304CA Columbia Solar Energy 19 MW AC / 13GEN475 - Hi-Level Milestone Schedule**	**Mon 9/22/14**	**Thu 4/30/15**	**159 days**		**0%**
2		1.1	Grading Permit - City of Pittsburg AHJ	Mon 9/22/14	Mon 9/22/14	0 days		75%
3		1.2	Building Permit - City of Pittsburg AHJ	Mon 10/20/14	Mon 10/20/14	0 days		50%
4		1.3	Release of Inverter, Modules, Long-Lead Item PO's	Mon 10/6/14	Fri 1/30/15	85 days	5	0%
5		1.4	EPC Mobilization Planning / Site Preparation	Mon 9/22/14	Fri 10/3/14	10 days	2SS	0%
6		1.5	Grading (Soil, Cutting, Trenching, Foundations)	Mon 10/6/14	Tue 12/16/14	52 days	5	0%
7		1.6	FNTP - (Full EPC Notice to Proceed)	Mon 11/3/14	Mon 11/3/14	0 days		0%
8		1.7	PV Construction (Racking, Panelization, Cabling)	Wed 12/17/14	Wed 3/4/15	56 days	6,7	0%
9		1.8	Mechanical Completion	Wed 3/4/15	Wed 3/4/15	0 days	8FF	0%
10		1.9	Electrical Completion	Mon 3/23/15	Mon 3/23/15	0 days	9FS+13 day	0%
11		1.10	PG&E Energize Developer Substation (Backfeed)	**Mon 3/23/15**	**Mon 3/23/15**	**0 days**	**10**	0%
12		1.11	Commissioning (Utility Testing)	Tue 3/24/15	Wed 4/22/15	22 days	11	0%
13		1.12	GCOD - Guaranteed Substantial Completion	**Wed 4/22/15**	**Wed 4/22/15**	**0 days**	**12**	**0%**
14		1.13	Project Close Out (Punchlist)	Fri 4/10/15	Thu 4/30/15	15 days	13SS-9 days	0%



Project: Prelim CSE Hi-Level Miles
Date: Wed 9/17/14

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

Appendix H
Cal-OSHA Lead Regulations

Cal/OSHA CONSTRUCTION SAFETY ORDERS, LEAD
SECTION 1532.1, amended March 6, 2007
Title 8 California Code of Regulations

Notes to the reader:

- This version reflects revisions to the standard that were effective March 6, 2007.
- The California standard has additional requirements not found in the federal standard.

Reprinted by the Occupational Lead Poisoning Prevention Program,
California Department of Public Health, May 2008

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Cal/OSHA CONSTRUCTION SAFETY ORDERS, LEAD SECTION 1532.1, amended March 6, 2007

Title 8 California Code of Regulations

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Sec. 1532.1. Lead

(a) Scope.

This section applies to all construction work where an employee may be occupationally exposed to lead. All construction work excluded from coverage in the general industry standard for lead by section 5216(a)(2) is covered by this standard. Construction work is defined as work for construction, alteration and/or repair, including painting and decorating. It includes but is not limited to the following:

(1) Demolition or salvage of structures where lead or materials containing lead are present;

(2) Removal or encapsulation of materials containing lead;

(3) New construction, alteration, repair, or renovation of structures, substrates, or portions thereof, that contain lead, or materials containing lead;

(4) Installation of products containing lead;

(5) Lead contamination/emergency cleanup;

(6) Transportation, disposal, storage, or containment of lead or materials containing lead on the site or location at which construction activities are performed, and

(7) Maintenance operations associated with the construction activities described in this subsection.

(b) Definitions.

Action level means employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air (30 $\mu g/m^3$) calculated as an 8-hour time-weighted average (TWA).

Chief means the Chief of the Division of Occupational Safety and Health or designee.

Lead means metallic lead, all inorganic lead compounds, and organic lead soaps. Excluded from this definition are all other organic lead compounds.

NIOSH means the National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, or designee.

Supervisor means one who is capable of identifying existing and predictable lead hazards in the surroundings or working conditions and who has authorization to take prompt corrective measures to eliminate them. Supervisors shall be trained, as required by this section, and, when required, be certified consistent with section (l)(3).

(c) Permissible exposure limit.

(1) The employer shall assure that no employee is exposed to lead at concentrations greater than fifty micrograms per cubic meter of air (50 $\mu g/m^3$) averaged over an 8-hour period.

(2) If an employee is exposed to lead for more than 8 hours in any work day the employees' allowable exposure, as a time weighted average (TWA) for that day, shall be reduced according to the following formula:

Allowable employee exposure (in $\mu g/m^3$) = 400 divided by hours worked in the day.

(3) When respirators are used to limit employee exposure as required under subsection (c) and all the requirements of subsections (e)(1) and (f) have been met, employee exposure may be considered to be at the level provided by the protection factor of the respirator for those periods the respirator is worn. Those periods may be averaged with exposure levels during periods when respirators are not worn to determine the employee's daily TWA exposure.

(d) Exposure assessment.

(1) General.

(A) Each employer who has a workplace or operation covered by this standard shall initially determine if any employee may be exposed to lead at or above the action level.

(B) For the purposes of subsection (d), employee exposure is that exposure which would occur if the employee were not using a respirator.

(C) With the exception of monitoring under subsection (d)(3), where monitoring is required under this section, the employer shall collect personal samples representative of a full shift including at least one sample for each job classification in each work area either for each shift or for the shift with the highest exposure level.

(D) Full shift personal samples shall be representative of the monitored employee's regular, daily exposure to lead.

(2) Protection of employees during assessment of exposure.

(A) With respect to the lead related tasks listed in subsection (d)(2)(A), where lead is present, until the employer performs an employee exposure assessment as required in subsection (d) and documents that the employee performing any of the listed tasks is not exposed above the PEL, the employer shall treat the employee as if the employee were exposed above the PEL, and not in excess of ten (10) times the PEL, and shall implement employee protective measures prescribed in subsection (d)(2)(E). The tasks covered by this requirement are:

1. Where lead containing coatings or paint are present: manual demolition of structures (e.g,, dry wall), manual scraping, manual sanding, heat gun applications, and power tool cleaning with dust collection systems;

2. Spray painting with lead paint

(B) In addition, with regard to tasks not listed in subsection (d)(2)(A), where the employee has any reason to believe that an employee performing the task may be exposed to lead in excess of the PEL, until the employer performs an employee exposure assessment as required by subsection (d) and documents that the employee's lead exposure is not above the PEL the employer shall treat the employee as if the employee were exposed above the PEL and shall implement employee protective measures prescribed in subsection (d)(2)(E).

(C) With respect to the tasks listed in subsection (d)(2)(C), where lead is present, until the employer performs an employee exposure assessment as required in subsection (d), and documents that the employee performing any of the listed tasks is not exposed in excess of 500 $\mu g/m^3$, the employer shall treat the employee as if the employee were exposed to lead in excess of 500 $\mu g/m^3$ and shall implement employee protective measures as prescribed in subsection (d)(2)(E) of this section. Where the employer does establish that the employee is exposed to levels of lead below 500 $\mu g/m^3$, the employer may provide the exposed employee with the appropriate respirator prescribed for such use at such lower exposures, in accordance with Table 1 of this section. The tasks covered by this requirement are:

1. Using lead containing mortar; lead burning

2. Where lead containing coatings or paint are present: rivet busting; power tool cleaning without dust collection systems; cleanup activities where dry expendable abrasives are used; and abrasive blasting enclosure movement and removal.

(D) With respect to the tasks listed in subsection (d)(2)(D), where lead is present, until the employer performs an employee exposure assessment as required in subsection (d) and documents that the employee performing any of the listed tasks is not exposed to lead in excess of 2,500 $\mu g/m^3$ (50 x PEL), the employer shall treat the employee as if the employee were exposed to lead in excess of 2,500 $\mu g/m^3$ and shall implement employee protective measures as prescribed in subsection (d)(2)(E). Where the employer does establish that the employee is exposed to levels of lead below 2,500 $\mu g/m^3$, the employer may provide the exposed employee with the appropriate respirator prescribed for use at such lower exposures, in accordance with Table I of this section. Interim protection as described in this subsection is required where lead containing coatings or paint are present on structures when performing:

1. Abrasive blasting,

2. Welding,

3. Cutting, and

4. Torch burning.

(E) Until the employer performs an employee exposure assessment as required under subsection (d) and determines actual employee exposure, the employer shall provide to employees performing the tasks described in subsections (d)(2)(A), (d)(2)(B), (d)(2)(C), and (d)(2)(D) with interim protection as follows:

1. Appropriate respiratory protection in accordance with subsection (f).

2. Appropriate personal protective clothing and equipment in accordance with subsection (g).

3. Change areas in accordance with subsection (i)(2).

4. Hand washing facilities in accordance with subsection (i)(5).

5. Biological monitoring in accordance with subsection (j)(1)(A), to consist of blood sampling and analysis for lead and zinc protoporphyrin levels, and

6. Training as required under subsection (l)(1)(A) regarding section 5194, Hazard Communication; training as required under subsection (l)(2)(C), regarding use of respirators; and training in accordance with section 1510, Safety Instruction for Employees.

(3) Basis of initial determination.

(A) Except as provided under subsections (d)(3)(C) and (d)(3)(D) the employer shall monitor employee exposures and shall base initial determinations on the employee exposure monitoring results and any of the following, relevant considerations:

1. Any information, observations, or calculations which would indicate employee exposure to lead;

2. Any previous measurements of airborne lead; and

3. Any employee complaints of symptoms which may be attributable to exposure to lead.

(B) Monitoring for the initial determination where performed may be limited to a representative sample of the exposed employees who the employer reasonably believes are exposed to the greatest airborne concentrations of lead in the workplace.

(C) Where the employer has previously monitored for lead exposures, and the data were obtained within the past 12 months during work operations conducted under workplace conditions closely resembling the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the employer's current operations, the employer may rely on such earlier monitoring results to satisfy the requirements of subsections (d)(3)(A) and (d)(6) if the sampling and analytical methods meet the accuracy and confidence levels of subsection (d)(9).

(D) Where the employer has objective data, demonstrating that a particular product or material containing lead or a specific process, operation or activity involving lead cannot result in employee exposure to lead at or above the action level during processing, use, or handling, the employer may rely upon such data instead of implementing initial monitoring.

1. The employer shall establish and maintain an accurate record documenting the nature and relevance of objective data as specified in subsection (n)(4), where used in assessing employee exposure in lieu of exposure monitoring.

2. Objective data, as described in subsection (d)(3)(D), is not permitted to be used for exposure assessment in connection with subsection (d)(2).

3. Objective data for surface coatings and materials that contain lead shall meet the following methodology:

a. Lead analysis shall be performed for each unique surface coating and material that may constitute a health hazard to employees engaged in activities within the scope of this section and;

b. Analysis of surface coatings and materials shall be performed in a manner that meets the requirements of subsection (d)(9) and shall be recorded, as described in subsection (n)(4).

(4) Positive initial determination and initial monitoring.

(A) Where a determination conducted under subsections (d)(1), (2) and (3) shows the possibility of any employee exposure at or above the action level the employer shall conduct monitoring which is representative of the exposure for each employee in the workplace who is exposed to lead.

(B) Where the employer has previously monitored for lead exposure, and the data were obtained within the past 12 months during work operations conducted under workplace conditions closely resembling the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the employer's current operations, the employer may rely on such earlier monitoring results to satisfy the

requirements of subsection (d)(4)(A) if the sampling and analytical methods meet the accuracy and confidence levels of subsection (d)(9).

(C) Objective data for an initial assessment that demonstrate surface coating or material that contain lead at concentrations equal to or exceeding 0.06% lead dry weight (600 ppm) demonstrate the presence of lead surface coatings or material that constitute a health hazard to employees engaged in lead-related construction work. The lead concentration of paint or materials is based on the lead content in the nonvolatile components of the surface coating or material such as paint. Objective data as described in this subsection are not permitted to be used in lieu of exposure assessment in connection with lead-related tasks listed in subsection (d)(2).

(5) Negative initial determination.

(A) Where a determination, conducted under subsections (d)(1), (2), and (3) of this section is made that no employee is exposed to airborne concentrations of lead at or above the action level the employer shall make a written record of such determination. The record shall include at least the information specified in subsection (d)(3)(i) of this section and shall also include the date of determination, location within the work site, and the name and social security number of each employee monitored.

(B) Objective data that meet the requirements of subsection (n)(4) for an initial assessment that demonstrate surface coating or material that contain lead at concentrations less than 0.06% lead dry weight (600 ppm) are sufficient to establish a negative determination. The lead concentration of surface coatings or materials is based on the lead content in the nonvolatile components of the surface coating or material such as paint. Objective data as described in this subsection are not permitted to be used in lieu of exposure assessment in connection with lead-related tasks listed in subsection (d)(2).

(6) Frequency.

(A) If the initial determination reveals employee exposure to be below the action level further exposure determination need not be repeated except as otherwise provided in subsection (d)(7).

(B) If the initial determination or subsequent determination reveals employee exposure to be at or above the action level but at or below the PEL the employer shall perform monitoring in accordance with this subsection at least every 6 months. The employer shall continue monitoring at the required frequency until at least two consecutive measurements, taken at least 7 days apart, are below the action level at which time the employer may discontinue monitoring for that employee except as otherwise provided in subsection (d)(7).

(C) If the initial determination reveals that employee exposure is above the PEL the employer shall perform monitoring quarterly. The employer shall continue monitoring at the required frequency until at least two consecutive measurements, taken at least 7 days apart, are at or below the PEL but at or above the action level at which time the employer shall repeat monitoring for that employee at the frequency specified in subsection (d)(6)(B), except as otherwise provided in subsection (d)(7). The employer shall continue monitoring at the required frequency until at least two consecutive measurements, taken at least 7 days apart, are below the action level at which time the employer may discontinue monitoring for that employee except as otherwise provided in subsection (d)(7).

(7) Additional exposure assessments. Whenever there has been a change of equipment, process, control, personnel or a new task has been initiated that may result in additional employees being exposed to lead at or above the action level or may result in employees already exposed at or above the action level being exposed above the PEL, the employer shall conduct additional monitoring in accordance with this subsection.

(8) Employee notification.

(A) Within 5 working days after completion of the exposure assessment the employer shall notify each employee in writing of the results which represent that employee's exposure.

(B) Whenever the results indicate that the representative employee exposure, without regard to respirators, is at or above the PEL the employer shall include in the written notice a statement that the employees exposure was at or above that level and a description of the corrective action taken or to be taken to reduce exposure to below that level.

(9) Accuracy of measurement. The employer shall use a method of monitoring and analysis which has an accuracy (to a confidence level of 95%) of not less than plus or minus 25 percent for airborne concentrations of lead equal to or greater than 30 $\mu g/m^3$. Methods for the determination of lead concentrations of surface coatings and material shall be determined by

methods which have an accuracy (to a confidence level of 95 percent) of not less than plus or minus 25 percent at 0.06% lead dry weight (600 ppm).

(e) Methods of compliance.

(1) Engineering and work practice controls.

(A) The employer shall implement engineering and work practice controls, including administrative controls, to reduce and maintain employee exposure to lead to or below the permissible exposure limit to the extent that such controls are feasible. Wherever all feasible engineering and work practices controls that can be instituted are not sufficient to reduce employee exposure to or below the permissible exposure limit prescribed in subsection (c), the employer shall nonetheless use them to reduce employee exposure to the lowest feasible level and shall supplement them by the use of respiratory protection that complies with the requirements of subsection (f).

(2) Compliance program.

(A) Prior to commencement of the job each employer shall establish and implement a written compliance program to achieve compliance with subsection (c).

(B) Written plans for these compliance programs shall include at least the following:

1. A description of each activity in which lead is emitted; e.g. equipment used, material involved, controls in place, crew size, employee job responsibilities, operating procedures and maintenance practices;

2. A description of the specific means that will be employed to achieve compliance and, where engineering controls are required engineering plans and studies used to determine methods selected for controlling exposure to lead;

3. A report of the technology considered in meeting the PEL;

4. Air monitoring data which documents the source of lead emissions;

5. A detailed schedule for implementation of the program, including documentation such as copies of purchase orders for equipment, construction contracts, etc.;

6. A work practice program which includes items required under subsections (g), (h) and (i) and incorporates other relevant work practices such as those specified in subsection (e)(5);

7. An administrative control schedule required by subsection (e)(4), if applicable;

8. A description of arrangements made among contractors on multi-contractor sites with respect to informing affected employees of potential exposure to lead and of regulated areas.

9. Other relevant information.

(C) The compliance program shall provide for frequent and regular inspections of job sites, regulated areas, materials, and equipment to be made by a supervisor.

(D) Written programs shall be submitted upon request to any affected employee or authorized employee representatives, to Chief and NIOSH, and shall be available at the work site for examination and copying by the Chief and NIOSH.

(E) Written programs shall be revised and updated at least every 6 months to reflect the current status of the program.

(3) Mechanical ventilation. When ventilation is used to control lead exposure, the employer shall evaluate the mechanical performance of the system in controlling exposure as necessary to maintain its effectiveness.

(4) Administrative controls. If administrative controls are used as a means of reducing employees TWA exposure to lead, the employer shall establish and implement a job rotation schedule which includes:

(A) Name or identification number of each affected employee;

(B) Duration and exposure levels at each job or work station where each affected employee is located; and

(C) Any other information which may be useful in assessing the reliability of administrative controls to reduce exposure to lead.

The employer shall ensure that, to the extent relevant, employees follow good work practices such as described in Appendix B of this section.

(f) Respiratory protection.

(1) General. For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this subsection. Respirators must be used during:

(A) Periods when an employee's exposure to lead exceeds the PEL;

(B) Work operations for which engineering controls and work practices are not sufficient to reduce exposures to or below the PEL;

(C) Periods when an employee requests a respirator; and

(D) Periods when respirators are required to provide interim protection for employees while they perform the operations specified in subsection (d)(2).

(2) Respirator program.

(A) The employer must implement a respiratory protection program in accordance with section 5144 (b) (except (d)(1)(C)) through (m).

(B) If an employee exhibits breathing difficulty during fit testing or respirator use, the employer must provide the employee with a medical examination in accordance with subsection (j)(3)(A)2. to determine if the employee can use a respirator while performing the required duties.

(3) Respirator selection.

(A) The employer shall select, and provide to employees, the appropriate respirator or combination of respirators specified in Section 5144(d)(3)(A)1.

(B) The employer shall provide a powered air-purifying respirator in lieu of the respirator specified in Section 5144(d)(3)(A)1 whenever:

1. An employee chooses to use this type of respirator; and

2. This respirator will provide adequate protection to the employee.

(C) The employer shall provide employees with a full facepiece respirator instead of a half mask respirator for protection against lead aerosols that may cause eye or skin irritation at the use concentrations.

(D) The employer shall provide HEPA filters for powered and non-powered air-purifying respirators.

(g) Protective work clothing and equipment.

(1) Provision and use. Where an employee is exposed to lead above the PEL without regard to the use of respirators, where employees are exposed to lead compounds which may cause skin or eye irritation (e.g., lead arsenate, lead azide), and as interim protection for employees performing tasks as specified in subsection (d)(2), the employer shall provide at no cost to the employee and assure that the employee uses appropriate protective work clothing and equipment that prevents contamination of the employee and the employee's garments such as, but not limited to:

(A) Coveralls or similar full-body work clothing;

(B) Gloves, hats, and shoes or disposable shoe coverlets; and

(C) Face shields, vented goggles, or other appropriate protective equipment which complies with section 1516.

(2) Cleaning and replacement.

(A) The employer shall provide the protective clothing required in subsection (g)(1) in a clean and dry condition at least weekly, and daily to employees whose exposure levels without regard to a respirator are over 200 $\mu g/m^3$ of lead as an 8-hour TWA.

(B) The employer shall provide for the cleaning, laundering, and disposal of protective clothing and equipment required by subsection (g)(1).

(C) The employer shall repair or replace required protective clothing and equipment as needed to maintain their effectiveness.

(D) The employer shall assure that all protective clothing is removed at the completion of a work shift only in change areas provided for that purpose as prescribed in subsection (A)(2).

(E) The employer shall assure that contaminated protective clothing which is to be cleaned, laundered, or disposed of, is placed in a closed container in the change area which prevents dispersion of lead outside the container.

(F) The employer shall inform in writing any person who cleans or launders protective clothing or equipment of the potentially harmful effects of exposure to lead.

(G) The employer shall assure that the containers of contaminated protective clothing and equipment required by subsection (g)(2)(E) are labeled as follows:

Caution: Clothing contaminated with lead. Do not remove dust by blowing or shaking. Dispose of lead contaminated wash water in

accordance with applicable local, state, or federal regulations.

(H) The employer shall prohibit the removal of lead from protective clothing or equipment by blowing, shaking, or any other means which disperses lead into the air.

(h) Housekeeping.

(1) All surfaces shall be maintained as free as practicable of accumulations of lead.

(2) Clean-up of floors and other surfaces where lead accumulates shall wherever possible, be cleaned by vacuuming or other methods that minimize the likelihood of lead becoming airborne.

(3) Shoveling, dry or wet sweeping, and brushing may be used only where vacuuming or other equally effective methods have been tried and found not to be effective.

(4) Where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters and used and emptied in a manner which minimizes the reentry of lead into the workplace.

(5) Compressed air shall not be used to remove lead from any surface unless the compressed air is used in conjunction with a ventilation system designed to capture the airborne dust created by the compressed air.

(i) Hygiene facilities, practices and regulated areas.

(1) The employer shall assure that in areas where employees are exposed to lead above the PEL without regard to the use of respirators, food or beverage is not present or consumed, tobacco products are not present or used, and cosmetics are not applied.

(2) Change areas.

(A) The employer shall provide clean change areas for employees whose airborne exposure to lead is above the PEL, and as interim protection for employees performing tasks as specified in subsection (d)(2), without regard to the use of respirators.

(B) The employer shall assure that change areas are equipped with separate storage facilities for protective work clothing and equipment and for street clothes which prevent cross-contamination.

(C) The employer shall assure that employees do not leave the workplace wearing any protective clothing or equipment that is required to be worn during the work shift.

(3) Showers.

(A) The employer shall provide shower facilities, where feasible, for use by employees whose airborne exposure to lead is above the PEL.

(B) The employer shall assure, where shower facilities are available, that employees shower at the end of the work shift and shall provide an adequate supply of cleansing agents and towels for use by affected employees.

(4) Eating facilities.

(A) The employer shall provide lunchroom facilities or eating areas for employees whose airborne exposure to lead is above the PEL, without regard to the use of respirators.

(B) The employer shall assure that lunchroom facilities or eating areas are as free as practicable from lead contamination and are readily accessible to employees.

(C) The employer shall assure that employees whose airborne exposure to lead is above the PEL, without regard to the use of a respirator, wash their hands and face prior to eating, drinking, smoking or applying cosmetics.

(D) The employer shall assure that employees do not enter lunchroom facilities or eating areas with protective work clothing or equipment unless surface lead dust has been removed by vacuuming, downdraft booth, or other cleaning method that limits dispersion of lead dust.

(5) Hand washing facilities.

(A) The employer shall provide adequate hand washing facilities for use by employees exposed to lead in accordance with section 1527.

(B) Where showers are not provided the employer shall assure that employees wash their hands and face at the end of the work shift.

(6) Regulated Area.

(A) Employers shall establish regulated areas, where feasible, for work areas where employees are exposed to lead at or above the PEL or performing the tasks described in subsection (d)(2).

(B) Regulated areas shall be posted with signs as described in subsection (m)(2).

(C) Employers shall restrict access to the regulated area to employees authorized by

the supervisor, to representatives of affected employees, as described in subsection (o) and to persons authorized by the Chief or NIOSH.

(D) Each employee authorized to enter the regulated area shall be provided with and be required to wear protective equipment required by subsections (f) and (g).

(j) Medical surveillance.

(1) General.

(A) The employer shall make available initial medical surveillance to employees occupationally exposed on any day to lead at or above the action level. Initial medical surveillance consists of biological monitoring in the form of blood sampling and analysis for lead and zinc protoporphyrin levels.

(B) The employer shall institute a medical surveillance program in accordance with subsections (j)(2) and (j)(3) for all employees who are or may be exposed by the employer at or above the action level for more than 30 days in any consecutive 12 months;

(C) The employer shall assure that all medical examinations and procedures are performed by or under the supervision of a licensed physician.

(D) The employer shall make available the required medical surveillance including multiple physician review under subsection (j)(3)(C) without cost to employees and at a reasonable time and place.

(2) Biological monitoring.

(A) Blood lead and ZPP level sampling and analysis. The employer shall make available biological monitoring in the form of blood sampling and analysis for lead and zinc protoporphyrin levels to each employee covered under subsections (j)(1)(A) and (B) on the following schedule:

1. For each employee covered under subsection (j)(1)(B), at least every 2 months for the first 6 months and every 6 months thereafter;

2. For each employee covered under subsections (j)(1) (A) or (B) whose last blood sampling and analysis indicated a blood lead level at or above 40 μg/dl, at least every two months. This frequency shall continue until two consecutive blood samples and analyses indicate a blood lead level below 40 μg/dl; and

3. For each employee who is removed from exposure to lead due to an elevated blood lead level at least monthly during the removal period.

(B) Follow-up blood sampling tests. Whenever the results of a blood lead level test indicate that an employee's blood lead level exceeds the numerical criterion for medical removal under subsection (k)(1)(A), the employer shall provide a second (follow-up) blood sampling test within two weeks after the employer receives the results of the first blood sampling test.

(C) Accuracy of blood lead level sampling and analysis. Blood lead level sampling and analysis provided pursuant to this section shall have an accuracy (to a confidence level of 95 percent) within plus or minus 15 percent or 6 μg/dl, whichever is greater, and shall be conducted by a laboratory approved by OSHA.

(D) Employee notification.

1. Within five working days after the receipt of biological monitoring results, the employer shall notify each employee in writing of his or her blood lead level; and

2. the employer shall notify each employee whose blood lead level exceeds 40 μg/dl that the standard requires temporary medical removal with Medical Removal Protection benefits when an employee's blood lead level exceeds the numerical criterion for medical removal under subsection (k)(1)(A).

(3) Medical examinations and consultations.

(A) Frequency. The employer shall make available medical examinations and consultations to each employee covered under subsection (j)(1)(B) on the following schedule:

1. At least annually for each employee for whom a blood sampling test conducted at any time during the preceding 12 months indicated a blood lead level at or above 40 μg/dl;

2. As soon as possible, upon notification by an employee either that the employee has developed signs or symptoms commonly associated with lead intoxication, that the employee desires medical advice concerning the effects of current or past exposure to lead on the employee's ability to procreate a healthy child, that the employee is pregnant, or that the employee

has demonstrated difficulty in breathing during a respirator fitting test or during use; and

3. As medically appropriate for each employee either removed from exposure to lead due to a risk of sustaining material impairment to health, or otherwise limited pursuant to a final medical determination.

(B) Content. The content of medical examinations made available pursuant to subsections (j)(3)(A)2. - 3. shall be determined by an examining physician and, if requested by an employee, shall include pregnancy testing or laboratory evaluation of male fertility. Medical examinations made available pursuant to subsection (j)(3)(A)1. of this section shall include the following elements:

1. A detailed work history and a medical history, with particular attention to past lead exposure (occupational and non-occupational), personal habits (smoking, hygiene), and past gastrointestinal, hematological, renal, cardiovascular, reproductive and neurological problems;

2. A thorough physical examination, with particular attention to teeth, gums, hematological, gastrointestinal, renal, cardiovascular, and neurological systems. Pulmonary status should be evaluated if respiratory protection will be used;

3. A blood pressure measurement;

4. A blood sample and analysis which determines:

   a. Blood lead level;

   b. Hemoglobin and hematocrit determinations, red cell indices, and examination of peripheral smear morphology;

   c. Zinc protoporphyrin;

   d. Blood urea nitrogen; and,

   e. Serum creatinine;

5. A routine urinalysis with microscopic examination; and

6. Any laboratory or other test relevant to lead exposure which the examining physician deems necessary by sound medical practice.

(C) Multiple physician review mechanism.

1. If the employer selects the initial physician who conducts any medical examination or consultation provided to an employee under this section, the employee may designate a second physician:

   a. To review any findings, determinations or recommendations of the initial physician; and

   b. To conduct such examinations, consultations, and laboratory tests as the second physician deems necessary to facilitate this review.

2. The employer shall promptly notify an employee of the right to seek a second medical opinion after each occasion that an initial physician conducts a medical examination or consultation pursuant to this section. The employer may condition its participation in, and payment for, the multiple physician review mechanism upon the employee doing the following within fifteen (15) days after receipt of the foregoing notification, or receipt of the initial physician's written opinion, whichever is later:

   a. The employee informing the employer that he or she intends to seek a second medical opinion, and

   b. The employee initiating steps to make an appointment with a second physician.

3. If the findings, determinations or recommendations of the second physician differ from those of the initial physician, then the employer and the employee shall assure that efforts are made for the two physicians to resolve any disagreement.

4. If the two physicians have been unable to quickly resolve their disagreement, then the employer and the employee through their respective physicians shall designate a third physician:

   a. To review any findings, determinations or recommendations of the prior physicians; and

   b. To conduct such examinations, consultations, laboratory tests and discussions with the prior physicians as the third physician deems necessary to resolve the disagreement of the prior physicians.

5. The employer shall act consistent with the findings, determinations and recommendations of the third physician, unless the employer and the employee reach an agreement which is otherwise consistent with the recommendations of at least one of the three physicians.

(D) Information provided to examining and consulting physicians.

1. The employer shall provide an initial physician conducting a medical examination or consultation under this section with the following information:

   a. A copy of this regulation for lead including all Appendices;
   b. A description of the affected employee's duties as they relate to the employee's exposure;

   c. The employee's exposure level or anticipated exposure level to lead and to any other toxic substance (if applicable);

   d. A description of any personal protective equipment used or to be used;

   e. Prior blood lead determinations; and

   f. All prior written medical opinions concerning the employee in the employer's possession or control.

2. The employer shall provide the foregoing information to a second or third physician conducting a medical examination or consultation under this section upon request either by the second or third physician, or by the employee.

(E) Written medical opinions.

1. The employer shall obtain and furnish the employee with a copy of a written medical opinion from each examining or consulting physician which contains only the following information:

   a. The physician's opinion as to whether the employee has any detected medical condition which would place the employee at increased risk of material impairment of the employee's health from exposure to lead;

   b. Any recommended special protective measures to be provided to the employee, or limitations to be placed upon the employee's exposure to lead;

   c. Any recommended limitation upon the employee's use of respirators, including a determination of whether the employee can wear a powered air purifying respirator if a physician determines that the employee cannot wear a negative pressure respirator; and

   d. The results of the blood lead determinations.

2. The employer shall instruct each examining and consulting physician to:

   a. Not reveal either in the written opinion or orally, or in any other means of communication with the employer, findings, including laboratory results, or diagnoses unrelated to an employee's occupational exposure to lead; and

   b. Advise the employee of any medical condition, occupational or non-occupational, which dictates further medical examination or treatment.

(F) Alternate physician determination mechanisms. The employer and an employee or authorized employee representative may agree upon the use of any alternate physician determination mechanism in lieu of the multiple physician review mechanism provided by subsection (j)(3)(C) so long as the alternate mechanism is as expeditious and protective as the requirements contained in this subsection.

(4) Chelation.

(A) The employer shall assure that any person whom he retains, employs, supervises or controls does not engage in prophylactic chelation of any employee at any time.

(B) If therapeutic or diagnostic chelation is to be performed by any person in subsection (j)(4)(A), the employer shall assure that it be done under the supervision of a licensed physician in a clinical setting with thorough and appropriate medical monitoring and that the employee is notified in writing prior to its occurrence.

(k) Medical removal protection.

(1) Temporary medical removal and return of an employee

(A) Temporary removal due to elevated blood lead level. The employer shall remove an employee from work having an exposure to lead at or above the action level on each occasion that a periodic and a follow-up blood sampling test conducted pursuant to this section indicate that the employee's blood lead level is at or above 50 $\mu g/dl$; and,

(B) Temporary removal due to a final medical determination.

1. The employer shall remove an employee from work having an exposure to lead at or

above the action level on each occasion that a final medical determination results in a medical finding, determination, or opinion that the employee has a detected medical condition which places the employee at increased risk of material impairment to health from exposure to lead.

2. For the purposes of this section, the phrase "final medical determination" means the written medical opinion on the employees' health status by the examining physician or, where relevant, the outcome of the multiple physician review mechanism or alternate medical determination mechanism used pursuant to the medical surveillance provisions of this section.

3. Where a final medical determination results in any recommended special protective measures for an employee, or limitations on an employee's exposure to lead, the employer shall implement and act consistent with the recommendation.

(C) Return of the employee to former job status.

1. The employer shall return an employee to his or her former job status:

a. For an employee removed due to a blood lead level at or above 50 μg/dl when two consecutive blood sampling tests indicate that the employee's blood lead level is at or below 40 μg/dl;

b. For an employee removed due to a final medical determination, when a subsequent final medical determination results in a medical finding, determination, or opinion that the employee no longer has a detected medical condition which places the employee at increased risk of material impairment to health from exposure to lead.

2. For the purposes of this section, the requirement that an employer return an employee to his or her former job status is not intended to expand upon or restrict any rights an employee has or would have had, absent temporary medical removal, to a specific job classification or position under the terms of a collective bargaining agreement.

(D) Removal of other employee special protective measure or limitations. The employer shall remove any limitations placed on an employee or end any special protective measures provided to an employee pursuant to a final medical determination when a subsequent final medical determination indicates that the limitations or special protective measures are no longer necessary.

(E) Employer options pending a final medical determination. Where the multiple physician review mechanism, or alternate medical determination mechanism used pursuant to the medical surveillance provisions of this section, has not yet resulted in a final medical determination with respect to an employee, the employer shall act as follows:

1. Removal. The employer may remove the employee from exposure to lead, provide special protective measures to the employee, or place limitations upon the employee, consistent with the medical findings, determinations, or recommendations of any of the physicians who have reviewed the employee's health status.

2. Return. The employer may return the employee to his or her former job status, end any special protective measures provided to the employee, and remove any limitations placed upon the employee, consistent with the medical findings, determinations, or recommendations of any of the physicians who have reviewed the employee's health status, with two exceptions:

a. If the initial removal, special protection, or limitation of the employee resulted from a final medical determination which differed from the findings, determinations, or recommendations of the initial physician; or

b. If the employee has been on removal status for the preceding eighteen months due to an elevated blood lead level, then the employer shall await a final medical determination.

(2) Medical removal protection benefits.

(A) Provision of medical removal protection benefits. The employer shall provide an employee up to eighteen (18) months of medical removal protection benefits on each occasion that an employee is removed from exposure to lead or otherwise limited pursuant to this section.

(B) Definition of medical removal protection benefits. For the purposes of this section, the requirement that an employer provide medical removal protection benefits means that, as long as the job the employee was removed from continues, the employer shall maintain the total normal earnings, seniority and other employment rights and benefits of

an employee, including the employee's right to his or her former job status as though the employee had not been medically removed from the employee's job or otherwise medically limited.

(C) Follow-up medical surveillance during the period of employee removal or limitation. During the period of time that an employee is medically removed from his or her job or otherwise medically limited, the employer may condition the provision of medical removal protection benefits upon the employee's participation in follow-up medical surveillance made available pursuant to this section.

(D) Workers' compensation claims. If a removed employee files a claim for workers' compensation payments for a lead-related disability, then the employer shall continue to provide medical removal protection benefits pending disposition of the claim. To the extent that an award is made to the employee for earnings lost during the period of removal, the employer's medical removal protection obligation shall be reduced by such amount. The employer shall receive no credit for workers' compensation payments received by the employee for treatment-related expenses.

(E) Other credits. The employer's obligation to provide medical removal protection benefits to a removed employee shall be reduced to the extent that the employee receives compensation for earnings lost during the period of removal either from a publicly or employer-funded compensation program, or receives income from employment with another employer made possible by virtue of the employee's removal.

(F) Voluntary removal or restriction of an employee. Where an employer, although not required by this section to do so, removes an employee from exposure to lead or otherwise places limitations on an employee due to the effects of lead exposure on the employee's medical condition, the employer shall provide medical removal protection benefits to the employee equal to that required by subsection (k)(2)(A) and (B).

(l) Employee information, training and certification.

(1) General.

(A) The employer shall communicate information concerning lead hazards according to the requirements of the Hazard Communication Standard, section 5194, including but not limited to the requirements concerning warning signs and labels, material safety data sheets (MSDS), and employee information and training.

(B) For all employees who are subject to exposure to lead at or above the action level on any day or who are subject to exposure to lead compounds which may cause skin or eye irritation (e.g., lead arsenate, lead azide), the employer shall provide a training program in accordance with subsection (l)(2) and assure employee participation.

(C) The employer shall provide the training program as initial training prior to the time of job assignment or prior to the start up date for this requirement, whichever comes last.

(D) The employer shall also provide the training program at least annually for each employee who is subject to lead exposure at or above the action level on any day.

(E) Where the certification of employee and supervisor training is required, as described in subsection (l)(3), the training shall be conducted by a training provider accredited by the California Department of Health Services, in accordance with Title 17, California Code of Regulations, Division 1, Chapter 8.

(2) Training program. The employer shall assure that each employee is trained in the following:

(A) The content of this standard and its appendices;

(B) The specific nature of the operations which could result in exposure to lead above the action level;

(C) The purpose, proper selection, fitting, use, and limitations of respirators;

(D) The purpose and a description of the medical surveillance program, and the medical removal protection program including information concerning the adverse health effects associated with excessive exposure to lead (with particular attention to the adverse reproductive effects on both males and females and hazards to the fetus and additional precautions for employees who are pregnant);

(E) The engineering controls and work practices associated with the employee's job assignment including training of employees to follow relevant good work practices described in Appendix B of this section;

(F) The contents of any compliance plan and the location of regulated areas in effect;

(G) Instructions to employees that chelating agents should not routinely be used to remove lead from their bodies and should not be used at all except under the direction of a licensed physician; and

(H) The employee's right of access to records under section 3204.

(3) Certification of training for residential and public buildings.

The employer shall ensure that all employees and supervisors who are engaged in lead related construction work as defined in Title 17, California Code of Regulations, Section 35040, and have been shown to be exposed to lead at or above the permissible exposure limit, meet the training requirements of this section, are trained by an accredited training provider and are certified by the California Department of Health Services. Lead related construction work is defined in Title 17 to be any construction, alteration, painting, demolition, salvage, renovation, repair, or maintenance of any residential or public building, including preparation and cleanup, that, by using or disturbing lead containing material or soil, may result in significant exposure of adults or children to lead. As used in the definition of lead related construction work, "public building" means a structure which is generally accessible to the public, including but not limited to, schools, daycare centers, museums, airports, hospitals, stores, convention centers, government facilities, office buildings and any other building which is not an industrial building or a residential building. Regulations for accreditation of training providers and for the certification of employees and supervisors are found in Title 17, California Code of Regulations, Division 1, Chapter 8.

(4) Access to information, training and certfication materials.

(A) The employer shall make readily available to all affected employees a copy of this standard and its appendices.

(B) The employer shall provide, upon request, all materials relating to the employee information training program and certification to affected employees, their designated representatives, and to the Chief, and NIOSH.

(m) Signs.

(1) General.

(A) The employer may use signs required by other statutes, regulations or ordinances in addition to, or in combination with, signs required by this subsection.

(B) The employer shall assure that no statement appears on or near any sign required by this subsection which contradicts or detracts from the meaning of the required sign.

(2) Signs.

(A) The employer shall post the following warning signs in each regulated area or work area where an employees exposure to lead is above the PEL.

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

(B) The employer shall assure that signs required by this subsection are illuminated and cleaned as necessary so that the legend is readily visible.

(n) Record keeping.

(1) Exposure assessment.

(A) The employer shall establish and maintain an accurate record of all monitoring and other data used in conducting employee exposure assessments as required in subsection (d).

(B) Exposure monitoring records shall include:

1. The date(s), number, duration, location and results of each of the samples taken if any, including a description of the sampling procedure used to determine representative employee exposure where applicable;

2. A description of the sampling and analytical methods used and evidence of their accuracy;

3. The type of respiratory protective devices worn, if any;

4. Name, social security number, and job classification of the employee monitored and of all other employees whose exposure the measurement is intended to represent; and

5. The environmental variables that could affect the measurement of employee exposure.

(C) The employer shall maintain monitoring and other exposure assessment records in accordance with the provisions of section 3204.

(2) Medical surveillance.

(A) The employer shall establish and maintain an accurate record for each employee subject to medical surveillance as required by subsection (j).

(B) This record shall include:

1. The name, social security number, and description of the duties of the employee;

2. A copy of the physician's written opinions;

3. Results of any airborne exposure monitoring done on or for that employee and provided to the physician; and

4. Any employee medical complaints related to exposure to lead.

(C) The employer shall keep, or assure that the examining physician keeps, the following medical records:

1. A copy of the medical examination results including medical and work history required under subsection (j);

2. A description of the laboratory procedures and a copy of any standards or guidelines used to interpret the test results or references to that information;

3. A copy of the results of biological monitoring.

(D) The employer shall maintain or assure that the physician maintains medical records in accordance with the provisions of section 3204.

(3) Medical removals.

(A) The employer shall establish and maintain an accurate record for each employee removed from current exposure to lead pursuant to subsection (k).

(B) Each record shall include:

1. The name and social security number of the employee;

2. The date of each occasion that the employee was removed from current exposure to lead as well as the corresponding date on which the employee was returned to his or her former job status;

3. A brief explanation of how each removal was or is being accomplished; and

4. A statement with respect to each removal indicating whether or not the reason for the removal was an elevated blood lead level.

(C) The employer shall maintain each medical removal record for at least the duration of an employee's employment.

(4) Objective data for exemption from requirement for initial monitoring.

(A) For purposes of this section, objective data are information demonstrating that a particular product or material containing lead or a specific process, operation, or activity involving lead cannot release dust or fumes in concentrations at or above the action level under any expected conditions of use. Objective data can be obtained from an industry-wide study or from laboratory product test results from manufacturers of lead containing products or materials, such as surface coating material. The data the employer uses from an industry-wide survey must be obtained under workplace conditions closely resembling the processes, types of material, control methods, work practices and environmental conditions in the employer's current operations.

(B) The employer shall maintain the record of the objective data relied upon for at least 30 years.

(5) Availability. The employer shall make available upon request all records required to be maintained by subsection (n) to affected employees, former employees, and their designated representatives, and to the Chief and NIOSH for examination and copying.

(6) Transfer of records.

(A) Whenever the employer ceases to do business, the successor employer shall receive and retain all records required to be maintained by subsection (n).

(B) Whenever the employer ceases to do business and there is no successor employer to receive and retain the records required to be maintained by this section for the prescribed period, these records shall be transmitted to NIOSH.

(C) At the expiration of the retention period for the records required to be maintained by this section, the employer shall notify NIOSH at least 3 months prior to the disposal of such records and shall transmit those records to NIOSH if requested within the period.

(D) The employer shall also comply with any additional requirements involving transfer of records set forth in section 3204(h).

(o) Observation of monitoring.

(1) Employee observation. The employer shall provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to lead conducted pursuant to subsection (d).

(2) Observation procedures.

(A) Whenever observation of the monitoring of employee exposure to lead requires entry into an area where the use of respirators, protective clothing or equipment is required, the employer shall provide the observer with and assure the use of such respirators, clothing and equipment, and shall require the observer to comply with all other applicable safety and health procedures.

(B) Without interfering with the monitoring, observers shall be entitled to:

1. Receive an explanation of the measurement procedures;

2. Observe all steps related to the monitoring of lead performed at the place of exposure; and

3. Record the results obtained or receive copies of the results when returned by the laboratory.

(p) Lead-work pre-job notification.

The employer shall provide written notification to the nearest Division District Office in the manner prescribed by subsections (p)(1) through (p)(4) when work is planned that includes any of the tasks listed in subsection (d)(2).

EXCEPTION NO. 1: The employer is not required to notify the Division if:

A. The amount of lead-containing materials to be disturbed is less than 100 square or 100 linear feet; or

B. The only subsection (d)(2) task to be performed consists of torch cutting or welding, not to exceed a duration of 1 hour in any shift.

EXCEPTION NO. 2: The employer is not required to notify the Division if the percentage of lead in the material disturbed is less than 0.5%, 5,000 parts per million (weight by weight), or 1.0 mg/cm^2.

(1) The employer shall ensure that the information required by subsection (p)(2) is received by the nearest Division District Office at least 24 hours prior to the commencement of the work by any of the following means:

(A) Letter;

(B) Facsimile;

(C) Electronic mail; or

(D) Telephone call, followed by written notification sent or mailed within 24 hours of placing the call.

EXCEPTION: When an employer intends to initiate unforeseen lead-work on an urgent basis within 24 hours, the notification requirement may be met by giving telephone notice to the Division at any time prior to commencement of the work, followed by written notification sent or mailed within 24 hours of telephoning the Division.

(2) The written notification provided by the employer shall contain the following:

(A) The name, address and phone number of the employer;

(B) The address of the job (or common name of the site with closest streets or roadways identified);

(C) The precise physical location of the lead related work at the job site;

(D) The projected starting date;

(E) The expected completion date or approximate duration of the work in days;

(F) The approximate number of workers planned to do the lead-related work;

(G) The type of structure(s) in which or on which the work is to be performed;

(H) The amount of lead containing material to be disturbed in square feet or linear feet;

(I) A description of the type of lead-related work to be performed and work practices that will be utilized;

(J) The name of the supervisor who will be responsible for the lead-related work; and

(K) The amount of lead in the disturbed materials (percent by weight, parts per million or milligrams per square centimeter) if known.

(3) The employer shall notify the Division, and provide the current information, if changes are made to the starting date, the surface area to be disturbed, or the type of lead-related work performed or work practices to be utilized, before or upon adoption of that change.

(4) An employer conducting ongoing, lead-related operations and maintenance work on stationary steel structures need only notify the Division once for each structure if the duration of the operations and maintenance work is less than one year. If the duration of the work is more than one year, the employer shall submit to the Division at least once per year a supplemental written notification updating all of the information required by subsection (p)(2) for each structure.

(q) Appendices.

The information contained in the appendices to this section is not intended, by itself, to create any additional obligations not otherwise imposed by this standard nor detract from any existing obligation.

Cal/OSHA CONSTRUCTION SAFETY ORDERS, LEAD SECTION 1532.1

Title 8 California Code of Regulations

APPENDICES

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APPENDIX A
Substance Data Sheet for Occupational Exposure to Lead

I. Substance Identification

A. **Substance**: Pure lead (Pb) is a heavy metal at room temperature and pressure and is a basic chemical element. It can combine with various other substances to form numerous lead compounds.

B. **Compounds covered by the standard**: The word "lead" when used in this interim final standard means elemental lead, all inorganic lead compounds and a class of organic lead compounds called lead soaps. This standard does not apply to other organic lead compounds.

C. **Uses**: Exposure to lead occurs in several different occupations in the construction industry, including demolition or salvage of structures where lead or lead-containing materials are present; removal or encapsulation of lead-containing materials, new construction, alteration, repair, or renovation of structures that contain lead or materials containing lead; installation of products containing lead. In addition, there are construction-related activities where exposure to lead may occur, including transportation, disposal, storage, or containment of lead or materials containing lead on construction sites, and maintenance operations associated with construction activities.

D. **Permissible exposure**: The permissible exposure limit (PEL) set by the standard is 50 micrograms of lead per cubic meter of air ($50\ \mu g/m^3$), averaged over an 8-hour workday.

E. **Action level**: The interim final standard establishes an action level of 30 micrograms of lead per cubic meter of air ($30\ \mu g/m^3$), averaged over an 8-hour workday. The action level triggers several ancillary provisions of the standard such as exposure monitoring, medical surveillance, and training.

II. Health Hazard Data

A. **Ways in which lead enters your body**. When absorbed into your body in certain doses, lead is a toxic substance. The object of the lead standard is to prevent absorption of harmful quantities of lead. The standard is intended to protect you not only from the immediate toxic effects of lead, but also from the serious toxic effects that may not become apparent until years of exposure have passed. Lead can be absorbed into your body by inhalation (breathing) and ingestion (eating). Lead (except for certain organic lead compounds not covered by the standard, such as tetraethyl lead) is not absorbed through your skin. When lead is scattered in the air as a dust, fume or mist it can be inhaled and absorbed through your lungs and upper respiratory tract. Inhalation of airborne lead is generally the most important source of occupational lead absorption. You can also absorb lead through your digestive system if lead gets into your mouth and is swallowed. If you handle food, cigarettes, chewing tobacco, or make-up which have lead on them or handle them with hands contaminated with lead, this will contribute to ingestion. A significant portion of the lead that you inhale or ingest gets into your blood stream. Once in your blood stream, lead is circulated throughout your body and stored in various organs and body tissues. Some of this lead is quickly filtered out of your body and excreted, but some remains in the blood and other tissues. As exposure to lead continues, the amount stored in your body will increase if you are absorbing more lead than your body is excreting. Even though you may not be aware of any immediate symptoms of disease, this lead stored in your tissues can be slowly causing irreversible damage, first to individual cells, then to your organs and whole body systems.

B. Effects of overexposure to lead

(1) **Short term (acute) overexposure**. Lead is a potent, systemic poison that serves no known useful function once absorbed by your body. Taken in large enough doses, lead can kill you in a matter of days. A condition affecting the brain called acute encephalopathy may arise which develops quickly to seizures, coma, and death from cardiorespiratory arrest. A short term dose of lead can lead to acute encephalopathy. Short term occupational exposures of this magnitude are highly unusual, but not impossible. Similar forms of encephalopathy may, however, arise from extended, chronic exposure to lower doses of lead. There is no sharp dividing line between rapidly developing acute effects of lead, and chronic effects which take longer to acquire. Lead adversely affects numerous body systems, and causes forms of health impairment and disease which arise after periods of exposure as short as days or as long as several years.

(2) **Long-term (chronic) overexposure**. Chronic overexposure to lead may result in severe damage to your blood-forming, nervous, urinary and reproductive systems. Some common symptoms of chronic overexposure include loss of appetite, metallic taste in the mouth, anxiety, constipation, nausea, pallor, excessive

tiredness, weakness, insomnia, headache, nervous irritability, muscle and joint pain or soreness, fine tremors, numbness, dizziness, hyperactivity and colic. In lead colic there may be severe abdominal pain. Damage to the central nervous system in general and the brain (encephalopathy) in particular is one of the most severe forms of lead poisoning. The most severe, often fatal, form of encephalopathy may be preceded by vomiting, a feeling of dullness progressing to drowsiness and stupor, poor memory, restlessness, irritability, tremor, and convulsions. It may arise suddenly with the onset of seizures, followed by coma, and death. There is a tendency for muscular weakness to develop at the same time. This weakness may progress to paralysis often observed as a characteristic "wrist drop" or "foot drop" and is a manifestation of a disease to the nervous system called peripheral neuropathy. Chronic overexposure to lead also results in kidney disease with few, if any, symptoms appearing until extensive and most likely permanent kidney damage has occurred. Routine laboratory tests reveal the presence of this kidney disease only after about two-thirds of kidney function is lost. When overt symptoms of urinary dysfunction arise, it is often too late to correct or prevent worsening conditions, and progression to kidney dialysis or death is possible. Chronic overexposure to lead impairs the reproductive systems of both men and women. Overexposure to lead may result in decreased sex drive, impotence and sterility in men. Lead can alter the structure of sperm cells raising the risk of birth defects. There is evidence of miscarriage and stillbirth in women whose husbands were exposed to lead or who were exposed to lead themselves. Lead exposure also may result in decreased fertility, and abnormal menstrual cycles in women. The course of pregnancy may be adversely affected by exposure to lead since lead crosses the placental barrier and poses risks to developing fetuses. Children born of parents either one of whom were exposed to excess lead levels are more likely to have birth defects, mental retardation, behavioral disorders or die during the first year of childhood. Overexposure to lead also disrupts the blood-forming system resulting in decreased hemoglobin (the substance in the blood that carries oxygen to the cells) and ultimately anemia. Anemia is characterized by weakness, pallor and fatigability as a result of decreased oxygen carrying capacity in the blood.

(3) **Health protection goals of the standard**. Prevention of adverse health effects for most workers from exposure to lead throughout a working lifetime requires that a worker's blood lead level (BLL, also expressed as PbB) be maintained at or below forty micrograms per deciliter of whole blood (40 μg/dl). The blood lead levels of workers (both male and female workers) who intend to have children should be maintained below 30 μg/dl to minimize adverse reproductive health effects to the parents and to the developing fetus. The measurement of your blood lead level (BLL) is the most useful indicator of the amount of lead being absorbed by your body. Blood lead levels are most often reported in units of milligrams (mg) or micrograms (μg) of lead (1 mg = 1,000 μg) per 100 grams (100 g), 100 milliliters (100 ml) or deciliter (dl) of blood. These three units are essentially the same. Sometimes BLLs are expressed in the form of mg% or μg%. This is a shorthand notation for 100 g, 100 ml, or dl. (References to BLL measurements in this standard are expressed in the form of μg/dl.)

BLL measurements show the amount of lead circulating in your blood stream, but do not give any information about the amount of lead stored in your various tissues. BLL measurements merely show current absorption of lead, not the effect that lead is having on your body or the effects that past lead exposure may have already caused. Past research into lead-related diseases, however, has focused heavily on associations between BLLs and various diseases. As a result, your BLL is an important indicator of the likelihood that you will gradually acquire a lead-related health impairment or disease.

Once your blood lead level climbs above 40 μg/dl, your risk of disease increases. There is a wide variability of individual response to lead, thus it is difficult to say that a particular BLL in a given person will cause a particular effect. Studies have associated fatal encephalopathy with BLLs as low as 150 μg/dl. Other studies have shown other forms of diseases in some workers with BLLs well below 80 μg/dl. Your BLL is a crucial indicator of the risks to your health, but one other factor is also extremely important. This factor is the length of time you have had elevated BLLs. The longer you have an elevated BLL, the greater the risk that large quantities of lead are being gradually stored in your organs and tissues (body burden). The greater

your overall body burden, the greater the chances of substantial permanent damage. The best way to prevent all forms of lead-related impairments and diseases—both short term and long term—is to maintain your BLL below 40 μg/dl. The provisions of the standard are designed with this end in mind.

Your employer has prime responsibility to assure that the provisions of the standard are complied with both by the company and by individual workers. You, as a worker, however, also have a responsibility to assist your employer in complying with the standard. You can play a key role in protecting your own health by learning about the lead hazards and their control, learning what the standard requires, following the standard where it governs your own actions, and seeing that your employer complies with provisions governing his or her actions.

(4) **Reporting signs and symptoms of health problems**. You should immediately notify your employer if you develop signs or symptoms associated with lead poisoning or if you desire medical advice concerning the effects of current or past exposure to lead or your ability to have a healthy child. You should also notify your employer if you have difficulty breathing during a respirator fit test or while wearing a respirator. In each of these cases, your employer must make available to you appropriate medical examinations or consultations. These must be provided at no cost to you and at a reasonable time and place. The standard contains a procedure whereby you can obtain a second opinion by a physician of your choice if your employer selected the initial physician.

APPENDIX B
Employee Standard Summary

This appendix summarizes key provisions of the standard for lead in construction that you as a worker should become familiar with.

I. Permissible Exposure Limit (PEL)—subsection (c)

The standard sets a permissible exposure limit (PEL) of 50 micrograms of lead per cubic meter of air (50 $\mu g/m^3$), averaged over an 8-hour workday which is referred to as a time-weighted average (TWA). This is the highest level of lead in air to which you may be permissibly exposed over an 8-hour workday. However, since this is an 8-hour average, short exposures above the PEL are permitted so long as for each 8-hour work day your average exposure does not exceed this level. This standard, however, takes into account the fact that your daily exposure to lead can extend beyond a typical 8-hour workday as the result of overtime or other alterations in your work schedule. To deal with this situation, the standard contains a formula which reduces your permissible exposure when you are exposed more than 8 hours. For example, if you are exposed to lead for 10 hours a day, the maximum permitted average exposure would be 40 $\mu g/m^3$.

II. Exposure Assessment—subsection (d)

If lead is present in your workplace in any quantity, your employer is required to make an initial determination of whether any employee's exposure to lead exceeds the action level (30 $\mu g/m^3$ averaged over an 8-hour day). Employee exposure is that exposure which would occur if the employee were not using a respirator. This initial determination requires your employer to monitor workers' exposures unless he or she has objective data which can demonstrate conclusively that no employee will be exposed to lead in excess of the action level. Where objective data is used in lieu of actual monitoring the employer must establish and maintain an accurate record, documenting its relevancy in assessing exposure levels for current job conditions. If such objective data is available, the employer need proceed no further on employee exposure assessment until such time that conditions have changed and the determination is no longer valid.

Objective data for surfaces and materials that is less than 0.06% lead dry weight (600 ppm) is indicative of materials that will not give lead concentrations above the action level. Lead analysis must be performed for each unique surface coating or material. Surface coating or material objective data cannot be used to replace air monitoring for exposure assessments required for the lead-related tasks listed in subsection (d)(2).

Objective data may be compiled from various sources; e.g., insurance companies and trade associations and information from suppliers or exposure data collected from similar operations. Objective data may also comprise previously collected sampling data including area monitoring. If it cannot be determined through using objective data that worker exposure is less than the action level, your employer must conduct monitoring or must rely on relevant previous personal sampling, if available. Where monitoring is required for the initial determination, it may be limited to a representative number of employees who are reasonably expected to have the highest exposure levels. If your employer has conducted appropriate air sampling for lead in the past 12 months, he or she may use these results, provided they are applicable to the same employee tasks and exposure conditions and meet the requirements for accuracy as specified in the standard. As with objective data, if such results are relied upon for the initial determination, your employer must establish and maintain a record as to the relevancy of such data to current job conditions.

If there have been any employee complaints of symptoms which may be attributable to exposure to lead or if there is any other information or observations which would indicate employee exposure to lead, this must also be considered as part of the initial determination.

If this initial determination shows that a reasonable possibility exists that any employee may be exposed, without regard to respirators, over the action level, your employer must set up an air monitoring program to determine the exposure level representative of each employee exposed to lead at your workplace. In carrying out this air monitoring program, your employer is not required to monitor the exposure of every employee, but he or she must monitor a representative number of employees and job types. Enough sampling must be done to enable each employee's exposure level to be reasonably represent full shift exposure. In addition, these air samples must be taken under conditions which represent each employee's regular, daily exposure to lead. Sampling performed in the past 12 months may be used to determine exposures above the action level if such sampling was conducted during work activities essentially similar to present work conditions.

The standard lists certain tasks which may likely result in exposures to lead in excess of the PEL and, in some cases, exposures in excess of 50 times the PEL. If you are performing any of these tasks, your employer must provide you with appropriate respiratory protection, protective clothing and equipment, change areas, hand washing facilities,

biological monitoring, and training until such time that an exposure assessment is conducted which demonstrates that your exposure level is below the PEL. Objective data cannot be used to replace air monitoring for this exposure assessment.

If you are exposed to lead and air sampling is performed, your employer is required to notify you in writing within 5 working days of the air monitoring results which represent your exposure. If the results indicate that your exposure exceeds the PEL (without regard to your use of a respirator), then your employer must also notify you of this in writing, and provide you with a description of the corrective action that has been taken or will be taken to reduce your exposure.

Your exposure must be rechecked by monitoring, at least every six months if your exposure is at or over the action level but below the PEL. Your employer may discontinue monitoring for you if 2 consecutive measurements, taken at least 7 days apart, are at or below the action level. Air monitoring must be repeated every 3 months if you are exposed over the PEL. Your employer must continue monitoring for you at this frequency until 2 consecutive measurements, taken at least 7 days apart, are below the PEL but above the action level, at which time your employer must repeat monitoring of your exposure every six months and may discontinue monitoring only after your exposure drops to or below the action level. However, whenever there is a change of equipment, process, control, or personnel or a new type of job is added at your workplace which may result in new or additional exposure to lead, your employer must perform additional monitoring.

III. Methods of Compliance—subsection (e)

Your employer is required to assure that no employee is exposed to lead in excess of the PEL as an 8-hour TWA. The standard for lead in construction requires employers to institute engineering and work practice controls including administrative controls to the extent feasible to reduce employee exposure to lead. Where such controls are feasible but not adequate to reduce exposures below the PEL they must be used nonetheless to reduce exposures to the lowest level that can be accomplished by these means and then supplemented with appropriate respiratory protection. Your employer must establish a regulated area that includes the work area where airborne exposure to lead is above the PEL, or where the lead-related tasks listed in subsection (d)(2) are performed.

Your employer is required to develop and implement a written compliance program prior to the commencement of any job where employee exposures may reach the PEL as an 8-hour TWA. The standard identifies the various elements that must be included in the plan. For example, employers are required to include a description of operations in which lead is emitted, detailing other relevant information about the operation such as the type of equipment used, the type of material involved, employee job responsibilities, operating procedures and maintenance practices. In addition, your employer's compliance plan must specify the means that will be used to achieve compliance and, where engineering controls are required, include any engineering plans or studies that have been used to select the control methods. If administrative controls involving job rotation are used to reduce employee exposure to lead, the job rotation schedule must be included in the compliance plan. The plan must also detail the type of protective clothing and equipment, including respirators, housekeeping and hygiene practices that will be used to protect you from the adverse effects of exposure to lead.

The written compliance program must be made available, upon request, to affected employees and their designated representatives, the Chief and NIOSH.

Finally, the plan must be reviewed and updated at least every 6 months to assure it reflects the current status in exposure control.

IV. Respiratory Protection—subsection (f)

Your employer is required to provide and assure your use of respirators when your exposure to lead is not controlled below the PEL by other means. The employer must pay the cost of the respirator. Whenever you request one, your employer is also required to provide you a respirator even if your air exposure level is not above the PEL. You might desire a respirator when, for example, you have received medical advice that your lead absorption should be decreased. Or, you may intend to have children in the near future, and want to reduce the level of lead in your body to minimize adverse reproductive effects. While respirators are the least satisfactory means of controlling your exposure, they are capable of providing significant protection if properly chosen, fitted, worn, cleaned, maintained, and replaced when they stop providing adequate protection.

Your employer is required to select respirators from the types specified in the Respiratory Protection Standard, Section 5144(d)(3)(A)1. Any respirator chosen must be approved by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 42 CFR part 84. This respirator selection table will enable your employer to choose a type of respirator which will give you a proper amount of protection based on your airborne lead exposure. Your employer may select a type of respirator that provides greater protection than that required by the standard; that

is, one recommended for a higher concentration of lead than is present in your workplace. For example, a powered air purifying respirator (PAPR) is much more protective than a typical negative pressure respirator, and may also be more comfortable to wear. A PAPR has a filter, cartridge or canister to clean the air, and a power source which continuously blows filtered air into your breathing zone. Your employer might make a PAPR available to you to ease the burden of having to wear a respirator for long periods of time. The standard provides that you can obtain a PAPR upon request.

Your employer must assure that your respirator facepiece fits properly. Proper fit of a respirator facepiece is critical. Obtaining a proper fit on each employee may require your employer to make available two or three different mask types. In order to assure that your respirator fits properly and that facepiece leakage is minimized, your employer must give you either a qualitative fit test or a quantitative fit test as specified in Appendix A of the Respiratory Protection standard located at section 5144.

You must also receive from your employer proper training in the use of respirators. Your employer is required to teach you how to wear a respirator, to know why it is needed, and to understand its limitations.

The standard provides that if your respirator uses filter elements, you must be given an opportunity to change the filter elements whenever an increase in breathing resistance is detected. You also must be permitted to periodically leave your work area to wash your face and respirator facepiece whenever necessary to prevent skin irritation. If you ever have difficulty in breathing during a fit test or while using a respirator, your employer must make a medical examination available to you to determine whether you can safely wear a respirator. The result of this examination may be to give you a positive pressure respirator (which reduces breathing resistance) or to provide alternative means of protection.

V. Protective Work Clothing and Equipment—subsection (g)

If you are exposed to lead above the PEL as an 8-hour TWA, without regard to your use of a respirator, or if you are exposed to lead compounds such as lead arsenate or lead azide which can cause skin and eye irritation, your employer must provide you with protective work clothing and equipment appropriate for the hazard. If work clothing is provided, it must be provided in a clean and dry condition at least weekly, and daily if your airborne exposure to lead is greater than 200 $\mu g/m^3$. Appropriate protective work clothing and equipment can include coveralls or similar full-body work clothing, gloves, hats, shoes or disposable shoe coverlets, and face shields or vented goggles. Your employer is required to provide all such equipment at no cost to you. In addition, your employer is responsible for providing repairs and replacement as necessary, and also is responsible for the cleaning, laundering or disposal of protective clothing and equipment.

The standard requires that your employer assure that you follow good work practices when you are working in areas where your exposure to lead may exceed the PEL. With respect to protective clothing and equipment, where appropriate, the following procedures should be observed prior to beginning work:

1. Change into work clothing and shoe covers in the clean section of the designated changing areas;
2. Use work garments of appropriate protective gear, including respirators before entering the work area; and
3. Store any clothing not worn under protective clothing in the designated changing area.

Workers should follow these procedures upon leaving the work area:

1. HEPA vacuum heavily contaminated protective work clothing while it is still being worn. At no time may lead be removed from protective clothing by any means which result in uncontrolled dispersal of lead into the air;
2. Remove shoe covers and leave them in the work area;
3. Remove protective clothing and gear in the dirty area of the designated changing area. Remove protective coveralls by carefully rolling down the garment to reduce exposure to dust.
4. Remove respirators last; and
5. Wash hands and face.

Workers should follow these procedures upon finishing work for the day (in addition to procedures described above):

1. Where applicable, place disposal coveralls and shoe covers with the abatement waste;
2. Contaminated clothing which is to be cleaned, laundered or disposed of must be placed in closed containers in the change room.
3. Clean protective gear, including respirators, according to standard procedures;

4. Wash hands and face again. If showers are available, take a shower and wash hair. If shower facilities are not available at the work site, shower immediately at home and wash hair.

VI. Housekeeping—subsection (h)

Your employer must establish a housekeeping program sufficient to maintain all surfaces as free as practicable of accumulations of lead dust. Vacuuming is the preferred method of meeting this requirement, and the use of compressed air to clean floors and other surfaces is generally prohibited unless removal with compressed air is done in conjunction with ventilation systems designed to contain dispersal of the lead dust. Dry or wet sweeping, shoveling, or brushing may not be used except where vacuuming or other equally effective methods have been tried and do not work. Vacuums must be used equipped with a special filter called a high-efficiency particulate air (HEPA) filter and emptied in a manner which minimizes the reentry of lead into the workplace.

VII. Hygiene Facilities, Practices and Regulated Areas—subsection (i)

The standard requires that hand washing facilities be provided where occupational exposure to lead occurs. In addition, change areas, showers (where feasible), and lunchrooms or eating areas are to be made available to workers exposed to lead above the PEL. Your employer must assure that except in these facilities, food and beverage is not present or consumed, tobacco products are not present or used, and cosmetics are not applied, where airborne exposures are above the PEL. Change rooms provided by your employer must be equipped with separate storage facilities for your protective clothing and equipment and street clothes to avoid cross-contamination. After showering, no required protective clothing or equipment worn during the shift may be worn home. It is important that contaminated clothing or equipment be removed in change areas and not be worn home or you will extend your exposure and expose your family since lead from your clothing can accumulate in your house, car, etc.

Lunchrooms or eating areas may not be entered with protective clothing or equipment unless surface dust has been removed by vacuuming, downdraft booth, or other cleaning method. Finally, workers exposed above the PEL must wash both their hands and faces prior to eating, drinking, smoking or applying cosmetics.

All of the facilities and hygiene practices just discussed are essential to minimize additional sources of lead absorption from inhalation or ingestion of lead that may accumulate on you, your clothes, or your possessions. Therefore, employers shall establish regulated areas, where access is controlled by the supervisor for work areas where employees are exposed to lead at or above the PEL or performing the specific tasks that require air monitoring, as required by subsection (d)(2). Any employee that enters the regulated area must be provided with protective equipment. Strict compliance with these provisions can virtually eliminate several sources of lead exposure which significantly contribute to excessive lead absorption.

VIII. Medical Surveillance—subsection (j)

The medical surveillance program is part of the standard's comprehensive approach to the prevention of lead-related disease. Its purpose is to supplement the main thrust of the standard which is aimed at minimizing airborne concentrations of lead and sources of ingestion. Only medical surveillance can determine if the other provisions of the standard have effectively protected you as an individual. Compliance with the standard's provision will protect most workers from the adverse effects of lead exposure, but may not be satisfactory to protect individual workers who:

1. have high body burdens of lead acquired over past years,
2. have additional uncontrolled sources of non-occupational lead exposure,
3. exhibit unusual variations in lead absorption rates, or
4. have specific non-work related medical conditions which could be aggravated by lead exposure (e.g., renal disease, anemia).

In addition, control systems may fail, or hygiene and respirator programs may be inadequate. Periodic medical surveillance of individual workers will help detect those failures. Medical surveillance will also be important to protect your reproductive ability—regardless of whether you are a man or woman.

All medical surveillance required by the interim final standard must be performed by or under the supervision of a licensed physician. The employer must provide required medical surveillance without cost to employees and at a reasonable time and place. The standard's medical surveillance program has two parts—periodic biological monitoring and medical examinations. Your employer's obligation to offer you medical surveillance is triggered by the results of the air monitoring program. Full medical surveillance must be made available to all employees who are or may be exposed to lead in excess of the action level for more than 30 days a year and whose blood lead level exceeds 40 μg/dl.

Initial medical surveillance consisting of blood sampling and analysis for lead and zinc protoporphyrin must be provided to all employees exposed at any time (1 day) above the action level.

Biological monitoring under the standard must be provided at least every 2 months for the first 6 months and every 6 months thereafter until your blood lead level is below 40 μg/dl. A zinc protoporphyrin (ZPP) test is a very useful blood test which measures an adverse metabolic effect of lead on your body and is therefore an indicator of lead toxicity.

If your BLL exceeds 40 μg/dl the monitoring frequency must be increased from every 6 months to at least every 2 months and not reduced until two consecutive BLLs indicate a blood lead level below 40 μg/dl. Each time your BLL is determined to be over 40 μg/dl, your employer must notify you of this in writing within five working days of his or her receipt of the test results. The employer must also inform you that the standard requires temporary medical removal with economic protection when your BLL exceeds 50 μg/dl. (See Discussion of Medical Removal Protection—subsection (k).) Anytime your BLL exceeds 50 μg/dl your employer must make available to you within two weeks of receipt of these test results a second follow-up BLL test to confirm your BLL. If the two tests both exceed 50 μg/dl, and you are temporarily removed, then your employer must make successive BLL tests available to you on a monthly basis during the period of your removal.

Medical examinations beyond the initial one must be made available on an annual basis if your blood lead level exceeds 40 μg/dl at any time during the preceding year and you are being exposed above the airborne action level of 30 $\mu g/m^3$ for 30 or more days per year. The initial examination will provide information to establish a baseline to which subsequent data can be compared.

An initial medical examination to consist of blood sampling and analysis for lead and zinc protoporphyrin must also be made available (prior to assignment) for each employee being assigned for the first time to an area where the airborne concentration of lead equals or exceeds the action level at any time. In addition, a medical examination or consultation must be made available as soon as possible if you notify your employer that you are experiencing signs or symptoms commonly associated with lead poisoning or that you have difficulty breathing while wearing a respirator or during a respirator fit test. You must also be provided a medical examination or consultation if you notify your employer that you desire medical advice concerning the effects of current or past exposure to lead on your ability to procreate a healthy child.

Finally, appropriate follow-up medical examinations or consultations may also be provided for employees who have been temporarily removed from exposure under the medical removal protection provisions of the standard. (See Part IX, below.)

The standard specifies the minimum content of pre-assignment and annual medical examinations. The content of other types of medical examinations and consultations is left up to the sound discretion of the examining physician. Pre-assignment and annual medical examinations must include:

1. a detailed work history and medical history;
2. a thorough physical examination, including an evaluation of your pulmonary status if you will be required to use a respirator;
3. a blood pressure measurement; and
4. a series of laboratory tests designed to check your blood chemistry and your kidney function. In addition, at any time upon your request, a laboratory evaluation of male fertility will be made (microscopic examination of a sperm sample), or a pregnancy test will be given.

The standard does not require that you participate in any of the medical procedures, tests, etc., which your employer is required to make available to you. Medical surveillance can, however, play a very important role in protecting your health. You are strongly encouraged, therefore, to participate in a meaningful fashion. The standard contains a multiple physician review mechanism which will give you a chance to have a physician of your choice directly participate in the medical surveillance program. If you are dissatisfied with an examination by a physician chosen by your employer, you can select a second physician to conduct an independent analysis. The two doctors would attempt to resolve any differences of opinion, and select a third physician to resolve any firm dispute. Generally your employer will choose the physician who conducts medical surveillance under the lead standard—unless you and your employer can agree on the choice of a physician or physicians. Some companies and unions have agreed in advance, for example, to use certain independent medical laboratories or panels of physicians. Any of these arrangements are acceptable so long as required medical surveillance is made available to workers.

The standard requires your employer to provide certain information to a physician to aid in his or her examination of you. This information includes:

1. the standard and its appendices,

2. a description of your duties as they relate to occupational lead exposure,

3. your exposure level or anticipated exposure level,

4. a description of any personal protective equipment you wear,

5. prior blood lead level results, and

6. prior written medical opinions concerning you that the employer has.

After a medical examination or consultation the physician must prepare a written report which must contain:

1. the physician's opinion as to whether you have any medical condition which places you at increased risk of material impairment to health from exposure to lead,

2. any recommended special protective measures to be provided to you,

3. any blood lead level determinations, and

4. any recommended limitation on your use of respirators. This last element must include a determination of whether you can wear a powered air purifying respirator (PAPR) if you are found unable to wear a negative pressure respirator.

The medical surveillance program of the interim lead standard may at some point in time serve to notify certain workers that they have acquired a disease or other adverse medical condition as a result of occupational lead exposure. If this is true, these workers might have legal rights to compensation from public agencies, their employers, firms that supply hazardous products to their employers, or other persons. Some states have laws, including worker compensation laws, that disallow a worker who learns of a job-related health impairment to sue, unless the worker sues within a short period of time after learning of the impairment. (This period of time may be a matter of months or years.) An attorney can be consulted about these possibilities. It should be stressed that OSHA is in no way trying to either encourage or discourage claims or lawsuits. However, since results of the standard's medical surveillance program can significantly affect the legal remedies of a worker who has acquired a job-related disease or impairment, it is proper for OSHA to make you aware of this.

The medical surveillance section of the standard also contains provisions dealing with chelation. Chelation is the use of certain drugs (administered in pill form or injected into the body) to reduce the amount of lead absorbed in body tissues. Experience accumulated by the medical and scientific communities has largely confirmed the effectiveness of this type of therapy for the treatment of very severe lead poisoning. On the other hand, it has also been established that there can be a long list of extremely harmful side effects associated with the use of chelating agents. The medical community has balanced the advantages and disadvantages resulting from the use of chelating agents in various circumstances and has established when the use of these agents is acceptable. The standard includes these accepted limitations due to a history of abuse of chelation therapy by some lead companies. The most widely used chelating agents are calcium disodium EDTA, ($CaNa_2EDTA$), Calcium Disodium Versenate (Versenate), and d-penicillamine (penicillamine or Cupramine).

The standard prohibits "prophylactic chelation" of any employee by any person the employer retains, supervises or controls. "Prophylactic chelation" is the routine use of chelating or similarly acting drugs to prevent elevated blood levels in workers who are occupationally exposed to lead, or the use of these drugs to routinely lower blood lead levels to pre-designated concentrations believed to be "safe." It should be emphasized that where an employer takes a worker who has no symptoms of lead poisoning and has chelation carried out by a physician (either inside or outside of a hospital) solely to reduce the worker's blood lead level, that will generally be considered prophylactic chelation. The use of a hospital and a physician does not mean that prophylactic chelation is not being performed. Routine chelation to prevent increased or reduce current blood lead levels is unacceptable whatever the setting.

The standard allows the use of "therapeutic" or "diagnostic" chelation if administered under the supervision of a licensed physician in a clinical setting with thorough and appropriate medical monitoring. Therapeutic chelation responds to severe lead poisoning where there are marked symptoms. Diagnostic chelation involved giving a patient a dose of the drug then collecting all urine excreted for some period of time as an aid to the diagnosis of lead poisoning.

In cases where the examining physician determines that chelation is appropriate, you must be notified in writing of this fact before such treatment. This will inform you of a potentially harmful treatment, and allow you to obtain a second opinion.

IX. Medical Removal Protection—subsection (k)

Excessive lead absorption subjects you to increased risk of disease. Medical removal protection (MRP) is a means of protecting you when, for whatever reasons, other methods, such as engineering

controls, work practices, and respirators, have failed to provide the protection you need. MRP involves the temporary removal of a worker from his or her regular job to a place of significantly lower exposure without any loss of earnings, seniority, or other employment rights or benefits. The purpose of this program is to cease further lead absorption and allow your body to naturally excrete lead which has previously been absorbed. Temporary medical removal can result from an elevated blood lead level, or a medical opinion. For up to 18 months, or for as long as the job the employee was removed from lasts, protection is provided as a result of either form of removal. The vast majority of removed workers, however, will return to their former jobs long before this eighteen month period expires.

You may also be removed from exposure even if your blood lead level is below 50 μg/dl if a final medical determination indicates that you temporarily need reduced lead exposure for medical reasons. If the physician who is implementing your employer's medical program makes a final written opinion recommending your removal or other special protective measures, your employer must implement the physician's recommendation. If you are removed in this manner, you may only be returned when the doctor indicates that it is safe for you to do so.

The standard does not give specific instructions dealing with what an employer must do with a removed worker. Your job assignment upon removal is a matter for you, your employer and your union (if any) to work out consistent with existing procedures for job assignments. Each removal must be accomplished in a manner consistent with existing collective bargaining relationships. Your employer is given broad discretion to implement temporary removals so long as no attempt is made to override existing agreements. Similarly, a removed worker is provided no right to veto an employer's choice which satisfies the standard.

In most cases, employers will likely transfer removed employees to other jobs with sufficiently low lead exposure. Alternatively, a worker's hours may be reduced so that the time weighted average exposure is reduced, or he or she may be temporarily laid off if no other alternative is feasible.

In all of these situations, MRP benefits must be provided during the period of removal; i.e., you continue to receive the same earnings, seniority, and other rights and benefits you would have had if you had not been removed. Earnings includes more than just your base wage; it includes overtime, shift differentials, incentives, and other compensation you would have earned if you had not been removed. During the period of removal you must also be provided with appropriate follow-up medical surveillance. If you were removed because your blood lead level was too high, you must be provided with a monthly blood test. If a medical opinion caused your removal, you must be provided medical tests or examinations that the doctor believes to be appropriate. If you do not participate in this follow-up medical surveillance, you may lose your eligibility for MRP benefits.

When you are medically eligible to return to your former job, your employer must return you to your "former job status." This means that you are entitled to the position, wages, benefits, etc., you would have had if you had not been removed. If you would still be in your old job if no removal had occurred that is where you go back. If not, you are returned consistent with whatever job assignment discretion your employer would have had if no removal had occurred. MRP only seeks to maintain your rights, not expand them or diminish them.

If you are removed under MRP and you are also eligible for worker compensation or other compensation for lost wages, your employer's MRP benefits obligation is reduced by the amount that you actually receive from these other sources. This is also true if you obtain other employment during the time you are laid off with MRP benefits.

The standard also covers situations where an employer voluntarily removes a worker from exposure to lead due to the effects of lead on the employee's medical condition, even though the standard does not require removal. In these situations MRP benefits must still be provided as though the standard required removal. Finally, it is important to note that in all cases where removal is required, respirators cannot be used as a substitute. Respirators may be used before removal becomes necessary, but not as an alternative to a transfer to a low-exposure job, or to a lay-off with MRP benefits.

X. Employee Information, Training and Certification—subsection (l)

Your employer is required to provide an information and training program for all employees exposed to lead above the action level or who may suffer skin or eye irritation from lead compounds such as lead arsenate or lead azide. The program must train these employees regarding the specific hazards associated with their work environment, protective measures which can be taken, including the contents of any compliance plan in effect, the danger of lead to their bodies (including their reproductive systems), and their rights under the standard. All employees must be trained prior to initial assignment to areas where there is a possibility of exposure over the action level.

This training program must also be provided at least annually thereafter unless further exposure above the action level will not occur.

The California Department of Health Services requires the certification of employees and supervisors performing lead related construction activities in residential and public buildings, as defined in Title 17, California Code of Regulations, Division 1, Chapter 8. Lead related construction work is defined in Title 17 as any construction, alteration, painting, demolition, salvage, renovation, repair, or maintenance of any residential or public building, including preparation and cleanup, that, by using or disturbing lead containing material or soil, may result in significant exposure of adults or children to lead. "Public building" means a structure which is generally accessible to the public, including but not limited to, schools, daycare centers, museums, airports, hospitals, stores, convention centers, government facilities, office buildings and any other building which is not an industrial building or a residential building. Where training and certification is required, the training must be given by a training provider accredited by the California Department of Health Services.

XI. Signs—subsection (m)

The standard requires that the following warning sign be posted in each regulated area or work areas where the exposure to lead exceeds the PEL:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

These signs are to be posted and maintained in a manner which assures that the legend is readily visible.

XII. Record Keeping—subsection (n)

Your employer is required to keep all records of exposure monitoring for airborne lead. These records must include the name and job classification of employees measured, details of the sampling and analytical techniques, the results of this sampling, and the type of respiratory protection being worn by the person sampled. Such records are to be retained for at least 30 years. Your employer is also required to keep all records of biological monitoring and medical examination results. These records must include the names of the employees, the physician's written opinion, and a copy of the results of the examination. Medical records must be preserved and maintained for the duration of employment plus 30 years. However, if the employee's duration of employment is less than one year, the employer need not retain that employee's medical records beyond the period of employment if they are provided to the employee upon termination of employment.

Record keeping is also required if you are temporarily removed from your job under the medical removal protection program. This record must include your name and social security number, the date of your removal and return, how the removal was or is being accomplished, and whether or not the reason for the removal was an elevated blood lead level. Your employer is required to keep each medical removal record only for as long as the duration of an employee's employment.

The standard requires that if you request to see or copy environmental monitoring, blood lead level monitoring, or medical removal records, they must be made available to you or to a representative that you authorize. Your union also has access to these records. Medical records other than BLLs must also be provided upon request to you, to your physician or to any other person whom you may specifically designate. Your union does not have access to your personal medical records unless you authorize their access.

XIII. Observation of Monitoring—subsection (o)

When air monitoring for lead is performed at your workplace as required by this standard, your employer must allow you or someone you designate to act as an observer of the monitoring. Observers are entitled to an explanation of the measurement procedure, and to record the results obtained. Since results will not normally be available at the time of the monitoring, observers are entitled to record or receive the results of the monitoring when returned by the laboratory. Your employer is required to provide the observer with any personal protective devices required to be worn by employees working in the area that is being monitored. The employer must require the observer to wear all such equipment and to comply with all other applicable safety and health procedures.

XIV. Effective Date—subsection (p)

The standard's effective date was November 4, 1993. Employer obligations under the standard begin as of that date with full implementation of engineering controls as soon as possible but no later than within four months, and all other provisions completed as soon as possible, but no later than within two months from the effective date.

XV. For Additional Information

A. A copy of the standard for lead in construction can be obtained free of charge by calling or writing your local Cal/OSHA Office.

B. Additional information about the standard, its enforcement, and your employer's compliance can be obtained from the nearest Cal/OSHA Area Office listed in your telephone directory under State Government Offices/Industrial Relations/ Division of Occupational Safety and Health.

APPENDIX C
Medical Surveillance Guidelines

Introduction

The primary purpose of the Occupational Safety and Health Act of 1970 is to assure, so far as possible, safe and healthful working conditions for every working man and woman. The occupational health standard for lead in construction is designed to protect workers exposed to inorganic lead including metallic lead, all inorganic lead compounds and organic lead soaps.

Under this standard occupational exposure to inorganic lead is to be limited to 50 $\mu g/m^3$ (micrograms per cubic meter) based on an 8-hour time-weighted average (TWA). This permissible exposure limit (PEL) must be achieved through a combination of engineering, work practice and administrative controls to the extent feasible. Where these controls are in place but are found not to reduce employee exposures to or below the PEL, they must be used nonetheless, and supplemented with respirators to meet the 50 $\mu g/m^3$ exposure limit.

The standard also provides for a program of biological monitoring for employees exposed to lead above the action level at any time, and additional medical surveillance for all employees exposed to levels of inorganic lead above 30 $\mu g/m^3$ (TWA) for more than 30 days per year and whose BLL exceeds 40 $\mu g/dl$.

The purpose of this document is to outline the medical surveillance provisions of the standard for inorganic lead in construction, and to provide further information to the physician regarding the examination and evaluation of workers exposed to inorganic lead.

Section 1 provides a detailed description of the monitoring procedure including the required frequency of blood testing for exposed workers, provisions for medical removal protection (MRP), the recommended right of the employee to a second medical opinion, and notification and record keeping requirements of the employer. A discussion of the requirements for respirator use and respirator monitoring and OSHA's position on prophylactic chelation therapy are also included in this section.

Section 2 discusses the toxic effects and clinical manifestations of lead poisoning and effects of lead intoxication on enzymatic pathways in heme synthesis. The adverse effects on both male and female reproductive capacity and on the fetus are also discussed.
Section 3 outlines the recommended medical evaluation of the worker exposed to inorganic lead, including details of the medical history, physical examination, and recommended laboratory tests, which are based on the toxic effects of lead as discussed in Section 2.

Section 4 provides detailed information concerning the laboratory tests available for the monitoring of exposed workers. Included also is a discussion of the relative value of each test and the limitations and precautions which are necessary in the interpretation of the laboratory results.

I. Medical Surveillance and Monitoring Requirements for Workers Exposed to Inorganic Lead

Under the standard for inorganic lead in the construction industry, initial medical surveillance consisting of biological monitoring to include blood lead and ZPP level determination shall be provided to employees exposed to lead at or above the action level on any one day. In addition, a program of biological monitoring is to be made available to all employees exposed above the action level at any time and additional medical surveillance is to be made available to all employees exposed to lead above 30 $\mu g/m^3$ TWA for more than 30 days each year and whose BLL exceeds 40 $\mu g/dl$. This program consists of periodic blood sampling and medical evaluation to be performed on a schedule which is defined by previous laboratory results, worker complaints or concerns, and the clinical assessment of the examining physician.

Under this program, the blood lead level (BLL) of all employees who are exposed to lead above 30 $\mu g/m^3$ for more than 30 days per year or whose blood lead is above 40 $\mu g/dl$ but exposed for no more than 30 days per year is to be determined at least every two months for the first six months of exposure and every six months thereafter. The frequency is increased to every two months for employees whose last blood lead level was 40 $\mu g/dl$ or above. For employees who are removed from exposure to lead due to an elevated blood lead, a new blood lead level must be measured monthly. A zinc protoporphyrin (ZPP) measurement is strongly recommended on each occasion that a blood lead level measurement is made.

An annual medical examination and consultation performed under the guidelines discussed in Section 3 is to be made available to each employee exposed above 30 $\mu g/m^3$ for more than 30 days per year for whom a blood test conducted at any time during the preceding 12 months indicated a blood lead level at or above 40 $\mu g/dl$. In addition, a medical examination must be provided as soon as possible after notification by an employee that the employee has developed signs or symptoms commonly associated with lead intoxication, that the employee desires medical advice regarding lead exposure and the ability to procreate a healthy child, or that the employee has demonstrated difficulty in breathing during a respirator fitting test or during respirator use. An examination is also to be made available to

each employee removed from exposure to lead due to a risk of sustaining material impairment to health, or otherwise limited or specially protected pursuant to medical recommendations.

Results of biological monitoring or the recommendations of an examining physician may necessitate removal of an employee from further lead exposure pursuant to the standard's medical removal protection (MRP) program. The object of the MRP program is to provide temporary medical removal to workers either with substantially elevated blood lead levels or otherwise at risk of sustaining material health impairment from continued substantial exposure to lead.

Under the standard's ultimate worker removal criteria, a worker is to be removed from any work having an eight-hour TWA exposure to lead of 30 $\mu g/m^3$ when his or her blood lead level reaches 50 $\mu g/dl$ and is confirmed by a second follow-up blood lead level performed within two weeks after the employer receives the results of the first blood sampling test. Return of the employee to his or her job status depends on a worker's blood lead level declining to 40 $\mu g/dl$.

As part of the standard, the employer is required to notify in writing each employee whose blood lead level exceeds 40 $\mu g/dl$. In addition each such employee is to be informed that the standard requires medical removal with MRP benefits, discussed below, when an employee's blood lead level exceeds the above defined limit.

In addition to the above blood lead level criterion, temporary worker removal may also take place as a result of medical determinations and recommendations. Written medical opinions must be prepared after each examination pursuant to the standard. If the examining physician includes a medical finding, determination or opinion that the employee has a medical condition which places the employee at increased risk of material health impairment from exposure to lead, then the employee must be removed from exposure to lead at or above 30 $\mu g/m^3$. Alternatively, if the examining physician recommends special protective measures for an employee (e.g., use of a powered air purifying respirator) or recommends limitations on an employee's exposure to lead, then the employer must implement these recommendations.

Recommendations may be more stringent than the specific provisions of the standard. The examining physician, therefore, is given broad flexibility to tailor special protective procedures to the needs of individual employees. This flexibility extends to the evaluation and management of pregnant workers and male and female workers who are planning to raise children. Based on the history, physical examination, and laboratory studies, the physician might recommend special protective measures or medical removal for an employee who is pregnant or who is planning to conceive a child when, in the physician's judgment, continued exposure to lead at the current job would pose a significant risk. The return of the employee to his or her former job status, or the removal of special protections or limitations, depends upon the examining physician determining that the employee is no longer at increased risk of material impairment or that special measures are no longer needed.

During the period of any form of special protection or removal, the employer must maintain the worker's earnings, seniority, and other employment rights and benefits (as though the worker had not been removed) for a period of up to 18 months or for as long as the job the employee was removed from lasts if less than 18 months. This economic protection will maximize meaningful worker participation in the medical surveillance program, and is appropriate as part of the employer's overall obligation to provide a safe and healthful workplace. The provisions of MRP benefits during the employee's removal period may, however, be conditioned upon participation in medical surveillance.

The lead standard provides for a multiple physician review in cases where the employee wishes a second opinion concerning potential lead poisoning or toxicity. If an employee wishes a second opinion, he or she can make an appointment with a physician of his or her choice. This second physician will review the findings, recommendations or determinations of the first physician and conduct any examinations, consultations or tests deemed necessary in an attempt to make a final medical determination. If the first and second physicians do not agree in their assessment they must try to resolve their differences. If they cannot reach an agreement then they must designate a third physician to resolve the dispute.
The employer must provide examining and consulting physicians with the following specific information: A copy of the lead regulations and all appendices, a description of the employee's duties as related to exposure, the exposure level or anticipated level to lead and any other toxic substances (if applicable), a description of personal protective equipment used, blood lead levels, and all prior written medical opinions regarding the employee in the employer's possession or control. The employer must also obtain from the physician and provide the employee with a written medical opinion containing blood lead levels, the physician's opinion as to whether the employee is at risk of material impairment to health, any recommended protective measures for the employee if further exposure is permitted, as well as any recommended limitations upon an employee's use of respirators.

Employers must instruct each physician not to reveal to the employer in writing or in any other way his or her findings, laboratory results, or diagnoses which are felt to be unrelated to occupational lead

exposure. They must also instruct each physician to advise the employee of any occupationally or non-occupationally related medical condition requiring further treatment or evaluation.

The standard provides for the use of respirators where engineering and other primary controls are not effective. However, the use of respirator protection shall not be used in lieu of temporary medical removal due to elevated blood lead levels or findings that an employee is at risk of material health impairment. This is based on the numerous inadequacies of respirators including skin rash where the facepiece makes contact with the skin, unacceptable stress to breathing in some workers with underlying cardiopulmonary impairment, difficulty in providing adequate fit, the tendency for respirators to create additional hazards by interfering with vision, hearing, and mobility, and the difficulties of assuring the maximum effectiveness of a complicated work practice program involving respirators. Respirators do, however, serve a useful function where engineering and work practice controls are inadequate by providing supplementary, interim, or short-term protection, provided they are properly selected for the environment in which the employee will be working, properly fitted to the employee, maintained and cleaned periodically, and worn by the employee when required.

In its standard on occupational exposure to inorganic lead in the construction industry, OSHA has prohibited prophylactic chelation. Diagnostic and therapeutic chelation are permitted only under the supervision of a licensed physician with appropriate medical monitoring in an acceptable clinical setting. The decision to initiate chelation therapy must be made on an individual basis and take into account the severity of symptoms felt to be a result of lead toxicity along with blood lead levels, ZPP levels, and other laboratory tests as appropriate. EDTA and penicillamine, which are the primary chelating agents used in the therapy of occupational lead poisoning, have significant potential side effects and their use must be justified on the basis of expected benefits to the worker. Unless frank and severe symptoms are present, therapeutic chelation is not recommended, given the opportunity to remove a worker from exposure and allow the body to naturally excrete accumulated lead. As a diagnostic aid, the chelation mobilization test using Ca-EDTA has limited applicability. According to some investigators, the test can differentiate between lead-induced and other nephropathies. The test may also provide an estimation of the mobile fraction of the total body lead burden.

Employers are required to assure that accurate records are maintained on exposure assessment, including environmental monitoring, medical surveillance, and medical removal for each employee. Exposure assessment records must be kept for at least 30 years. Medical surveillance records must be kept for the duration of employment plus 30 years except in cases where the employment was less than one year. If duration of employment is less than one year, the employer need not retain this record beyond the term of employment if the record is provided to the employee upon termination of employment. Medical removal records also must be maintained for the duration of employment. All records required under the standard must be made available upon request to the Chief and the National Institute for Occupational Safety and Health. Employers must also make environmental and biological monitoring and medical removal records available to affected employees and to former employees or their authorized employee representatives. Employees or their specifically designated representatives have access to their entire medical surveillance records.

In addition, the standard requires that the employer inform all workers exposed to lead at or above 30 $\mu g/m^3$ of the provisions of the standard and all its appendices, the purpose and description of medical surveillance and provisions for medical removal protection if temporary removal is required. An understanding of the potential health effects of lead exposure by all exposed employees along with full understanding of their rights under the lead standard is essential for an effective monitoring program.

II. Adverse Health Effects of Inorganic Lead

Although the toxicity of lead has been known for 2,000 years, the knowledge of the complex relationship between lead exposure and human response is still being refined. Significant research into the toxic properties of lead continues throughout the world, and it should be anticipated that our understanding of thresholds of effects and margins of safety will be improved in future years. The provisions of the lead standard are founded on two prime medical judgments: First, the prevention of adverse health effects from exposure to lead throughout a working lifetime requires that worker blood lead levels be maintained at or below 40 $\mu g/dl$, and second, the blood lead levels of workers, male or female, who intend to parent in the near future should be maintained below 30 $\mu g/dl$ to minimize adverse reproductive health effects to the parents and developing fetus. The adverse effects of lead on reproduction are being actively researched and OSHA encourages the physician to remain abreast of recent developments in the area to best advise pregnant workers or workers planning to conceive children.

The spectrum of health effects caused by lead exposure can be subdivided into five developmental stages: Normal, physiological changes of uncertain significance, pathophysiological changes, overt symptoms (morbidity), and mortality. Within this process there are no sharp distinctions, but rather a continuum of effects. Boundaries between categories overlap due to the wide variation of individual responses and exposures in the working population.

OSHA's development of the lead standard focused on pathophysiological changes as well as later stages of disease.

1. **Heme Synthesis Inhibition**. The earliest demonstrated effect of lead involves its ability to inhibit at least two enzymes of the heme synthesis pathway at very low blood levels. Inhibition of delta aminolevulinic acid dehydrase (ALA-D) which catalyzes the conversion of delta-aminolevulinic acid (ALA) to protoporphyrin is observed at a blood lead level below 20 μg/dl. At a blood lead level of 40 μg/dl, more than 20% of the population would have 70% inhibition of ALA-D. There is an exponential increase in ALA excretion at blood lead levels greater than 40 μg/dl.

   Another enzyme, ferrochelatase, is also inhibited at low blood lead levels. Inhibition of ferrochelatase leads to increased free erythrocyte protoporphyrin (FEP) in the blood which can then bind to zinc to yield zinc protoporphyrin. At a blood lead level of 50 μg/dl or greater, nearly 100% of the population will have an increase in FEP. There is also an exponential relationship between blood lead levels greater than 40 μg/dl and the associated ZPP level, which has led to the development of the ZPP screening test for lead exposure.

   While the significance of these effects is subject to debate, it is OSHA's position that these enzyme disturbances are early stages of a disease process which may eventually result in the clinical symptoms of lead poisoning. Whether or not the effects do progress to the later stages of clinical disease, disruption of these enzyme processes over a working lifetime is considered to be a material impairment of health.

   One of the eventual results of lead-induced inhibition of enzymes in the heme synthesis pathway is anemia which can be asymptomatic if mild but associated with a wide array of symptoms including dizziness, fatigue, and tachycardia when more severe. Studies have indicated that lead levels as low as 50 μg/dl can be associated with a definite decreased hemoglobin, although most cases of lead-induced anemia, as well as shortened red-cell survival times, occur at lead levels exceeding 80 μg/dl. Inhibited hemoglobin synthesis is more common in chronic cases whereas shortened erythrocyte life span is more common in acute cases.

   In lead-induced anemias, there is usually a reticulocytosis along with the presence of basophilic stippling, and ringed sideroblasts, although none of the above are pathognomonic for lead-induced anemia.

2. **Neurological Effects**. Inorganic lead has been found to have toxic effects on both the central and peripheral nervous systems. The earliest stages of lead-induced central nervous system effects first manifest themselves in the form of behavioral disturbances and central nervous system symptoms including irritability, restlessness, insomnia and other sleep disturbances, fatigue, vertigo, headache, poor memory, tremor, depression, and apathy. With more severe exposure, symptoms can progress to drowsiness, stupor, hallucinations, delirium, convulsions and coma.

   The most severe and acute form of lead poisoning which usually follows ingestion or inhalation of large amounts of lead is acute encephalopathy which may arise precipitously with the onset of intractable seizures, coma, cardiorespiratory arrest, and death within 48 hours.

   While there is disagreement about what exposure levels are needed to produce the earliest symptoms, most experts agree that symptoms definitely can occur at blood lead levels of 60 μg/dl whole blood and therefore recommend a 40 μg/dl maximum. The central nervous system effects frequently are not reversible following discontinued exposure or chelation therapy and when improvement does occur, it is almost always only partial.

   The peripheral neuropathy resulting from lead exposure characteristically involves only motor function with minimal sensory damage and has a marked predilection for the extensor muscles of the most active extremity. The peripheral neuropathy can occur with varying degrees of severity. The earliest and mildest form which can be detected in workers with blood lead levels as low as 50 μg/dl is manifested by slowing of motor nerve conduction velocity often without clinical symptoms. With progression of the neuropathy there is development of painless extensor muscle weakness usually involving the extensor muscles of the fingers and hand in the most active upper extremity, followed in severe cases by wrist drop or, much less commonly, foot drop.

   In addition to slowing of nerve conduction, electromyographical studies in patients with blood lead levels greater than 50 μg/dl have demonstrated a decrease in the number of acting motor unit potentials, an increase in the duration of motor unit potentials, and spontaneous pathological activity including fibrillations and fasciculations. Whether these effects occur at levels of 40 μg/dl is undetermined.

   While the peripheral neuropathies can occasionally be reversed with therapy, again such recovery is not assured particularly in the more

severe neuropathies and often improvement is only partial. The lack of reversibility is felt to be due in part to segmental demyelination.

3. **Gastrointestinal**. Lead may also affect the gastrointestinal system producing abdominal colic or diffuse abdominal pain, constipation, obstipation, diarrhea, anorexia, nausea and vomiting. Lead colic rarely develops at blood lead levels below 80 μg/dl.

4. **Renal**. Renal toxicity represents one of the most serious health effects of lead poisoning. In the early stages of disease nuclear inclusion bodies can frequently be identified in proximal renal tubular cells. Renal function remains normal and the changes in this stage are probably reversible. With more advanced disease there is progressive interstitial fibrosis and impaired renal function. Eventually extensive interstitial fibrosis ensues with sclerotic glomeruli and dilated and atrophied proximal tubules; all represent end-stage kidney disease. Azotemia can be progressive, eventually resulting in frank uremia necessitating dialysis. There is occasionally associated hypertension and hyperuricemia with or without gout.

   Early kidney disease is difficult to detect. The urinalysis is normal in early lead nephropathy and the blood urea nitrogen and serum creatinine increase only when two-thirds of kidney function is lost. Measurement of creatinine clearance can often detect earlier disease as can other methods of measurement of glomerular filtration rate. An abnormal Ca-EDTA mobilization test has been used to differentiate between lead-induced and other nephropathies, but this procedure is not widely accepted. A form of Fanconi syndrome with aminoaciduria, glycosuria, and hyperphosphaturia indicating severe injury to the proximal renal tubules is occasionally seen in children.

5. **Reproductive effects**. Exposure to lead can have serious effects on reproductive function in both males and females. In male workers exposed to lead there can be a decrease in sexual drive, impotence, decreased ability to produce healthy sperm, and sterility. Malformed sperm (teratospermia), decreased number of sperm (hypospermia), and sperm with decreased motility (asthenospermia) can all occur. Teratospermia has been noted at mean blood lead levels of 53 μg/dl and hypospermia and asthenospermia at 41 μg/dl. Furthermore, there appears to be a dose–response relationship for teratospermia in lead exposed workers.

   Women exposed to lead may experience menstrual disturbances including dysmenorrhea, menorrhagia and amenorrhea. Following exposure to lead, women have a higher frequency of sterility, premature births, spontaneous miscarriages, and stillbirths.

   Germ cells can be affected by lead and cause genetic damage in the egg or sperm cells before conception and result in failure to implant, miscarriage, stillbirth, or birth defects.

   Infants of mothers with lead poisoning have a higher mortality during the first year and suffer from lowered birth weights, slower growth, and nervous system disorders.

   Lead can pass through the placental barrier and lead levels in the mother's blood are comparable to concentrations of lead in the umbilical cord at birth. Transplacental passage becomes detectable at 12 to 14 weeks of gestation and increases until birth.

   There is little direct data on damage to the fetus from exposure to lead but it is generally assumed that the fetus and newborn would be at least as susceptible to neurological damage as young children. Blood lead levels of 50 to 60 μg/dl in children can cause significant neurobehavioral impairments and there is evidence of hyperactivity at blood levels as low as 25 μg/dl. Given the overall body of literature concerning the adverse health effects of lead in children, OSHA feels that the blood lead level in children should be maintained below 30 μg/dl with a population mean of 15 μg/dl. Blood lead levels in the fetus and newborn likewise should not exceed 30 μg/dl.

   Because of lead's ability to pass through the placental barrier and also because of the demonstrated adverse effects of lead on reproductive function in both the male and female as well as the risk of genetic damage of lead on both the ovum and sperm, OSHA recommends a 30 μg/dl maximum permissible blood lead level in both males and females who wish to bear children.

6. **Other toxic effects**. Debate and research continue on the effects of lead on the human body. Hypertension has frequently been noted in occupationally exposed individuals although it is difficult to assess whether this is due to lead's adverse effects on the kidney or if some other mechanism is involved. Vascular and electrocardiographic changes have been detected but have not been well characterized. Lead is thought to impair thyroid function and interfere with the pituitary-adrenal axis, but again these effects have not been well defined.

III. Medical Evaluation

The most important principle in evaluating a worker for any occupational disease including lead poisoning is a high index of suspicion on the part of

the examining physician. As discussed in Section 2, lead can affect numerous organ systems and produce a wide array of signs and symptoms, most of which are non-specific and subtle in nature at least in the early stages of disease. Unless serious concern for lead toxicity is present, many of the early clues to diagnosis may easily be overlooked.

The crucial initial step in the medical evaluation is recognizing that a worker's employment can result in exposure to lead. The worker will frequently be able to define exposures to lead and lead containing materials but often will not volunteer this information unless specifically asked. In other situations the worker may not know of any exposures to lead but the suspicion might be raised on the part of the physician because of the industry or occupation of the worker. Potential occupational exposure to lead and its compounds occur in many occupations in the construction industry, including demolition and salvaging operations, removal or encapsulation of materials containing lead, construction, alteration, repair or renovation of structures containing lead, transportation, disposal, storage or containment of lead or lead-containing materials on construction sites, and maintenance operations associated with construction activities.

Once the possibility for lead exposure is raised, the focus can then be directed toward eliciting information from the medical history, physical exam, and finally from laboratory data to evaluate the worker for potential lead toxicity.

A complete and detailed work history is important in the initial evaluation. A listing of all previous employment with information on job description, exposure to fumes or dust, known exposures to lead or other toxic substances, a description of any personal protective equipment used, and previous medical surveillance should all be included in the worker's record. Where exposure to lead is suspected, information concerning on-the-job personal hygiene, smoking or eating habits in work areas, laundry procedures, and use of any protective clothing or respiratory protection equipment should be noted. A complete work history is essential in the medical evaluation of a worker with suspected lead toxicity, especially when long term effects such as neurotoxicity and nephrotoxicity are considered.

The medical history is also of fundamental importance and should include a listing of all past and current medical conditions, current medications including proprietary drug intake, previous surgeries and hospitalizations, allergies, smoking history, alcohol consumption, and also non-occupational lead exposures such as hobbies (hunting, riflery). Also known childhood exposures should be elicited. Any previous history of hematological, neurological, gastrointestinal, renal, psychological, gynecological, genetic, or reproductive problems should be specifically noted.

A careful and complete review of systems must be performed to assess both recognized complaints and subtle or slowly acquired symptoms which the worker might not appreciate as being significant. The review of symptoms should include the following:

1. General—weight loss, fatigue, decreased appetite.

2. Head, Eyes, Ears, Nose, Throat (HEENT)—headaches, visual disturbances or decreased visual acuity, hearing deficits or tinnitus, pigmentation of the oral mucosa, or metallic taste in mouth.

3. Cardio-pulmonary—shortness of breath, cough, chest pains, palpitations, or orthopnea.

4. Gastrointestinal—nausea, vomiting, heartburn, abdominal pain, constipation or diarrhea.

5. Neurological—irritability, insomnia, weakness (fatigue), dizziness, loss of memory, confusion, hallucinations, incoordination, ataxia, decreased strength in hands or feet, disturbances in gait, difficulty in climbing stairs, or seizures.

6. Hematological—pallor, easy fatigability, abnormal blood loss, melena.

7. Reproductive (male and female and spouse where relevant)—history of infertility, impotence, loss of libido, abnormal menstrual periods, history of miscarriages, stillbirths, or children with birth defects.

8. Musculo-skeletal—muscle and joint pains.

The physical examination should emphasize the neurological, gastrointestinal, and cardiovascular systems. The worker's weight and blood pressure should be recorded and the oral mucosa checked for pigmentation characteristic of a possible Burtonian or lead line on the gingiva. It should be noted, however, that the lead line may not be present even in severe lead poisoning if good oral hygiene is practiced.

The presence of pallor on skin examination may indicate an anemia which, if severe, might also be associated with a tachycardia. If an anemia is suspected, an active search for blood loss should be undertaken including potential blood loss through the gastrointestinal tract.

A complete neurological examination should include an adequate mental status evaluation including a search for behavioral and psychological disturbances, memory testing, evaluation for irritability, insomnia, hallucinations, and mental clouding. Gait and coordination should be examined along with close observation for tremor. A detailed evaluation of peripheral nerve function including careful sensory and motor function testing is warranted. Strength

testing particularly of extensor muscle groups of all extremities is of fundamental importance.

Cranial nerve evaluation should also be included in the routine examination.

The abdominal examination should include auscultation for bowel sounds and abdominal bruits and palpation for organomegaly, masses, and diffuse abdominal tenderness.

Cardiovascular examination should evaluate possible early signs of congestive heart failure. Pulmonary status should be addressed particularly if respirator protection is contemplated.

As part of the medical evaluation, the interim lead standard requires the following laboratory studies:

1. Blood lead level
2. Hemoglobin and hematocrit determinations, red cell indices, and examination of the peripheral blood smear to evaluate red blood cell morphology
3. Blood urea nitrogen
4. Serum creatinine
5. Routine urinalysis with microscopic examination
6. A zinc protoporphyrin level.

In addition to the above, the physician is authorized to order any further laboratory or other tests which he or she deems necessary in accordance with sound medical practice. The evaluation must also include pregnancy testing or laboratory evaluation of male fertility if requested by the employee. Additional tests which are probably not warranted on a routine basis but may be appropriate when blood lead and ZPP levels are equivocal include delta aminolevulinic acid and coproporphyrin concentrations in the urine, and dark-field illumination for detection of basophilic stippling in red blood cells.

If an anemia is detected further studies including a careful examination of the peripheral smear, reticulocyte count, stool for occult blood, serum iron, total iron binding capacity, bilirubin, and, if appropriate, vitamin B12 and folate may be of value in attempting to identify the cause of the anemia.

If a peripheral neuropathy is suspected, nerve conduction studies are warranted both for diagnosis and as a basis to monitor any therapy.

If renal disease is questioned, a 24-hour urine collection for creatinine clearance, protein, and electrolytes may be indicated. Elevated uric acid levels may result from lead-induced renal disease and a serum uric acid level might be performed.

An electrocardiogram and chest x-ray may be obtained as deemed appropriate.

Sophisticated and highly specialized testing should not be done routinely and where indicated should be under the direction of a specialist.

IV. Laboratory Evaluation

The blood lead level at present remains the single most important test to monitor lead exposure and is the test used in the medical surveillance program under the lead standard to guide employee medical removal. The ZPP has several advantages over the blood lead level. Because of its relatively recent development and the lack of extensive data concerning its interpretation, the ZPP currently remains an ancillary test.

This section will discuss the blood lead level and ZPP in detail and will outline their relative advantages and disadvantages. Other blood tests currently available to evaluate lead exposure will also be reviewed.

The blood lead level is a good index of current or recent lead absorption when there is no anemia present and when the worker has not taken any chelating agents. However, blood lead levels along with urinary lead levels do not necessarily indicate the total body burden of lead and are not adequate measures of past exposure. One reason for this is that lead has a high affinity for bone and up to 90% of the body's total lead is deposited there. A very important component of the total lead body burden is lead in soft tissue (liver, kidney, and brain). This fraction of the lead body burden, the biologically active lead, is not entirely reflected by blood lead levels since it is a function of the dynamics of lead absorption, distribution, deposition in bone and excretion. Following discontinuation of exposure to lead, the excess body burden is only slowly mobilized from bone and other relatively stable body stores and excreted. Consequently, a high blood lead level may only represent recent heavy exposure to lead without a significant total body excess and likewise a low blood lead level does not exclude an elevated total body burden of lead.

Also due to its correlation with recent exposures, the blood lead level may vary considerably over short time intervals.

To minimize laboratory error and erroneous results due to contamination, blood specimens must be carefully collected after thorough cleaning of the skin with appropriate methods using lead-free blood containers and analyzed by a reliable laboratory. Under the standard, samples must be analyzed in laboratories which are approved by OSHA. Analysis is to be made using atomic absorption spectrophotometry, anodic stripping voltammetry

or any method which meets the accuracy requirements set forth by the standard.

The determination of lead in urine is generally considered a less reliable monitoring technique than analysis of whole blood primarily due to individual variability in urinary excretion capacity as well as the technical difficulty of obtaining accurate 24-hour urine collections. In addition, workers with renal insufficiency, whether due to lead or some other cause, may have decreased lead clearance and consequently urine lead levels may underestimate the true lead burden. Therefore, urine lead levels should not be used as a routine test.

The zinc protoporphyrin test, unlike the blood lead determination, measures an adverse metabolic effect of lead and as such is a better indicator of lead toxicity than the level of blood lead itself. The level of ZPP reflects lead absorption over the preceding 3 to 4 months, and therefore is a better indicator of lead body burden. The ZPP requires more time than the blood lead to read significantly elevated levels; the return to normal after discontinuing lead exposure is also slower. Furthermore, the ZPP test is simpler, faster, and less expensive to perform and no contamination is possible. Many investigators believe it is the most reliable means of monitoring chronic lead absorption.

Zinc protoporphyrin results from the inhibition of the enzyme ferrochelatase which catalyzes the insertion of an iron molecule into the protoporphyrin molecule, which then becomes heme. If iron is not inserted into the molecule then zinc, having a greater affinity for protoporphyrin, takes the place of the iron, forming ZPP.

An elevation in the level of circulating ZPP may occur at blood lead levels as low as 20 to 30 μg/dl in some workers. Once the blood lead level has reached 40 μg/dl there is more marked rise in the ZPP value from its normal range of less than 100 μg/dl. Increases in blood lead levels beyond 40 μg/dl are associated with exponential increases in ZPP.

Whereas blood lead levels fluctuate over short time spans, ZPP levels remain relatively stable. ZPP is measured directly in red blood cells and is present for the cell's entire 120-day life span. Therefore, the ZPP level in blood reflects the average ZPP production over the previous 3 to 4 months and consequently the average lead exposure during that time interval.

It is recommended that a hematocrit be determined whenever a confirmed ZPP of 50 μg/dl whole blood is obtained to rule out a significant underlying anemia. If the ZPP is in excess of 100 μg/dl and not associated with abnormal elevations in blood lead levels, the laboratory should be checked to be sure that blood leads were determined using atomic absorption spectrophotometry anodic stripping voltammetry, or any method which meets the accuracy requirements set forth by the standard by an OSHA approved laboratory which is experienced in lead level determinations. Repeat periodic blood lead studies should be obtained in all individuals with elevated ZPP levels to be certain that an associated elevated blood lead level has not been missed due to transient fluctuations in blood leads.

ZPP has a characteristic fluorescence spectrum with a peak at 594 nm which is detectable with a hematofluorometer. The hematofluorometer is accurate and portable and can provide on-site, instantaneous results for workers who can be frequently tested via a finger prick.

However, careful attention must be given to calibration and quality control procedures. Limited data on blood lead–ZPP correlations and the ZPP levels which are associated with the adverse health effects discussed in Section 2 are the major limitations of the test. Also it is difficult to correlate ZPP levels with environmental exposure and there is some variation of response with age and sex. Nevertheless, the ZPP promises to be an important diagnostic test for the early detection of lead toxicity and its value will increase as more data is collected regarding its relationship to other manifestations of lead poisoning.

Levels of delta-aminolevulinic acid (ALA) in the urine are also used as a measure of lead exposure. Increasing concentrations of ALA are believed to result from the inhibition of the enzyme delta-aminolevulinic acid dehydrase (ALA-D). Although the test is relatively easy to perform, inexpensive, and rapid, the disadvantages include variability in results, the necessity to collect a complete 24-hour urine sample which has a specific gravity greater than 1.010, and also the fact that ALA decomposes in the presence of light.

The pattern of porphyrin excretion in the urine can also be helpful in identifying lead intoxication. With lead poisoning, the urine concentrations of coproporphyrins I and II, porphobilinogen and uroporphyrin I rise. The most important increase, however, is that of coproporphyrin III; levels may exceed 5,000 μg/l in the urine in lead poisoned individuals, but its correlation with blood lead levels and ZPP are not as good as those of ALA. Increases in urinary porphyrins are not diagnostic of lead toxicity and may be seen in porphyria, some liver diseases, and in patients with high reticulocyte counts.

Summary. The standard for inorganic lead in the construction industry places significant emphasis on the medical surveillance of all workers exposed to levels of inorganic lead above 30 μg/m^3 TWA. The physician has a fundamental role in this surveillance program, and in the operation of the medical removal protection program.

Even with adequate worker education on the adverse health effects of lead and appropriate training in work practices, personal hygiene and other control measures, the physician has a primary responsibility for evaluating potential lead toxicity in the worker. It is only through a careful and detailed medical and work history, a complete physical examination and appropriate laboratory testing that an accurate assessment can be made. Many of the adverse health effects of lead toxicity are either irreversible or only partially reversible and therefore early detection of disease is very important.

This document outlines the medical monitoring program as defined by the occupational safety and health standard for inorganic lead. It reviews the adverse health effects of lead poisoning and describes the important elements of the history and physical examinations as they relate to these adverse effects. Finally, the appropriate laboratory testing for evaluating lead exposure and toxicity is presented.

It is hoped that this review and discussion will give the physician a better understanding of the OSHA standard with the ultimate goal of protecting the health and well-being of the worker exposed to lead under his or her care.