Landfill Clean Closure Certification Report

Corporation Yard Landfill, Folsom, CA

November 4, 2009

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	– Well Abandonment Permits	Electronic (.pdf)
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Appendix B.	Health and Safety Documentation	
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	– Fact Sheets	Hardcopy
	– Public Notices	Hardcopy
	– Project Website Screen Shots	Hardcopy
	– Air Monitoring Website Shots	Hardcopy
	– Perimeter Signs	Hardcopy
Appendix D.	Regulatory Agency Correspondence	Electronic (.pdf)
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Appendix F.	Transportation Manifests and Landfill Disposal Receipts	
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	– Metals Results	Hardcopy
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ACRONYMS AND ABBREVIATIONS

AHERA	Asbestos Hazard Emergency Response Act
BaPeq	benzo(a)pyrene equivalent
BC	Brown and Caldwell
BCL	background concentration limit
BMPs	best management practices, storm water
CAM 17	17 total metals listed in Title 22 California Administrative Manual
CEQA	California Environmental Quality Act
CHHSL	California Human Health Screening Level
CIH	Certified Industrial Hygienist
City	City of Folsom
CIWMB	California Integrated Waste Management Board
County	County of Sacramento
CQA	construction quality assurance
CSM	conceptual site model
CV	coefficient of variation
DRO	diesel range organics
DTSC	California Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
ft^2	square feet
GRO	gasoline range organics
HASP	Health and Safety Plan
L/min	liters per minute
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LEA	Local Enforcement Agency
LEL	lower explosive limit
MCE	mixed cellulose ester
MCL	Maximum Contaminant Level
MCPA	2,4-D, 2-methyl-4-chlorophenoxyacetic acid
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MLF	Main Landfill Area
mph	miles per hour
MRO	motor oil range organics
MS	matrix spike
MSD	matrix spike duplicate
NIOSH	National Institute for Occupational Safety and Health

ACRONYMS AND ABBREVIATIONS (continued)

PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PM_{10}	particulate matter with a diameter less than 10 micrometers
ppmv	parts per million by volume
PRGs	EPA Preliminary Remediation Goals
RPD	relative percent difference
RWQCB	California Regional Water Quality Control Board, Central Valley Region
Site	Folsom Corporation Yard Landfill, 1300 Leidesdorff Street, Folsom, CA
SMAQMD	Sacramento Metropolitan Air Quality Management District
STLC	Soluble Threshold Limit Concentration
SVOCs	semi-volatile organic compounds
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
TPH	total petroleum hydrocarbons
TTLC	Total Threshold Limit Concentration
UFA	Uncontrolled Fill Area
$\mu g/m^3$	micrograms per cubic meter
µmhos/cm	micromhos per centimeter
VOCs	volatile organic compounds
WDRs	Waste Discharge Requirements
WET	California Waste Extraction Test
XRF	X-ray fluorescence
yd^3	cubic yards

1.0 INTRODUCTION

The City of Folsom Utilities Department (City) has completed clean closure of the Corporation Yard Landfill located at 1300 Leidesdorff Street, Folsom, California (Site). Clean closure of the landfill allows for future unrestricted use of the property by removing all waste and waste residuals, including any impacted soil. Clean closure was also undertaken as a corrective action measure to address impacts to shallow groundwater beneath the landfill by removing potential groundwater contamination sources.

Clean closure construction activities were conducted from October 2008 through September 2009 with a hiatus during the winter rainy season. Field activities consisted of excavating more than 70,000 cubic yards (yd^3) of material consisting of the landfill cap, fill, former wastewater lagoon liner, and any contaminated soils underlying the landfill. Approximately 92% of the fill material was composed of soil and cobbles with the remainder consisting of construction and demolition debris, green waste, street litter, and other waste from City municipal activities. Mechanical and manual methods were used to segregate concrete, asphalt, metal, tires, and refuse from the soil and cobbles for off-site recycling or disposal. Segregated soil was chemically tested and compared to regulatory-approved cleanup goals to determine if the soil was suitable for backfill on-site or if the soil had to be disposed off-site at an appropriate facility. Confirmation testing was performed at the bottom of the excavation and the analytical results were compared to the cleanup goals to confirm that impacted soil had been removed prior to backfilling. Mitigation measures conducted during the construction activities included air monitoring, dust suppression, and protection of habitat. Final field activity consisted of final grading and implementing storm water best management practices (BMPs) including hydro-seeding the Site with grass to stabilize it and prevent erosion during winter storms.

This document presents a detailed description of the various project activities, including field activities required to achieve clean closure. In addition, it provides the required documentation relating to construction activities, waste characterization, transportation, and disposal necessary for the City to certify completion of clean closure of the Site.

The remainder of this introductory section describes background information on the clean closure project: Site location, features, and history; project objectives, approach, and team; regulatory agencies and permitting; Site characterization; target parameters; and cleanup goals. Section 2 provides the construction quality assurance (CQA) report which describes key CQA aspects of the project: health and safety; public participation; regulatory agency participation; and CQA measures. Sections 3 and 4 describe how waste was excavated, segregated, stockpiled, characterized, and disposed/recycled. Results of confirmation sampling at the bottom of the excavation are presented in Section 5 and results

of air monitoring conducted during the construction activities are presented in Section 6. Section 7 describes the data quality review for both soil and air data. Section 8 describes Site restoration and post-closure land use and the report concludes with a certification of clean closure. An annotated list of references is provided in Section 9.

1.1 Site Location and Features

The City Corporation Yard is an 18-acre property located adjacent to Lake Natoma at the western terminus of Leidesdorff Street in the Folsom Historic District as shown in Figure 1-1. In October 2008 at the beginning of clean closure, the Site was a capped landfill that occupied approximately 4 acres of the lower half of the Corporation Yard property as shown in Figure 1-2. The northern portion of the landfill featured an asphalt parking lot for City employees. The Folsom Lake State Recreation Area and East Lake Natoma Multi-purpose Trail borders the Site to the west and north. The Folsom Veterans Hall and Lake Natoma Shores residential development borders the Site to the east and south. Prior to clean closure, eight groundwater monitoring wells (FCY-2 through FCY-9) and six landfill gas monitoring wells (GAS-1 through GAS-6) were used to monitor the capped landfill. Now that clean closure is complete, the Site has been graded for drainage and hydro-seeded with grass.

1.2 Site History

Site history is presented in detail in the *Final Amended Report of Waste Discharge / Clean Closure Work Plan* (Clean Closure Work Plan, Brown and Caldwell, 2008k) and summarized in this section. Historical aerial photographs are provided in Figure 1-3. During the late 1800s to early 1900s, the general area of the Site was dredged for gold. The dredge tailings at the Site and surrounding area are shown in the 1952 aerial. In the 1950s, the City constructed a domestic sewage treatment plant and operated it through the 1970s (refer to the 1952, 1961, and 1971 aerials). A photograph (*circa* 1973) of the former aeration and settling ponds associated with the sewage treatment plant is provided in Figure 1-4. In 1974, the City began using the former ponds associated with the sewage treatment plant as a landfill (refer to the 1981 aerial). The City discharged primarily non-municipal solid-waste including construction and demolition debris, green waste, and street litter. In 1978, the landfill was permitted as a Class III sanitary landfill and continued to operate until 1986. Plan and section drawings of the inactive landfill in 1986 are provided in Figure 1-5. Illegal dumping of municipal waste by unknown parties south of the landfill also occurred – with this area being designated as the “uncontrolled fill area” shown in Figure 1-6. In 1996 after ten years of inactivity, a cap was installed on the landfill as part of the regulatory closure plan required by the California Regional Water Quality Control Board, Central Valley Region (RWQCB). From 1996 to the beginning of clean closure in October 2008, the City maintained the landfill cap and conducted post-closure monitoring of landfill gas and groundwater and

submitted semi-annual and annual monitoring reports as required by the RWQCB.

1.3 Project Objectives

There were three primary objectives for the clean closure project:

1) Conduct the clean closure (removal of the waste) in a manner that protects human health, the environment, and provides for future unrestricted use of the property;
2) Involve and engage regulatory and neighboring agencies and the public in both the planning and execution phases of the project; and
3) Obtain written concurrence from the appropriate regulatory agencies that clean closure has been accomplished and the Site is suitable for future unrestricted land use.

1.4 Project Approach

The City's approach to achieving the project objectives involved an extensive outreach program to both the public and regulatory agencies. To ensure that the cleanup criteria and goals were comprehensive, addressed agency concerns, and were appropriate to achieve the objectives, the City engaged a variety of regulatory agencies in development and review of the goals and approach. These agencies, their authority and objectives are delineated in Section 1.5. The clean closure project involved the following general tasks:

- Completing the CEQA process including evaluating environmental effects resulting from the project, avoiding or mitigating effects where possible, and notifying regulatory agencies and the public;
- Preparing a Clean Closure Work Plan for regulatory review and approval;
- Obtaining revised Waste Discharge Requirements (WDRs) and regulatory agency approval prior to commencing clean closure activities;
- Preparing bid documents (*e.g.*, design drawings and specifications) and contracting;
- Conducting clean closure field activities (*e.g.*, waste excavation/ segregation/disposal, confirmation sampling, final grading, hydro-seeding);
- Preparing a Landfill Clean Closure Certification Report documenting the completion of clean closure activities; and
- Obtaining regulatory agency concurrence of clean closure completion and suitability for future unrestricted land use.

1.5 Project Team

The following table outlines the key members of the project team and their affiliation.

Project Team Key Members		
Project Role	**Individual(s)**	**Organization**
Owner	Walt Sadler, PE / Annette Borges	City of Folsom
Regulator	Todd Del Frate / John Moody Jacque Kelley / Wendy Wyels	RWQCB
	Frank Davies, Jr.	CIWMB
	Patrice Webb / Lisa Todd	Sacramento County
	Maria Gillette	DTSC
	Joseph Hurley / John Angi	SMAQMD
Project Manager	Guy Graening, PE	Brown and Caldwell
Engineer / CQA Manager	Amanda Morrow, PE	Brown and Caldwell
Health and Safety Officer	Jim Bucha, CIH	Brown and Caldwell
Public Participation Specialist	Jennifer Tencati	CirclePoint
Construction Contractor	Dennis Robinson, PhD, CIH Feliciano Cardenas	Pacific States Environmental Corp.
Hazardous Material Specialist	Michelle Walker	City of Folsom
Bio./Cultural Resources Specialist Air Monitoring Specialist	G. O. Graening, PhD	Natural Investigations

1.6 Regulatory Agencies and Permitting

Agencies with regulatory oversight and approval for the clean closure activities consisted of:

- RWQCB;
- California Integrated Waste Management Board (CIWMB);
- County of Sacramento Environmental Management Department (County) acting as the Local Enforcement Agency (LEA);
- California Department of Toxic Substances Control (DTSC); and
- Sacramento Metropolitan Air Quality Management District (SMAQMD).

Agencies that own and manage land to the west and north of the Site (*i.e.*, the Folsom Lake State Recreation Area) consist of:

- U.S. Bureau of Reclamation; and
- California Department of Parks and Recreation.

1.6.1 CEQA Requirements

In November 2007, the City began the California Environmental Quality Act (CEQA) by informing the various regulatory and neighboring agencies of its intent to clean close the landfill. Clean closure was described as removal of the waste from the Site, as it had previously been closed by virtue of the landfill being capped. In January 2008 to begin the clean closure planning process, the City as lead agency prepared the *Folsom Corporation Yard Clean Closure Project Initial Study* (Initial Study; Natural Investigations Co., 2008), and provided a 45-day comment period. The Initial Study concluded that the project would not have a significant effect on the environment after the incorporation of mitigation measures, and would provide long term environmental benefits by virtue of the waste being removed. The Initial Study was provided to regulatory agencies and

the public for review and comment. By Resolution No. 8237, the City Council on February 26, 2008 adopted a Mitigated Negative Declaration which included mitigation monitoring and reporting.

1.6.2 RWQCB Waste Discharge Requirements Order

In February 2008, the City prepared the *Draft Final Amended Report of Waste Discharge / Clean Closure Work Plan* (Brown and Caldwell, 2008g) for regulatory agency review and comment. The *Final Amended Report of Waste Discharge / Clean Closure Work Plan* (Brown and Caldwell, 2008k) that incorporated regulatory agency comments was finalized and submitted to the various regulatory agencies in May 2008. Approval of the Clean Closure Work Plan was subsequently received from each agency. Using the information in the combined document, the RWQCB prepared the *Tentative Revised Waste Discharge Requirements for Clean Closure of Folsom Corporation Yard Landfill* (RWQCB, 2008d) and issued it for public review and comment in May 2008.

On July 31, 2008, after a public hearing, the RWQCB adopted the *Updated Waste Discharge Requirements Order No. R5-2008-0106* (Updated WDRs; RWQCB, 2008e), which are included in Appendix A. This action was necessary to allow clean closure activities to proceed, as the WDRs contained the cleanup goals, schedule, financial assurance requirements, and monitoring requirements. During the course of construction, RWQCB staff conducted periodic inspections to verify that the clean closure project was being conducted in accordance with the Updated WDRs, and that the storm water BMPs were in place.

1.6.3 CIWMB/LEA Clean Closure Advisory

Requirements for how to conduct clean closure activities are specified by the State Water Resources Control Board (SWRCB) and CIWMB in Title 27 of the California Code of Regulations (27 CCR) §21090(f) and §21810 and the *LEA Clean Closure Advisory* (CIWMB, 1994). Both the CIWMB and the County, acting as the LEA, conducted periodic inspections to verify that the clean closure activities were being conducted according to the LEA Clean Closure Advisory. The Advisory is included in Appendix A.

1.6.4 County Well Abandonment Permits

The County required abandonment permits for the removal of the landfill gas monitoring wells (GAS-1 through GAS-6) and groundwater monitoring well FCY-9 that were located in the excavation footprint. The well abandonment permits are included in Appendix A. A County inspector was present during well abandonment.

1.6.5 DTSC Voluntary Cleanup Program

To address the City's objective of achieving future unrestricted use of the property once clean closure was finished, the City entered into a Technical Consultation Agreement (Agreement) with DTSC. The intent of the Agreement was for DTSC to provide technical consultation to the City in the form of review

and comment on the clean closure documents and provision of a final letter of concurrence that no further action is necessary for the protection of public health and environment, and that the Site is suitable for future unrestricted use. This was accomplished through California's Voluntary Cleanup Program, which enables DTSC to become involved in project review. The DTSC was an active consultant during clean closure construction as they conducted periodic inspections and reviewed project documents, chemical data results, and correspondence as part of the Agreement.

1.6.6 SMAQMD Asbestos Permit

The waste in the landfill included some transite pipe (*i.e.*, cement pipe containing asbestos) most likely originating from City sewer maintenance projects. SMAQMD required a permit for demolition activities that involved handling over 260 linear feet of transite pipe. The asbestos permit is included in Appendix A. Information on the identification, handling, and disposal of the transite pipe is provided in Section 3.2.3 and Section 4.2 of this document. The SMAQMD conducted periodic inspections to verify that the clean closure project was being conducted according to the permit requirements.

1.7 Site Characterization

Site characterization is presented in detail in the Clean Closure Work Plan and summarized in this section. From December 1985 through July 2008, the City conducted the following investigation and monitoring activities:

- Drilled 12 exploratory borings;
- Installed 11 temporary landfill gas test probes;
- Installed nine groundwater wells for periodic monitoring;
- Installed six landfill gas wells for periodic monitoring;
- Excavated 43 exploratory test pits; and
- Collected over 200 groundwater samples, 150 landfill gas samples, and 20 background soil samples for analysis.

The locations of investigation borings, landfill gas test probes, monitoring wells, test pits, and background soil sampling are shown on Figure 1-6. The Site characterization information was used to delineate the nature and extent of waste, develop accurate volume estimates for design/bidding, and to develop a conceptual site model (CSM).

1.7.1 Conceptual Site Model

Using the results of the detailed Site characterization and groundwater monitoring, a CSM of the regional and Site stratigraphy/hydrogeology was developed. The CSM is presented in detail in the Clean Closure Work Plan. Dredge tailings from historical mining activities underlie the Site. The tailings layer is about 10 feet think under the landfill and is a mixture of disturbed river

alluvium, Quaternary Laguna and, to a lesser extent, Tertiary Mehrten deposits, including unconsolidated cobble, gravel, and sand. An upper water-bearing zone is in the dredge tailings layer, perched on the underlying Mehrten formation. The depth to this shallow groundwater in the landfill area generally ranges from about 20 to 26 feet below ground surface and groundwater was not encountered during excavation.

1.7.2 Landfill Cap

In July 1996, the landfill cap was constructed that consists of three layers totaling approximately 4 feet:

- 12-inch vegetative soil layer;
- 12-inch clay layer; and
- 24-inch foundation layer.

The northern portion of the landfill cap featured a 180-foot by 240-foot parking lot for City employee parking. The landfill cap in this area consisted of four layers totaling approximately 4 feet:

- 2.5-inch asphalt concrete;
- 10-inch aggregate base rock;
- 12-inch clay layer; and
- 24-inch foundation layer.

1.7.3 Nature and Extent of Waste

The nature and extent of waste was characterized based on the investigation results. Cross sections of the landfill are provided in Figures 1-7 and 1-8. The landfill can be divided into two basic areas: the Main Landfill Area (MLF) and the Uncontrolled Fill Area (UFA).

- <u>Main Landfill Area</u>: the nature of the fill in this area generally consisted of soil with some concrete, asphalt, green waste, metal, and refuse. The fill was underlain by what appeared to be a clay liner covering a plastic liner associated with the former sewage treatment plant ponds. The clay pond liner appeared to have been disturbed and mixed with debris fill in some locations. The historical photograph in Figure 1-4 indicated a roadway through the center of the former ponds; however, a distinct separation between the former ponds was not identified during the investigations.

  The extent of fill is shown in Figure 1-6 and was estimated at 140,000 square feet (ft^2; 3.2 acres). The maximum depth of fill was approximately 12 to 16 feet below grade (*i.e.*, the top of the cap). The cap was approximately 4 feet thick; therefore, the fill layer was approximately 8 to 12 feet thick. Assuming the fill layer had a uniform thickness of 8 feet throughout the fill area, the approximate *in situ* fill volume was estimated

at 42,000 yd^3. The approximate *in situ* volume of the cap materials was estimated at 21,000 yd^3.

- Uncontrolled Fill Area: the nature of fill in this area generally consisted of soil with some household waste such as newspaper, carpet, plastic bags, clothing, and tires. The fill in this area was less dense and more variable than the fill in the Main Landfill Area.

  The extent of fill is shown in Figure 1-6 and was estimated at 50,000 ft^2 (1.1 acres). The maximum depth of fill was approximately 4 to 8 feet below grade. Assuming the fill depth was uniform at an average of 6 feet throughout the fill area, the approximate *in situ* fill volume was estimated at 11,000 yd^3.

The total *in situ* volume of material associated with the cap and waste in both the Main Landfill Area and the Uncontrolled Fill Area was estimated at approximately 74,000 yd^3. Assuming 30% expansion upon excavation, the total *ex situ* volume of all excavated materials was estimated at approximately 96,000 yd^3.

1.8 Target Parameters

Target parameters in groundwater, soil, and ambient air were evaluated during clean closure activities were identified based on Site characterization information and are summarized in the following sections.

1.8.1 Groundwater

Former use of the Site for sewage treatment plant ponds and subsequently for the Corporation Yard landfill appears to have impacted Site groundwater and several water quality parameters are currently above primary or secondary California Maximum Contaminant Levels (MCLs) in one or more Site wells:

- Metals (primarily arsenic and iron);
- Nitrate;
- Sulfate;
- Specific conductance; and
- Total dissolved solids (TDS).

The Updated WDRs required that groundwater monitoring be conducted during and after the clean closure field activities to document the effectiveness of clean closure as a corrective action. Results for the groundwater monitoring conducted in December 2008 and June 2009 during the clean closure were reported in annual and semi-annual monitoring reports (Brown and Caldwell, 2008d, 2009b). The results of the groundwater monitoring following clean closure will be reported in future monitoring reports to be provided to the RWQCB.

1.8.2 Soil

The landfill waste and former landfill sewage treatment plant pond liner was targeted for removal during the clean closure project. The Clean Closure Work Plan identified the following target parameters in soil primarily based on elevated groundwater parameters:

- Metals;
- Soluble nitrate; and
- Soluble sulfate.

Cleanup goals were established for these target parameters as described in Section 1.9.

1.8.3 Ambient Air

The waste in the Corporation Yard landfill contained some decomposable green waste (*e.g.*, tree stumps/branches, lumber) and methane has historically been detected at low concentrations or not detected at all in semi-annual monitoring of the gas wells. Waste containing volatile organic compounds (VOCs) was not anticipated to be present in the landfill based on previous investigations. In addition, the waste was not expected to generate hydrogen sulfide. However, monitoring for landfill gases such as methane, total VOCs, and hydrogen sulfide at landfills is a standard health and safety precaution for on-site workers. General construction activities such as excavation and grading have the potential to temporarily increase airborne concentrations of dust.

Target parameters in soil (primarily metals) had the potential to become disturbed during construction and temporarily become suspended in air. According to U.S. Geological Survey maps, no naturally occurring asbestos is present within a mile of the Site; however, old landfills have the potential to contain asbestos containing building materials. The Clean Closure Work Plan identified the following target parameters in ambient air:

- Methane;
- Total VOCs;
- Hydrogen Sulfide;
- Dust;
- Metals; and
- Asbestos.

These target parameters were incorporated into the air monitoring described in Section 6.0.

1.9 Cleanup Goals

Cleanup goals were developed for the project to determine if soil excavated from the landfill and segregated from waste was suitable for backfill on-site or if it must be disposed off-site. In addition, cleanup goals were used to confirm that all impacted soil beneath the waste was removed. Because one of the project goals was to prepare the Site for future unrestricted land use, many soil cleanup goals were based on the stringent chemical concentrations associated with a future residential human health risk exposure scenario. Protection of groundwater was also considered in the development of cleanup goals.

1.9.1 Metals, Nitrate, and Sulfate

Various metals and nitrate/sulfate are found naturally in Site soils and cleanup goals were needed that distinguish between concentrations that are naturally occurring and concentrations that represent Site impacts. In February 2008, soil samples were collected from 20 locations in dredge tailings surrounding the landfill that represented background soil conditions. The samples were analyzed for 17 total metals listed in the Title 22 California Administrative Manual (CAM 17 metals) and soluble nitrate/sulfate. A soil background concentration limit (BCL) was developed for each metal and soluble parameter based on statistical analysis presented in the *Results Report for Pre-Design Data Collection Activities* (Brown and Caldwell, 2008h). Soil BCLs are shown in Table 1-1.

The cleanup goal for each metal was set at the higher of the BCL and the residential California Human Health Screening Level (CHHSL). The cleanup goal for 15 metals was set at the CHHSL. Arsenic was the only metal with a BCL higher than the CHHSL, and the cleanup goal was set at 10 milligrams per kilogram (mg/kg). For total chromium, the cleanup goal was based on the residential U.S. Environmental Protection Agency (EPA) Preliminary Remediation Goal (PRG) of 210 mg/kg that assumes a hypothetical concentration in soil of one part hexavalent chromium to six parts trivalent chromium. The cleanup goals for metals in soil are shown in Table 1-1.

Cleanup goals for nitrate and sulfate in soil were developed using the RWQCB Designated Level Methodology (Brown and Caldwell, 2008i, 2008l). This methodology considers the California Water Quality Goal, environmental attenuation, and the leachability of the constituent to determine a total designated (*i.e.*, acceptable) level of a constituent in soil that is protective of groundwater. The soil cleanup goals developed for nitrate and sulfate using this methodology were 450 and 570 mg/kg, respectively as shown in Table 1-1.

1.9.2 TPH

Site-specific cleanup goals for total petroleum hydrocarbons (TPH) in soil were developed using the RWQCB Designated Level Methodology (Brown and Caldwell, 2008t, 2008u). TPH in soil stockpiles was analyzed in three ranges: gasoline range organics (GRO); diesel range organics (DRO); and motor oil

range organics (MRO). Separate cleanup goals were developed for each TPH range: 10 mg/kg for GRO; 250 mg/kg for DRO; and 1,900 mg/kg for MRO. The following information was used to develop the cleanup goal for TPH in soil.

- Nature of the TPH: an independent opinion on the nature and solubility of the TPH in soil at the Site was provided by a forensic laboratory that specializes in hydrocarbons. In summary, the laboratory determined that the TPH material is consistent with a high boiling point petroleum product such as asphalt with a portion that may be due to naturally occurring material such as pine oil. When subjected to aggressive leaching, the soluble level of the TPH was relatively low.

- Environmental Attenuation: as constituents migrate through site soils toward groundwater, the concentration can be reduced (or attenuated) by physical, chemical, and biological means. Environmental characteristics of the Site were considered including: depth to groundwater, net recharge (annual precipitation minus evaporation), soil types, nature of the TPH present, and biodegradation potential.

- Leachability of the TPH: soil samples from selected stockpiles were analyzed for total and soluble TPH to determine the leachability of the TPH.

- Groundwater Monitoring: water samples from Site wells were analyzed for TPH.

1.9.3 PAHs

Polycyclic aromatic hydrocarbons (PAHs) are common environmental contaminants with multiple natural and man-made sources such as asphalt, motor vehicles, wood stoves, and forest fires. The landfill waste included a significant amount of soil, cobble, concrete, and asphalt that was most likely generated from maintenance of City streets and utilities. The asphalt was typically dry and crumbling and was present in various sizes from large, oversize chunks to ground up fines. A significant effort was made to segregate the asphalt by mechanical and manual means, but some asphalt remained in various stockpiles.

PAHs were detected consistently at low levels, below 100 micrograms per kilogram µg/kg, in stockpiles of excavated soil. The high frequency of detections (up to 70%) was different than metals, VOCs, and polychlorinated biphenyls (PCBs) which were detected only sporadically above cleanup goals. California Environmental Protection Agency guidance for using on-site data to develop a background threshold for metals was applied to the development of the PAH cleanup goal (Brown and Caldwell, 2009a, 2009c). With DTSC approval, a PAH

cleanup goal of 151 benzo(a)pyrene equivalents (BaPeq) was developed for the project.

1.9.4 Other Chemicals

For other chemicals detected in stockpile soil samples, analytical results were compared to residential CHHSLs. For example, detected PCBs were compared to the residential CHHSL of 0.089 mg/kg. If a CHHSL was not available for a particular chemical, analytical results were compared to the residential EPA PRG.

2.0 CONSTRUCTION QUALITY ASSURANCE REPORT

The City contracted with Pacific States Environmental Contractors as the Construction Contractor to conduct the clean closure. To ensure the clean closure project was conducted properly, the City contracted with Brown and Caldwell to provide a qualified, full-time, on-site CQA Manager. The qualifications of the CQA Manager included current California registration as a Professional Engineer and a Construction Management Certificate from the University of California, Davis. In managing the clean closure project, the City placed specific emphasis on the following key CQA aspects of the project:

- Health and safety;
- Public participation;
- Regulatory agency participation; and
- CQA measures.

These key CQA aspects of the project are discussed in the following sections.

2.1 Health and Safety

The health and safety of the community and Site workers during clean closure construction activities were of primary concern to the City. Health and safety practices that were implemented during construction included community protection measures, preparation of a Health and Safety Plan (HASP), and tailgate safety meetings. Health and safety documentation is provided in Appendix B.

2.1.1 Community Protection Measures

The following measures were implemented to protect the community during the project:

- Construction area fencing;
- Snake fencing along Young Wo Circle;
- Erosion control measures;
- Dust suppression measures and perimeter air monitoring; and
- Signs along the Site perimeter with City contact information.

2.1.2 Health and Safety Plan

Each contractor and subcontractor on Site was responsible for the health and safety of their own employees during construction. A HASP was developed by each contractor and subcontractor that identified anticipated Site hazards and required personal protective equipment associated with each construction activity. In February 2008, a HASP was prepared that governs the activities of Brown and Caldwell personnel at the Site during clean closure (Brown and

Caldwell, 2008e). The HASP was available at the Site during the construction period and is provided in Appendix B.

2.1.3 Tailgate Safety Meetings

Tailgate safety meetings were held almost daily prior to the start of construction activity. Topics discussed during the meetings included the planned activities for the day, Site and weather conditions, specific hazards, and required personal protective equipment. The tailgate safety meetings were conducted primarily by the Construction Contractor with the CQA Manager observing. Visitors to the Site were required to attend a safety meeting and acknowledge the training on a form. Tailgate safety meeting forms are provided in Appendix B.

2.2 Public Participation

The community surrounding the Site includes members of the Folsom Veterans Hall, occupants of the surrounding residences (*e.g.*, the Lake Natoma Shores development), City employees at the Corporation Yard, and recreational users of the East Lake Natoma Multi-purpose Trail (and the greater Folsom Lake State Recreation Area). A Community Relations Plan was prepared and included in the Clean Closure Work Plan. The Community Relations Plan was implemented throughout the project and included public comment periods, neighborhood meetings, a project website, and signs. Public participation documentation is provided in Appendix C.

2.2.1 Public Comment Periods

There were two public comment periods at key points in the project. The first comment period was for the Initial Study and began on January 7, 2008 and ended on February 14, 2008. The second comment period was for the *Tentative Revised Waste Discharge Requirements* (RWQCB, 2008d) and began on May 23, 2008 and ended on June 23, 2008. A public hearing was held on July 31, 2008 at the Water Board prior to the Board adopting the Updated WDRs.

2.2.2 Neighborhood Meetings

The City held four neighborhood meetings during the clean closure project as summarized in the following table. The meetings were held near the Site to encourage neighbors to attend. A PowerPoint presentation and poster boards were provided for each neighborhood meeting and are included in Appendix C.

2.2.3 Fact Sheets

Fact sheets on the project were created for the public and were available at the neighborhood meetings and could be downloaded from the project website. The fact sheets are included in Appendix C.

Summary of Neighborhood Meetings		
Date	**Location (Attendees)**	**Subjects**
1/17/08	Folsom Veterans Hall (22 public attendees)	Introduction of key project members Site location & history What is clean closure? What are the environmental aspects? (CEQA process) CEQA mitigation measures Regulatory agency involvement Milestones & schedule Opportunities for public participation
4/29/08	Folsom Veterans Hall (21 public attendees)	Project progress to date CEQA mitigation measures Excavation plan Pre-design investigation Milestones & schedule Opportunities for public participation
7/15/08	Folsom Veterans Hall (11 public attendees)	Project progress to date Incorporation of public input Air monitoring & neighbor notification Groundwater monitoring Soil & waste profiling Milestones & schedule Opportunities for public participation
10/27/08	Folsom Community Center (13 public attendees)	Project progress to date Neighborhood safety measures Preliminary air monitoring results Milestones & schedule Opportunities for public participation

2.2.4 Public Notices

The public was provided notice for each meeting using several methods:

- Letters/post cards mailed to 160 residents, businesses, and regulatory agency members; and
- Advertisements in the project website, Folsom Life, and Folsom Telegraph.

The notices provided the time and place for the neighborhood meetings, a brief list of topics, and a telephone number and website to obtain additional information regarding the project. The public notices are included in Appendix C.

2.2.5 Project Website

A project website was created as part of the City website. The website included daily construction summaries, project documents, and air monitoring results. Project documents available for download from the project website included the presentation slides from the neighborhood meetings, poster boards, fact sheets, safety measures, Results Report for Pre-Design Data Collection Activities, Initial Study, Clean Closure Work Plan, and Storm Water Pollution Prevention Plan (SWPPP). Information available for download from the air monitoring portion of the website included the Air Monitoring Plan, monthly wind roses, air monitoring summary figures and cumulative data spreadsheet. An example air monitoring

summary figure is provided in Figure 2-1. Screen shots of the website are included in Appendix C. A copy of this report will also be placed on the website.

2.2.6 Perimeter Signs

Signs were placed at several locations on the southern portion of the perimeter fence of the Corporation Yard and in two locations on the East Lake Natoma Multi-purpose Trail. The signs provided a telephone number and website to obtain additional information regarding the project. An example of the perimeter sign is included in Appendix C.

2.3 Regulatory Agency Participation

The regulatory agencies participated in the project by attending project meetings, conducting inspections, and corresponding on specific issues that arose during the project.

2.3.1 Meetings and Inspections

Project meetings were held periodically with regulatory agencies as summarized in Table 2-1. Inspections were conducted by regulatory agencies periodically throughout the project.

2.3.2 Correspondence

The City provided regulatory agencies with e-mails of construction progress every one to two weeks during the project. The progress reports provided detailed information including types of construction activity/equipment, volume estimates of material excavated/screened, inventory of stockpiles, storm water BMPs, and issues/resolutions. Correspondence exchanged between the regulatory agencies and the City included the following topics:

- Regulatory comments and approvals on work plans;
- Summaries of inspections and meetings;
- Development of cleanup goals;
- Analytical results of air sampling during the start-up period;
- Interim analytical results of stockpile and confirmation soil sampling;
- Interim documentation of waste disposal and recycling; and
- Financial assurances.

Primary correspondence between the regulatory agencies and the City is provided in Appendix D.

2.4 CQA Measures and Documentation

CQA measures were activities conducted by the CQA Manager to verify the following:

- The project was being conducted according to the Clean Closure Work Plan and regulatory requirements; and
- The Construction Contractor was adhering to contract requirements (*i.e.*, design drawings and specifications).

The CQA measures implemented during the clean closure project included the following:

- Air monitoring to evaluate the effectiveness of dust suppression measures;
- Biological/cultural monitoring to ensure protection of identified resources;
- Inspecting storm water pollution prevention controls;
- Documenting construction progress with photographs;
- Monitoring the proper handling and disposal or recycling of multiple waste streams;
- Monitoring noise, traffic, and temporary parking; and
- Monitoring Site security and protection of existing structures.

The CQA Manager documented the results of the CQA measures on nearly a daily basis with construction reports provided in Appendix E.

2.4.1 Dust Suppression and Air Monitoring

Dust suppression measures implemented by the Construction Contractor included the following:

- Applying water to the excavation, stockpiles, and haul roads using a water truck present on-site full-time;
- Covering stockpiles with plastic sheeting;
- Minimizing vehicle speed on haul roads; and
- Maintaining proper emission systems on construction vehicles and complying with emissions standards for vehicles.

An Air Monitoring Specialist, independent of the Construction Contractor, assisted the CQA Manager with air monitoring to protect on-site workers near the excavation and to evaluate the effectiveness of dust suppression measures. The results of the air monitoring are discussed in Section 6.0 and indicate that dust suppression measures were effective. Landfill gas meter logs and perimeter air monitoring logs are provided in Appendix E.

2.4.2 Biological and Cultural Resources Monitoring

The Initial Study identified sensitive habitat and protected trees in several locations on the Site. The Construction Contractor installed protective fencing and warning signs around these areas prior to excavation. A qualified Biological/Cultural Resources Specialist, independent of the Construction Contractor, assisted the CQA Manager with monitoring the sensitive areas. The Biological/Cultural Resources Specialist provided biological/cultural resources

awareness training to Construction Contractor personnel at the beginning of the construction period. The Biological/Cultural Resources Awareness Training form is provided in Appendix E. Sensitive habitat and protected trees were undisturbed during the project. No archaeological, cultural, historical resources, artifacts or other features were discovered during the course of construction anywhere on the Site.

2.4.3 Storm Water Monitoring

The project was subject to the requirements of the SWRCB National Pollutant Discharge Elimination System WDRs for discharges of storm water associated with industrial activities and/or general construction. The Construction Contractor was responsible for compliance with these permit requirements, which included filing a Notice of Intent to discharge storm water associated with construction activities and preparing a Construction SWPPP.

Prior to construction, the Construction Contractor installed erosion and sedimentation control devices to minimize the potential for discharges of waste and impacted storm water during construction. These controls are described in detail in the SWPPP and include:

- Installation of silt fencing and sedimentation barriers;
- Slope minimization;
- Stabilization of temporary soil and waste stockpiles;
- Construction and stabilization of storm water detention basins; and
- Hydro-seeding with native grasses when construction was complete.

Additional prevention measures included parking vehicles and locating waste stockpiles away from storm water drainage points.

Temporary storm water pollution prevention controls will remain in place until restoration is complete and final vegetation is fully established. Storm water inspections were conducted as summarized in Table 2-2. Storm water inspection reports are provided in Appendix E.

2.4.4 Monitoring Noise, Traffic, and Temporary Parking

The CQA Manager verified that the Construction Contractor complied with the City Noise Control Ordinance, General Plan Noise Element, and Standard Construction Specifications. Hours of construction operation was limited to 7:00 a.m. to 6:00 p.m. on weekdays and 8:00 a.m. to 5:00 p.m. on Saturdays. One incident occurred when the Construction Contractor began too early, but the CQA Manager quickly rectified the problem. Construction equipment was muffled and shrouded when possible to minimize noise levels. The Construction Contractor prepared a Traffic Control Plan for City review and approval prior to commencing construction. The plan included haul routes, anticipated times and frequency of hauling, equipment decontamination, truck tarping procedures, and roadway cleaning practices. To avoid disturbing residents of the Lake Natoma

Shores development, the Construction Contractor accessed the Corporation Yard via the Leidesdorff Street entrance and avoided the Forrest Street/Veterans Way entrance. Since the clean closure project involved the demolition of the parking lot on the northern portion of the landfill, the City arranged for alternate employee parking near the Site at the newly constructed parking structure on Leidesdorff Street in the Folsom Historic District.

2.4.5 Monitoring Site Security and Protection of Existing Structures

The CQA Manager verified that the Construction Contractor maintained Site security during construction and restricted access to the Site to authorized personnel. The Construction Contractor erected temporary construction fencing to secure the construction area and prevent unauthorized access. Temporary gates were secured across ingress and egress points when construction was not actively being performed. Signs were posted at 100-foot intervals to prohibit trespassers. The Construction Contractor was responsible for protecting existing structures including utilities and groundwater monitoring wells.

3.0 EXCAVATION AND WASTE MANAGEMENT

This section describes how waste was excavated, segregated, and stockpiled. The material excavated consisted of both the landfill contents and the liner associated with the former wastewater treatment plant lagoons.

3.1 Waste Excavation

This section describes how the waste was excavated at the Site including the sequence, schedule, equipment, and methods. Excavation was conducted until the native dredge tailings beneath the Site were encountered.

3.1.1 Excavation Sequence and Schedule

The general sequence of excavation was to remove waste from the southern portion of the Site to the northern portion as outlined below.

- Uncontrolled Fill Area: The UFA was defined as the southernmost portion of the Site outside of the main landfill area where illegal dumping of municipal waste by unknown parties occurred. Phase I of the project consisted of removal and backfill of the UFA which occurred from October 13, 2008 through December 5, 2008.
- Main Landfill Area – Lower Deck: The lower deck of the MLF was defined as the central portion of the Site where the landfill was not covered by the parking lot. Phase II of the project consisted of removal and backfill of the lower deck of the MLF which occurred from December 5, 2008 through June 22, 2009. The project was shutdown from January 22, 2009 through March 17, 2009 for the winter.
- Main Landfill Area – Upper Deck: The upper deck of the Main Landfill Area was defined as the northernmost portion of the Site where the landfill was covered by the parking lot. Phase III of the project consisted of removal and backfill of the upper deck of the MLF which occurred from March 18, 2009 through September 8, 2009.

The construction schedule is provided in Figure 3-1. Figures 3-2 through 3-10 illustrate the progress of the construction layout of the Site from October 2008 through August 2009.

3.1.2 Excavation Equipment and Methods

The Construction Contractor used a variety of equipment to perform the excavation and other activities. The following table presents a list of the major equipment that was used.

Primary Equipment Used During Construction		
Equipment	**Typical Model**	**Application(s)**
Excavator	CAT 330DL	Excavating soil and waste and direct-loading into trucks or screen plant
End-Dump Truck	10-wheeled (9 yd^3/12 ton)	Moving soil and waste within the Site
End-Dump Truck (Hauling)	18-wheeled (12 yd^3/20 ton)	Hauling soil to the off-site disposal facility
Screen Plant	Warrior 1800 PowerScreen	Segregating cobble, concrete, asphalt, and refuse from soil
Front Loader	CAT 950	Creating discrete stockpiles of waste, soil, cobble, asphalt, and concrete and moving equipment/materials within the Site
Skidster	CAT 248C	Assisting the front loader with stockpile management and moving equipment/materials within the Site
Bulldozer	CAT D6 or D8	Maintaining stockpiles and finish grading
Scraper	CAT 623G	Finish grading
Water Truck	2,500-gallon	Dust suppression
Roller	CAT CS -533E	Compacting sub-base of new parking lot after remediation

A typical construction day consisted of one CAT 330DL excavator with a 2.7 cubic yard bucket removing waste from the open face of the excavation at a rate of approximately 1,500 yd^3 per day. The excavator was assisted by two or three 10-wheeled, 9 yd^3/12 ton capacity, end-dump trucks and a CAT D6 bulldozer which would build and stage a waste stockpile for processing.

During the same day, a second CAT 330DL excavator would feed waste from the staged stockpile into a Warrior 1800 PowerScreen for mechanical segregation at an average rate of 500 yd^3 per day. The screen plant screened waste into three piles: oversize, 4-inch plus, and 4-inch minus. A CAT 248C Skidster supported the screen plant operation by removing screened refuse. A CAT 950 front loader alternated from building a waste stockpile to building screened soil and cobble stockpiles.

A 2,500-gallon water truck and 10,000-gallon water tower provided dust control for the entire operation. Once a day, a fuel/service truck would arrive on Site to refuel and grease all the equipment.

Backfilling operations typically used a CAT 330DL excavator, a CAT D6 bulldozer with a grading blade attachment, a CAT 950 front loader, and three 10-wheeled end-dump trucks.

Approximately a half-hour before the end of the shift, the crew would stop production activities and focus on securing the Site (*e.g.*, covering stockpiles) for the night. The project generated approximately 40 yd^3 of refuse per day that was hauled off by the City in City-supplied 20-yd^3 roll-off bins.

On days when soil was to be hauled to a Class II disposal facility, transportation operations used a CAT 330DL excavator, a CAT 950 front loader, and 18-wheeled, 12 yd^3/20 ton capacity, end-dumps or transfer trucks. The actual quantity of trucks depended upon the volume to off-haul and turn-around time from the receiving landfill.

3.1.3 Groundwater and Storm Water Management

Groundwater was not encountered during excavation. There was some minor seepage from perched water on portions of the liner associated with the former wastewater treatment plant lagoons. In addition, there was some minor seepage from the benched and developed areas to the northeast.

A lined detention basin collected storm water runoff from the paved parking area during the construction period. This basin (*i.e.*, the "middle detention basin") was located below the outfall at the southwest corner of the parking lot near the former landfill gas monitoring well GAS-6 (refer to Figure 1-6). Surface water from this basin was pumped periodically with a vactor truck and discharged to the sanitary sewer by City personnel operating under the City's general discharge permit. A summary of the volume of storm water removed from the middle detention basin is presented in the following table.

Summary of Pumping from Middle Detention Basin

Date	Volume (gal)
12/14/08	100
12/15/08	100
2/13/09	2,000
2/18/09	1,500
4/9/09	2,250
5/5/09	2,000
Total =	7,950

3.2 Waste Segregation

As waste was excavated, the Construction Contractor staged it in a pre-determined area for segregation, stockpiling, and characterization to assess its final destination.

Waste segregation was accomplished by four general methods:

1) The excavator operator segregated tires and oversize items of concrete and asphalt with the excavator "thumb";
2) Stockpiles of soil were mechanically screened of cobble, recyclable materials, and refuse;
3) Transite pipe and household hazardous waste was manually segregated; and
4) The excavator operator visually segregated soil from refuse (*e.g.*, landfill cap and soil overburden).

Table 3-1 provides a summary of the waste generated on a daily basis during the project.

3.2.1 Tires and Oversize Items

The excavator operator identified tires and set them aside for a loader to transfer them to a 40 yd^3 roll-off bin specially designated for tires. Piles of oversize items (*i.e.*, 6-inch plus) were created for metal, concrete, and asphalt. Asphalt from the parking lot was added to the asphalt stockpile. These piles were sent to the appropriate recycler.

3.2.2 Mechanical and Manual Screening

Stockpiles of soil/refuse were mechanically screened with a screen plant to separate soil from refuse to the extent practical. The screen plant was mounted on tracks so that it could be positioned anywhere on the site. The screen plant featured a hopper, shaker section with two screens (6-inch and 4-inch), and three conveyor belts. The first conveyor belt created piles of oversize objects such as boulders, concrete, asphalt, and metal items. The oversize pile had little to no refuse. The second conveyor belt created piles of midsized objects (*i.e.*, between oversize and 4-inch) such as cobbles, concrete, asphalt, and refuse. The midsize pile had considerable refuse mixed in with the cobbles that required considerable manual labor to segregate. The third conveyor belt created piles of fines (*i.e.*, dirt and minus 4-inch objects). The fines pile had varying amounts of refuse, depending upon the composition of the stockpile; however, the refuse was typically only small pieces of plastic or metal. The screen plant was operated continuously until the entire stockpile (or multiple stockpiles) was processed. Operating continuously resulted in piles of oversize, midsize, and fines/undersize continually building beneath the conveyor belts. A front end loader or Skidster would periodically remove a load from each of the piles to prevent them from building to the height of the conveyor and interfering with operation of the screen plant.

Manual laborers were used in addition to the mechanical screening to assist with waste segregation. Two laborers were positioned on either side of the shaker on the screen plant and removed refuse manually with a 3-foot pole and hook. This was the most effective segregation method and resulted in removal of large quantities of refuse. The 4-inch screen on the screen plant would periodically get clogged and required laborers to manually remove refuse (primarily plastic bags, plastic sheeting, and carpet fibers). A front end loader would periodically take loads from the midsize pile and spread out the objects on the paved portion of the main land fill so that laborers could separate refuse from the cobbles. One or two laborers were positioned at the fines/undersize pile and removed refuse manually with a rake as the pile was created. Finally, two laborers would hand-pick larger pieces of plastic and similar debris from the material that was being backfilled.

3.2.3 Transite Pipe Household Hazardous Waste

The Construction Contractor inspected excavated soil for transite pipe and household hazardous waste items including tires, batteries, and oil filters. Construction Contractor personnel were trained at the EPA Asbestos Hazard Emergency Response Act (AHERA) "Asbestos Awareness Level" and identified transite pipe at various stages of segregation. When identified, the transite pipe was placed in lined containers near the excavation or screen plant. City of Folsom personnel working in the Household Hazardous Waste Division were trained at the AHERA "40-hr Asbestos Contractor/Supervisor Level" which meets the provisions of the Toxic Substances Control Act, 40 CFR, Part 763, Subpart E and took custody of the transite pipe once it was placed in the temporary lined containers. The Household Hazardous Waste Division personnel transported the transite pipe to a larger asbestos container at the Household Hazardous Waste Division facility until enough quantity was accumulated for disposal.

3.2.4 Soil

Soil generated during the project originated from the landfill cap, overburden soil free of refuse, and fines segregated from the mechanical screen plant. A total of 131 soil stockpiles were generated during the project.

- Cap Soil: the landfill cap consisted of approximately 21,000 yd^3 (*in situ* volume) of soil in a 12-inch vegetative layer, 12-inch clay layer, and a 24-inch foundation layer. Because the lower 6 inches of the foundation layer was potentially in contact with waste, only the vegetative and clay layers and the upper 18 inches of the foundation layer (a total of approximately 18,000 yd^3 [*in situ* volume]) was segregated for chemical testing. The lower 6 inches, approximately 3,000 yd^3 (*in situ* volume), was sent to the screening plant. A total of 20 cap soil stockpiles were generated during the project.

- UFA Soil: mixed soil and refuse from the UFA was sent to the screening plant while debris-free overburden soil was stockpiled for sampling. A total of 24 UFA soil stockpiles were generated.

- MLF Soil: mixed soil and refuse from the MLF was sent to the screening plant while debris-free overburden soil was stockpiled for sampling. A total of 87 MLF soil stockpiles were generated.

3.3 Soil Stockpile Management

Screened soil was temporarily stored on-site in stockpiles placed on plastic sheeting pending the results of chemical sampling. The soil stockpiles were covered with plastic sheeting and secured with rope and sand bags for dust control and to isolate the soil from storm water. The stockpiles were located away from drainage courses and storm water drop inlets. Soil stockpiles were

regularly inspected to verify that stockpile BMPs were in place and working effectively.

The soil was placed in stockpiles with a maximum volume of approximately 750 yd^3. Table 3-2 provides a summary of soil stockpiles including their origin (*i.e.*, cap, UFA, or MLF), origination date, approximate volume, their fate (*i.e.*, on-site backfill or off-site disposal), and final disposition date.

4.0 WASTE CHARACTERIZATION AND DISPOSAL

Waste generated during the clean closure project consisted of refuse and household hazardous waste (primarily tires, automotive batteries, and oil filters), transite pipe, concrete and asphalt, scrap metal, and soil that exceeded one or more cleanup goals. Waste was either recycled or disposed as described in the following sections. Receipts from recycling/disposal facilities are provided in Appendix F.

Final Disposition of Waste			
Waste Type	**Facility**	**Distance from Site**	**Quantity Recycled/Disposed**
Refuse and Household Hazardous Waste	Sacramento County Kiefer Landfill 12701 Kiefer Boulevard Sloughhouse, CA 95683	18 miles	778 tons refuse 1,391 tires (33.1 tons)
	Battery Bill, Inc. 625 Sunbeam Avenue, Sacramento, CA 95811	23 miles	18 auto batteries
	PSC Environmental Services, LLC. 535 Getty Ct Benicia, CA 94510	79 miles	157 oil filters
Transite Pipe	Waste Management Altamont Landfill 10840 Altamont Pass Road Livermore, CA 94551	102 miles	306 linear feet
Concrete and Asphalt	Crete Crush 12584 White Rock Road Rancho Cordova, CA 95742	8 miles	1,828 tons
Scrap Metal	Schnitzer Steel Industries 12000 Folsom Boulevard Rancho Cordova, CA 95742	6 miles	20.3 tons
Soil that exceeded one or more cleanup goals	Norcal Waste Ostrum Road Landfill 5900 Ostrum Road Wheatland, CA 95692	41 miles	14,037 tons

4.1 Refuse and Household Hazardous Waste Disposal

Refuse removed from the landfill included paper, plastic bags and sheeting, and other items. A total of 778 tons of refuse was disposed at Keifer Landfill, a Class III disposal facility. A total of 18 automotive batteries, 157 oil filters, and 1,391 tires (33.1 tons) were separated and properly disposed at Battery Bill, PSC Environmental Services, and Kiefer Landfill, respectively.

4.2 Transite Pipe Characterization and Disposal

The transite pipe recovered from the waste was a non-friable cement pipe that contained asbestos. Analysis of the transite pipe by EPA Method 600/R-93-116 indicated that it contains approximately 25% bulk asbestos (15% chrysotile and 10% crocidolite). A total of 306 linear feet transite pipe was disposed at Altamont Landfill, a Class II disposal facility.

4.3 Concrete, Asphalt, and Metal Recycling

A total of 1,828 tons of concrete and asphalt were recycled at the Crete Crush aggregate crushing yard. Scrap metal removed from the landfill included water heaters and automotive parts (rims, axles). A total of 20.3 tons of scrap metal was recycled at the Schnitzer Steel metal recycling yard.

4.4 Soil Characterization

Segregated and stockpiled soil was characterized chemically to determine if it was suitable for on-site backfill or if it had to be disposed off-site. After a stockpile reached its final volume, the Construction Contractor collected a sample from each of the four sides of the stockpile. Samples were collected into laboratory-supplied glass jars. Samples for VOC analysis were collected with Encore Samplers that comply with EPA Method 5035. Samples were labeled, refrigerated and transported under chain-of-custody to Test America, which is certified by the California Department of Public Health Environmental Laboratory Accreditation Program. The laboratory composited the four individual stockpile samples prior to analysis.

Stockpiled soil was sampled and analyzed for the chemical suites shown in the following table. Note that stockpiles were sampled for the chemical suites at a frequency specified in the Clean Closure Work Plan. For example, herbicides/pesticides were sampled on a 25% frequency which corresponded to every fourth stockpile or one sample per approximately 3,000 yd^3.

Laboratory Analyses for Stockpiled Soil

Analyte	Laboratory Method	Stockpile Sampling Frequency	
		Planned	Actual
Moisture		100% (1 per 750 yd^3)	100%
Sulfate and Nitrate	EPA 300	100% (1 per 750 yd^3)	100%
Specific Conductance	EPA 120.1	100% (1 per 750 yd^3)	100%
pH	EPA 150.1	100% (1 per 750 yd^3)	100%
Asbestos	NIOSH 7400	100% (1 per 750 yd^3)	100%
Metals (total, CAM 17)	EPA 6010A/7471B	100% (1 per 750 yd^3)	100%
TPH (GRO/DRO/MRO)	EPA 8015M	100% (1 per 750 yd^3)	100%
VOCs	EPA 8260B	100% (1 per 750 yd^3)	100%
SVOCs (including PAHs)	EPA 8270C	50% (1 per 1,500 yd^3)	50%
PCBs	EPA 8082	50% (1 per 1,500 yd^3)	50%
Herbicides	EPA 8151A	25% (1 per 3,000 yd^3)	25%
Pesticides	EPA 8141A	25% (1 per 3,000 yd^3)	25%

A stockpile was determined to be suitable for on-site backfill when all analytical results were at or below Site cleanup goals. According to the Updated WDRs, the stockpile also had to meet an aesthetic goal of little to no visible refuse (*e.g.*, small pieces of plastic or plastic sheeting). The rigorous mechanical and manual screening produced stockpiles that met the aesthetic goal, and regulatory agencies periodically inspected the soil quality. If analytical results were above the cleanup goals, then the soil was disposed off-site at a disposal facility. Since

the soil had little to no visible refuse, the disposal facility accepted the soil from the Site as daily cover rather than fill.

Laboratory analytical reports in Adobe PDF format are provided in Appendix G and the analytical database in Microsoft Excel format is provided in Appendix H. The following sections discuss analytical results organized by chemical class. All chemical results are dry weight corrected. Appendix I provides analytical results for detected compounds. Tables 4-1 through 4-9 provide summary statistics for each chemical suite consisting of:

- Total sample count and quantity/percent of detections;
- Minimum, mean, maximum, standard deviation, and coefficient of variation (CV) for detected results only;
- Cleanup goal and source (*i.e.*, background limit, CHHSL, PRG, or leachability analysis);
- Quantity of results over the cleanup goal; and
- Maximum result expressed as a percentage of the cleanup goal.

For chemical suites where at least one analyte was above a cleanup goal, the statistics are calculated again at the bottom of the page. This second set of statistics displays analytical results only for stockpiles that were backfilled on Site (*i.e.*, analytical results for stockpiles disposed off-site are not included in the second set of statistics).

4.4.1 Moisture Analytical Results and Dry-Weight Correction

The moisture of each soil stockpile was analyzed for two reasons:

- Comparison of chemical results to regulatory comparison levels (*e.g.*, CHHSLs) should be done on a dry-weight basis for consistency; and

- Disposal facilities typically require demonstration that waste is greater than 50% solids.

Moisture analytical results are provided by stockpile in Appendix I and summary statistics are provided in Table 4-1. Moisture was measured in all 131 soil stockpiles and ranged from 3.4% to 29% with a mean of 12%, and a CV of 0.40. Moisture content was used to apply a dry-weight correction to analytical results for other chemical suites. Soil stockpiles disposed off-site were within the Class II disposal facility requirements of moisture less than 50%.

4.4.2 Nitrate and Sulfate Analytical Results

Soluble nitrate and sulfate was analyzed in all 131 stockpiles by preparing each soil sample by the California Waste Extraction Test (WET) method using de-ionized water. Nitrate and sulfate analytical results are provided by stockpile in Appendix I and summary statistics are provided in Table 4-1.

- Nitrate: detected in all but one of 131 stockpile soil samples (99% detections) and ranged from 1.1 to 220 mg/kg with a mean of 38 mg/kg, and a CV of 1.1. All sample results were below the cleanup goal of 450 mg/kg.

- Sulfate: detected in all 131 stockpile soil samples and ranged from 29 to 2,800 mg/kg with a mean of 254 mg/kg and a CV of 1.0. Three samples had a sulfate concentration above the cleanup goal of 570 mg/kg: UFA-SP-13 at 2800 mg/kg, MLF-SP-2 at 670 mg/kg, and MLF-SP-4 at 590 mg/kg. These three stockpiles were disposed off-site at a Class II disposal facility and the maximum sulfate concentration backfilled on-site was 540 mg/kg.

4.4.3 Specific Conductance and pH Analytical Results

Specific conductance and pH was measured in all 131 stockpiles by making a paste of each soil sample from equal parts soil and de-ionized water. Specific conductance and pH analytical results are provided by stockpile in Appendix I and summary statistics are provided in Table 4-1.

- Specific Conductance: ranged from 11.8 to 820 micromhos per centimeter (µmhos/cm) with a mean of 152 µmhos/cm and a CV of 1.0. The Updated WDRs required that soil samples be analyzed for specific conductance, but no cleanup goal was specified.

- pH: in soil stockpile samples, pH ranged from 4.84 to 9.01 units with a mean of 6.7 units and a CV of 0.11. Soil stockpiles disposed off-site were within the Class II disposal facility requirements of pH in soil between 2.0 and 12.5 units.

4.4.4 Asbestos Analytical Results

Bulk asbestos was analyzed in all 131 stockpiles and was not detected in any soil sample.

4.4.5 Metals Analytical Results

CAM 17 total metals were analyzed in all 131 stockpiles. Metals analytical results are provided by stockpile in Appendix I and summary statistics are provided in Table 4-2. Nearly all metals were detected frequently (from 51 to 100% detects) except for antimony, selenium, and thallium which were detected less frequently (from 7 to 31% detects). The mean detections for all metals were below their respective cleanup goals. Three metals (arsenic, cadmium, and chromium) had maximum detections above their respective cleanup goals.

- Arsenic: detected in all 131 stockpile soil samples and ranged from 2.3 to 11 mg/kg with a mean of 5.0 mg/kg and a CV of 0.25. One sample had an arsenic concentration above the cleanup goal of 10 mg/kg: MLF-SP-81 at 11 mg/kg. This stockpile was disposed off-site at a Class II disposal

facility and the maximum arsenic concentration backfilled on-site was 8.8 mg/kg.

- Cadmium: detected in 67 of 131 stockpile soil samples (51% detections) and ranged from 0.016 to 3.8 mg/kg with a mean of 0.34 mg/kg and a CV of 1.6. Two samples had cadmium concentrations above the cleanup goal of 1.7 mg/kg: UFA-SP-13 at 3.8 mg/kg and MLF-SP-71 at 2.3 mg/kg. These stockpiles were disposed off-site at a Class II disposal facility and the maximum cadmium concentration backfilled on-site was 1.3 mg/kg.

- Chromium: detected in all 131 stockpile soil samples and ranged from 31 to 280 mg/kg with a mean of 59 mg/kg and a CV of 0.38. One sample had a chromium concentration above the cleanup goal of 210 mg/kg: MLF-SP-1 at 280 mg/kg. This stockpile was disposed off-site at a Class II disposal facility and the maximum chromium concentration backfilled on-site was 97 mg/kg.

4.4.6 Total Petroleum Hydrocarbons Analytical Results

TPH in three ranges (GRO, DRO, and MRO) was analyzed in all 131 stockpiles. TPH analytical results are provided by stockpile in Appendix I and summary statistics are provided in Table 4-3. GRO was detected infrequently (12% detections) while DRO and MRO were detected in nearly every sample (97 to 99% detections).

- GRO: detected in 16 of 131 stockpile soil samples (12% detections) ranging from 0.014 to 0.74 mg/kg with a mean of 0.13 mg/kg and a CV of 1.3. All samples were below the cleanup goal of 10 mg/kg. The maximum GRO concentration backfilled on-site was 0.25 mg/kg.

- DRO: detected in 127 of 131 stockpile soil samples (97% detections) ranging from 5.9 to 450 mg/kg with a mean of 71 mg/kg and a CV of 0.80. One sample had a DRO concentration above the cleanup goal of 250 mg/kg: sample MLF-SP-5 at 450 mg/kg. This stockpile was disposed off-site at a Class II disposal facility and the maximum DRO concentration backfilled on-site was 250 mg/kg.

- MRO: detected in 130 of 131 samples (99% detections) ranging from 31 to 1,800 mg/kg with a mean of 319 mg/kg and a CV of 0.76. All samples were below the cleanup goal of 1,900 mg/kg. The maximum MRO concentration backfilled on-site was 1,300 mg/kg.

4.4.7 VOCs Analytical Results

All 131 stockpiles were analyzed for 65 individual VOCs listed on Table 4-4. A total of 29 VOCs were detected at least once, but VOC detections were infrequent (7% or less detections). All detected results were less than 1% of their respective cleanup goals with the exception of 1,2,3-trichloropropane which was

detected at 16% of its cleanup goal. Many of the detected VOCs are associated with gasoline (*e.g.*, benzene, toluene, ethylbenzene, xylenes) and their infrequent detections at low concentrations are consistent with the GRO results.

4.4.8 SVOCs Analytical Results

A total of 112 stockpiles were analyzed for 44 individual semi-volatile organic compounds (SVOCs) listed on Table 4-5. A total of seven SVOCs were detected at least once, but SVOC detections were infrequent (15% or less detections). All detected results were less than 1% of their respective cleanup goals with the exception of bis(2-ethylhexl) phthalate which was detected at 37% of its cleanup goal of 35 mg/kg and pentachlorophenol detected at 18% of its cleanup goal of 4.4 mg/kg.

4.4.9 PAHs Analytical Results

PAHs are typically included in the standard list of SVOCs analyzed by EPA Method 8270C; however, the detection limits for PAHs are typically greater than regulatory comparison levels. Analysis of PAHs was conducted separately from SVOCs using EPA Method 8270C Selected Ion Monitoring early in the project to provide the proper analytical resolution.

A total of 116 stockpiles were analyzed for 16 individual PAHs listed on Table 4-6 and all were detected in at least one soil sample except for acenaphthylene and dibenz(a,h)anthracene. When PAHs were detected in a soil sample, it was common for multiple individual PAHs to be present. A total of eight PAHs were detected frequently (from 30 to 69% detections): benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene. BaPeq was calculated from the analytical results of carcinogenic PAHs for each soil sample. Three soil samples had a BaPeq calculated concentration above the cleanup goal of 0.151 mg/kg: UFA-SP-1-DUP at 0.469 mg/kg, MLF-SP-9 at 0.409 mg/kg, and MLF-SP-67 at 0.279 mg/kg. These stockpiles were disposed off-site at a Class II disposal facility and the maximum BaPeq calculated concentration backfilled on-site is 0.13 mg/kg.

4.4.10 PCBs Analytical Results

A total of 117 stockpiles were analyzed for 7 individual PCBs listed on Table 4-7 and five PCBs were detected at low frequency (2 to 9% detections): Aroclor-1016, Aroclor-1242, Aroclor-1248, Aroclor-1254, and Aroclor-1260.

- <u>Aroclor-1016</u>: detected in three of 117 samples (3% detections). The three detections were above the cleanup goal of 0.089 mg/kg: MLF-SP-48 at 0.14 mg/kg and UFA-SP-24 at 0.21 mg/kg, and MLF-SP-32 at 0.92 mg/kg. These stockpiles were disposed off-site at a Class II disposal facility and Aroclor-1016 was not detected in soil samples from stockpiles backfilled on-site.

- Aroclor-1242: detected in two of 117 samples (2% detections) and both were above the cleanup goal of 0.089 mg/kg: MLF-SP-4 at 0.11 mg/kg and MLF-SP-5 at 0.27 mg/kg. These stockpiles were disposed off-site at a Class II disposal facility and Aroclor-1242 was not detected in soil samples from stockpiles backfilled on-site.

- Aroclor-1248: detected in seven of 117 samples (7% detections) from 0.044 to 0.72 mg/kg with a mean of 0.26 and a CV of 0.85. Six samples had detections above the cleanup goal of 0.089 mg/kg: MLF-SP-49 at 0.13 mg/kg, MLF-SP-48 at 0.15 mg/kg, UFA-SP-24 at 0.20 mg/kg, MLF-SP-16 at 0.24 mg/kg, UFA-SP-22 at 0.36 mg/kg, and MLF-SP-32 at 0.72 mg/kg. These stockpiles were disposed off-site at a Class II disposal facility and the maximum Aroclor-1248 concentration backfilled on-site is 0.044 mg/kg.

- Aroclor-1254: detected in four of 117 samples (4% detections) from 0.052 to 0.57 mg/kg with a mean of 0.23 mg/kg and a CV of 0.99. Three samples had detections above the cleanup goal of 0.089 mg/kg: MLF-SP-9 at 0.14 mg/kg, UFA-SP-24 at 0.17 mg/kg, and CAP-SP-14 at 0.57 mg/kg. These stockpiles were disposed off-site at a Class II disposal facility and Aroclor-1254 was not detected in soil samples from stockpiles backfilled on-site.

- Aroclor-1260: detected in 11 of 117 samples (9% detections) from 0.002 to 0.099 mg/kg with a mean of 0.023 mg/kg and a CV of 1.3. One sample had a detection above the cleanup goal of 0.089 mg/kg: MLF-SP-9 at 0.099 mg/kg. This stockpile was disposed off-site at a Class II disposal facility and the maximum Aroclor-1260 concentration backfilled on-site is 0.019 mg/kg.

4.4.11 Pesticides Analytical Results

A total of 34 stockpiles were analyzed for up to 31 individual pesticides listed on Table 4-8. Pesticide analysis was conducted at more than one laboratory during the project and the standard list of individual pesticides varied. Pesticides were not detected in any soil sample with only one exception: Famphur was detected in sample MLF-SP-72 at a trace level of 0.023 mg/kg. A regulatory limit has not been established for this chemical and therefore the stockpile was backfilled on-site.

4.4.12 Herbicides Analytical Results

A total of 34 soil stockpile samples were analyzed for 10 individual herbicides listed on Table 4-9 and four herbicides were detected infrequently (from 3 to 23% detections): 2,4,5-trichlorophenoxy (Silvex), 2,4-D, 2-methyl-4-chlorophenoxyacetic acid (MCPA), and Dalapon. All detected results were less than 8% of their respective cleanup goals.

  - Silvex: detected in two of 34 samples (6% detections) below the cleanup goal of 4.4 mg/kg: MLF-SP-1 at 0.0067 mg/kg and UFA-SP-22 at 0.37 mg/kg.

- 2,4-D: detected in two of 34 samples (6% detections) below the cleanup goal of 690 mg/kg: MLF-SP-32 at 0.007 mg/kg and MLF-SP-1 at 0.01 mg/kg.

- MCPA: detected in one of 34 samples (3% detections) below the cleanup goal of 31 mg/kg: MLF-SP-16 at 2.6 mg/kg.

- Dalapon: detected in seven of 34 samples (21% detections) from 0.025 to 0.11 mg/kg with a mean of 0.055 mg/kg and a CV of 0.54. All samples were below the cleanup goal of 1,800 mg/kg.

4.5 Soil Disposal

A total of 18 of 131 soil stockpiles (14%) generated during the project had one or more analytical results that exceeded chemical cleanup goals and were disposed off-site according to the Clean Closure Work Plan. The following table summarizes the approximate volume, weight, and chemical suite(s) above cleanup goals for soil stockpiles disposed off-site.

Soil Stockpiles Disposed Off-Site		
Stockpile ID	**Approx. Volume (*ex situ* yd^3)**	**Chemical Suite(s) Above Cleanup Goals**
CAP-14	600	PCBs
UFA-1	475	PAHs
UFA-13	475	Sulfate, Cadmium
UFA-20	250	PAHs
UFA-22	750	PCBs
UFA-24	750	PCBs
MLF-1	750	Chromium
MLF-2	500	Sulfate
MLF-4	500	Sulfate, PCBs
MLF-5	500	DRO, PCBs
MLF-9	600	PCBs, PAHs
MLF-16	600	PCBs
MLF-32	600	PCBs
MLF-48	600	PCBs
MLF-49	600	PCBs
MLF-67	600	PAHs
MLF-71	600	Cadmium
MLF-81	600	Arsenic
Total =	10,350	

When analytical results for stockpiled soil exceeded the cleanup goals, additional analyses were conducted as necessary to:

- Characterize the soil as either hazardous or non-hazardous waste; and

- Demonstrate the soil meets the disposal facility requirements (*e.g.*, waste must be greater than 50% solids).

4.5.1 Waste Classification Analytical Results

Soil is classified as non-hazardous in California if total results are below the Total Threshold Limit Concentration (TTLC) and soluble results are below the Soluble Threshold Limit Concentration (STLC). All analytical results for total metals in the 18 soil samples were below TTLCs as summarized in Table 4-10.

A simple rule of thumb is applied to the total results to determine if soluble analysis (*i.e.*, California WET method using citrate) was required. Since the CA WET method involves a 10:1 dilution, total results in mg/kg should be less than 10 times the STLC results in milligrams per liter (mg/L). All analytical results for total metals in the 18 soil samples were below 10 times their respective STLCs with the exception of chromium and lead:

- Chromium: 10 times the chromium STLC of 5 mg/L is 50 mg/kg. Total chromium was equal to or greater than 50 mg/kg in 14 stockpiles which required additional soluble analyses. All analytical results for soluble chromium were below the STLC of 5 mg/L.

- Lead: 10 times the lead STLC of 5 mg/L is 50 mg/kg. Total lead was greater than 50 mg/kg in 5 stockpiles which required additional soluble analyses. All analytical results for soluble lead were below the STLC of 5 mg/L.

Upon completion of the additional analyses, all 18 soil stockpiles were classified as non-hazardous waste and were disposed off-site at a Class II disposal facility.

4.5.2 Disposal Facility Requirements

The Norcal Waste Ostrum Road Landfill located in Wheatland, California is a Class II disposal facility that is permitted to accept soil classified as non-hazardous waste. The Ostrum Road disposal facility required the following:

- Waste must be greater than 50% solids;
- pH between 2.0 and 12.5 units;
- GRO less than 8,000 mg/kg, DRO less than 8,000 mg/kg, and MRO less than 25,000 mg/kg; and
- Soil must be free of visible refuse (to be accepted as daily cover).

The 18 soil stockpiles met all of the requirements of the Ostrum Road disposal facility and the soil was accepted for beneficial use as daily cover. Once the soil was characterized and accepted by the off-site facility, the Construction Contractor prepared transportation manifests and loaded the soil into trucks. Prior to departure, trucks were tarped, and tires were dry-brushed or wet-washed as necessary to remove visible soil. The trucks followed the approved haul route to the Ostrum Road disposal facility. Transportation manifests and disposal tickets are provided in Appendix F.

5.0 CONFIRMATION OF WASTE REMOVAL

The Confirmation Sampling Plan was included in the Clean Closure Work Plan. The purpose of the confirmation sampling was to document that waste had been removed and residual concentrations of target parameters did not exceed the soil cleanup goals established for the Site. If any sample results exceeded cleanup goals, then step-out samples were collected and additional excavation and re-confirmation sampling was performed. After confirmation sampling results cleared a portion of the Site, stockpiled soil that was deemed acceptable to remain on-site could then be backfilled in the cleared area. Confirmation sampling was conducted in stages during the project rather than at the end for several reasons:

- Space was limited at the Site for staging stockpiles; and
- The WDRs limited the time stockpiles could be staged on Site.

A grid was established for the Site with nodes on a 25-foot spacing for possible sampling points as shown in Figure 5-1. The extent of the UFA and MLF comprised a potential total of 336 nodes and the goal was to randomly sample 25% of the total (84 nodes). When the Construction Contractor cleared an area, 25% of the nodes in the cleared area were randomly selected for sampling (using SPSS version 15.0 statistical software). A surveyor located the sampling points including determining the elevation. The survey allowed excavation equipment to precisely re-excavate as necessary. In addition, the survey of each confirmation sample was used to provide the topography of the excavation. The excavation topography, in combination with the initial surface topography, was used in AutoCAD Civil 3D software to determine an accurate volume of waste excavated.

Confirmation samples were collected at the bottom surface of the excavation in the native dredge tailings beneath the Site. In some locations, a sample could not be collected due to the predominance of cobbles/gravels and the lack of a soil matrix. In these instances, a sample was collected at an adjacent node, if possible. When the sampling results indicated that additional excavation was necessary, excavated material was screened to remove the cobbles which typically represented about 80% of the total volume. The screened soil was then disposed at an off-site Class II disposal facility. Confirmation samples were analyzed for CAM 17 total metals, nitrate, and sulfate. Table 5-1 summarizes the possible and selected nodes for each cleared area as well as the analytical results for confirmation samples. Figures 5-2 through 5-5 show the possible and selected nodes for each cleared area.

5.1 Confirmation Sampling in UFA

Two rounds of confirmation sampling were conducted in the UFA as shown on Figure 5-2.

- UFA Round 1 Southern Portion: during October 13-28, 2008, the southern portion of the UFA was cleared and soil samples were collected on October 29, 2008 at six of 25 possible nodes. All sample results were below cleanup goals with only two exceptions: 1) sulfate in sample X6Y3 was detected at 2,600 mg/kg which was above the cleanup goal of 570 mg/kg; and 2) arsenic in sample X8Y3 was detected at 13 mg/kg which was above the cleanup goal of 10 mg/kg. Step-out sampling and re-confirmation sampling was conducted where possible. Note that in some portions of the cleared area, little to no soil matrix was present between the cobbles associated with the dredge tailings and sample collection was not feasible. An impacted area of approximately 1,600 ft^2 was excavated to a depth of approximately 1.5 feet.

- UFA Round 2 Northern Portion: during November 1-20, 2008, the northern portion of the UFA was cleared and soil samples were collected on November 21, 2008 at 16 of 59 possible nodes. All sample results were below cleanup goals with only two exceptions: 1) lead in sample X8Y6 was detected at 160 mg/kg which was above the cleanup goal of 150 mg/kg; and 2) cadmium in sample X8Y9 was detected at 2.2 mg/kg which was above the cleanup goal of 1.7 mg/kg. Step-out sampling and re-confirmation sampling was conducted where possible. A lead-impacted area and cadmium-impacted area of approximately 625 ft^2 each were excavated to a depth of approximately 1.5 feet.

5.2 Confirmation Sampling in MLF – Lower Deck

Seven rounds of confirmation sampling were conducted in the lower deck of the MLF as shown in Figure 5-3. The MLF lower deck was excavated until all waste and the lagoon liner associated with the former sewage treatment plant was removed and the native dredge tailings were encountered. The lagoon liner (cover sand/plastic liner/bedding sand) was evident in this area and provided a definitive indication of the bottom of the fill.

- MLF Round 1: during November 22 to December 9, 2008, a small southern portion of the MLF lower deck was cleared and soil samples were collected on December 10, 2008 at two of 16 possible nodes. Soil samples could not be collected at the two other planned nodes (or surrounding nodes) due to the predominance of dredge tailings and lack of soil matrix. All sample results were below cleanup goals.

- MLF Round 2: during March 18-20, 2009, a second small southern portion of the MLF lower deck was cleared and soil samples were collected on March 23, 2009 at two of 16 possible nodes. Soil samples could not be collected at the two other planned nodes due to the predominance of

dredge tailings and lack of soil matrix. All sample results were below cleanup goals.

- MLF Round 3: during March 25 to April 15, 2009, a large central portion of the MLF lower deck was cleared and soil samples were collected on April 16, 2009 at nine of 33 possible nodes. A soil sample could not be collected at one other planned node due to the predominance of dredge tailings and lack of soil matrix. All sample results were below cleanup goals.

- MLF Round 4: during April 28 to May 4, 2009, a small central portion of the MLF lower deck and eastern haul road was cleared and soil samples were collected on May 7, 2009 at four of 12 possible selected nodes. All sample results were below cleanup goals.

- MLF Round 5: during May 12-13, 2009, a second small central portion of the MLF lower deck was cleared and soil samples were collected on May 19, 2009 at three of nine randomly selected nodes. All sample results were below cleanup goals.

- MLF Round 6: during May 20-27, 2009, a western portion of the MLF lower deck and western haul road was cleared and soil samples were collected on May 28, 2009 at five of 17 possible nodes. All sample results were below cleanup goals.

- MLF Round 7: during May 29 to June 10, 2009, the northern portion of the MLF lower deck was cleared and soil samples were collected on June 11, 2009 at five of 18 possible selected nodes. All sample results were below cleanup goals with one exception: sulfate in sample X11Y23 was detected at 1,600 mg/kg which was above the cleanup goal of 570 mg/kg. Step-out sampling and re-confirmation sampling was conducted. A sulfate-impacted area of approximately 625 ft^2 was excavated to a depth of approximately 1.5 feet.

5.3 Confirmation Sampling in MLF – Upper Deck

Four rounds of confirmation sampling were conducted in the lower deck of the MLF as shown in Figure 5-4. The confirmation sampling included the center berm of the former waste water treatment plant lagoons.

- MLF Round 8: during June 12-25, 2009, the eastern portion of the MLF lower deck and southern portion of the MLF upper deck were cleared and soil samples were collected on June 29, 2009 at four of 14 possible nodes. All sample results were below cleanup goals with one exception: arsenic in sample X13Y26 was detected at 11 mg/kg which was above the

cleanup goal of 10 mg/kg. Step-out sampling and re-confirmation sampling was conducted. An arsenic-impacted area of approximately 625 ft^2 was excavated to a depth of approximately 1.5 feet.

- MLF Round 9: during June 29 to July 16, 2009, a southern portion of the MLF upper deck and western/eastern haul roads was cleared and soil samples were collected on July 20, 2009 at five of 17 possible nodes. All sample results were below cleanup goals with only one exception: arsenic in sample X12Y28 was detected at 21 mg/kg which was above the cleanup goal of 10 mg/kg. Step-out sampling and re-confirmation sampling was conducted. An arsenic-impacted area of approximately 2,500 ft^2 was excavated to a depth of approximately 2.5 feet.

- MLF Round 10: during July 20-29, 2009, a second southern portion of the MLF lower deck was cleared and soil samples were collected on July 30, 2009 at five of 20 possible nodes. All sample results were below cleanup goals.

- MLF Round 11: during August 4-19, 2009, the large central/northern portion of the MLF upper deck was cleared. This area included the former waste water treatment plant aeration pond and the berm between the aeration pond and the former waste water treatment plant lagoons. Soil samples were collected on August 21, 2009 at 13 of 50 possible nodes. All sample results were below cleanup goals with only one exception: arsenic in sample X19Y36 was detected at 18 mg/kg which was above the cleanup goal of 10 mg/kg. Step-out sampling and re-confirmation sampling was conducted. An arsenic-impacted area of approximately 1,875 ft^2 was excavated to a depth of approximately 1.5 feet.

5.4 Confirmation Sampling in the Screening Plant Area

Throughout the project, the screening plant was moved northward ahead of the excavation up to the aeration pond. The screening plant was then moved to the southern portion of the former MLF upper deck. Since the screening activity was conducted on a previously cleared area, confirmation samples were collected in the footprint where the screening plant was temporarily located. Soil samples were collected on August 21, 2009 at three of nine possible nodes as shown in Figure 5-5. All sample results were below cleanup goals with one exception: sulfate in sample X09Y23 was detected at 760 mg/kg which was above the cleanup goal of 570 mg/kg. Step-out sampling and re-confirmation sampling was conducted. A sulfate-impacted area of approximately 1,875 ft^2 was excavated to a depth of approximately 1.5 feet.

6.0 AIR MONITORING RESULTS

The Air Monitoring Plan for the project was included in the Clean Closure Work Plan. The plan specified a combination of monitoring landfill gases (*i.e.*, methane, VOCs, and hydrogen sulfide) near the excavation with real-time, hand-held meters and monitoring dust, metals, and asbestos at the perimeter with fixed equipment. Due to public input, the asbestos monitoring was subsequently moved from the perimeter to the excavation.

The fixed monitoring was conducted at five stations (AM1 through AM5) located at the perimeter of the Site as shown in Figure 6-1. The locations were chosen to monitor air quality at four principal directions and near neighboring properties as summarized in the following table. The locations were also chosen to represent upwind and downwind conditions. Each station was equipped with a continuous dust sampler capable of detecting particulate matter with a diameter less than 10 micrometers (PM_{10}). The sampler also featured an air pump and filter for simultaneously collecting airborne metals. Station AM1 was also equipped with a meteorological station.

Monitoring Locations and Equipment		
Station	**Location**	**Equipment**
---	Near excavations	Real-time, hand-held meter for methane/VOCs/hydrogen sulfide, separate air pump/filter for asbestos
AM1	Southern station; upwind station during light to moderate winds; near residents of Natoma Shores development	Continuous PM_{10} sampler and air pump/filter for metals, meteorological station
AM2	Downwind station during stronger winds; near residents of Natoma Shores development	Continuous PM_{10} sampler and air pump/filter for metals
AM3	Eastern station; cross-wind station during light to moderate winds; downwind station during stronger winds; near members of Folsom Veterans Hall	Continuous PM_{10} sampler and air pump/filter for metals
AM4	Northern station; downwind station during light to moderate winds; near City employees working at the Corporation Yard	Continuous PM_{10} sampler and air pump/filter for metals
AM5	Western station; cross-wind station during light to moderate winds; near recreational users of Lake Natoma State Recreation Area	Continuous PM_{10} sampler and air pump/filter for metals

Prior to the start of construction activities, limited monitoring was conducted to establish baseline concentrations of target parameters and to assess general wind patterns. Monitoring during construction activities was conducted frequently during the start-up period. Health-protective action levels for target parameters were established to provide an indication of when dust control measures should be increased or when construction practices should be limited or modified. The air monitoring action levels are provided in Table 6-1. According to the Air Monitoring Plan, the monitoring for the remainder of the construction period could be modified if the analytical results during the start-up period were within action levels (Brown and Caldwell, 2008s).

Pre-construction air quality monitoring was conducted with fixed equipment on six monitoring events: July 1, July 28, August 13, 21, and 28, and October 10, 2008. Construction air quality monitoring was conducted with meters and fixed equipment during each business day of the two-week start-up period from October 13-24, 2008. During the remainder of the construction period (October 27, 2008 through September 1, 2009), air monitoring was conducted approximately three times a week. The sampling days selected each week were staggered. The air monitoring targeted eight hours of the construction day from approximately 7:30 a.m. to 3:30 p.m.

The results of the air monitoring program are discussed in the following sections. The analytical laboratory results are provided in Appendix J and the laboratory reports are provided in Appendix G.

6.1 Excavation Monitoring

The CQA Manager placed a landfill gas meter and an asbestos sampler near the downwind side of the excavation on each construction day involving excavation work.

6.1.1 Landfill Gas Results

Measurements of methane, VOCs, and hydrogen sulfide were obtained with a Multi-RAE Plus which provided direct and continuous readout as well as electronic data logging. Methane was measured in a range from 0 to 100% lower explosive limit (LEL) with a resolution of 1%. VOCs were monitored with a photo-ionization detector with a lamp strength of 10.0 electron volts and calibrated to isobutylene. The range of VOC measurement was 0 to 200 parts per million by volume (ppmv) with a resolution of 0.1 ppmv. Hydrogen sulfide was measured in a range from 0 to 100 ppmv with a resolution of 1 ppmv. The meter was calibrated by the supplier prior to the start of construction and then calibrated by field staff following manufacturer guidelines on a daily basis prior to use.

The results of landfill gas monitoring are provided in Appendix E. Measurements were taken hourly during the first days of the start-up period and no detections were noted. The measurement frequency was reduced to several times a day during the remainder of the start-up period. Methane, VOCs, and hydrogen sulfide were not detected during the remainder of the start-up period. Note that the meter has pre-set safety limits for these parameters and an alarm sounds if they are exceeded.

The measurement frequency during the remainder of the construction period remained at several times per day. There were no detections of methane, VOCs, or hydrogen sulfide during the remainder of the construction period.

6.1.2 Asbestos Results

Measurement for airborne asbestos fibers was conducted with a Gillian GilAir 5 sampling pump operating at 2 liters per minute (L/min) to draw air through a 25 mm diameter mixed cellulose ester (MCE) fiber filter. The filter was removed at the end of the sample duration and sent to Forensic Analytical Laboratories in Hayward, California which has accreditation from the American Industrial Hygiene Association. The samples were analyzed for airborne asbestos by National Institute for Occupational Safety and Health (NIOSH) Method 7402 using transmission electron microscopy.

Asbestos sampling was conducted weekly during the project. The results of asbestos monitoring are provided in Appendix J. There were no detections of airborne asbestos fibers during the project. Note that these results are consistent with the stockpile soil sampling results where there were no detections of bulk asbestos in any of the 131 soil stockpiles.

6.2 Meteorological Monitoring

A meteorological station was installed at AM1 on March 7 to 8, 2008 and 15-minute average measurements of wind direction/speed, ambient temperature, and barometric pressure were collected continuously from March 9, 2008 through September 30, 2009. The meteorological equipment was calibrated at the start of the program and on April 30, 2009. The Air Monitoring Specialist downloaded data from the meteorological station on a weekly basis.

6.2.1 Wind Speed

Wind speed data is summarized by month in Table 6-2. Measured wind speed at the Site ranged from 0 to 16.5 miles per hour (mph) during the project. Monthly mean wind speeds tended to be higher in spring and summer months compared to fall and winter months. The frequency of wind measurements is charted on Figure 6-2. Wind speed measurements were grouped into general wind speed classes (*i.e.*, 0 mph up to 5 mph, 5 mph up to 10 mph). The frequency of wind speed measurements is indicated for each wind speed class. Over 90% of wind speed measurements at the Site were below 5 mph.

6.2.2 Wind Direction

Wind direction measurements are commonly presented as a wind rose. A wind rose groups wind direction measurements into ranges of degrees (0 to 22.5, 22.5 to 45, etc.) and represents the ranges by a vector on a radial chart. The length of the vector is determined by the number of measurements in that range compared to the total number of measurements. In addition, a wind rose can also provide information on wind speed by coloring the vectors that correspond to wind speed ranges. Wind roses were created using Rose Works Joint Frequency Distribution Program software by UAI Environmental to display both wind direction and wind speed. Rose Works was used because it accepts raw 15-

minute data generated from the meteorological station without the need to average or round values for pre-processing input files.

A wind rose that depicts cumulative wind direction and speed measurements during the construction period is provided in Figure 6-3. Monthly wind roses that depict measured wind direction and speed for March 2008 through September 2009 are provided in Figure 6-4. Wind blows predominantly across the Site from the southwest to the northeast at low speed (*i.e.*, less than 5 mph). The upwind station is typically AM1 and the downwind station is typically AM4 with the other stations typically cross-wind. When wind speed reaches 10 to 15 mph, the wind typically changes direction and blows from the northwest to the southeast. During these periods of higher winds, AM2 and AM3 tend to be the downwind stations.

6.2.3 Temperature, Humidity, Pressure, and Precipitation

Ambient temperature, relative humidity, barometric pressure, and precipitation during the project are summarized by month in Table 6-3. The Site is located in Folsom which has a moderate, Mediterranean-type climate with about nine months of mild to hot, dry conditions and three months of cold, wet conditions. Measured ambient temperature at the Site ranged from 28 to 109°F. Monthly mean ambient temperatures were highest in summer months (74 to 77°F) and lowest in winter months (44 to 54°F). Measured relative humidity at the Site ranged from 6 to 34%. Monthly mean relative humidity was highest in winter months (79 to 83%) and lowest in summer months (39 to 45%). The Site is located at approximately 155 feet above mean sea level and measured barometric pressure at the Site was relatively constant, ranging from 29.23 to 30.45 inches of mercury. Precipitation data was obtained from Weather Underground Station KCAFOLSO4 located about 1 mile from the Site. A total of 18.9 inches of precipitation occurred during the construction period from October 2008 through September 2009. The majority of the precipitation occurred between November 2008 and March 2009. The most significant precipitation event of 1.6 inches occurred on November 1, 2008 while construction was suspended and the Site was winterized as shown on Figure 3-1.

6.3 Perimeter Monitoring

Perimeter monitoring for dust and metals at AM1 through AM5 was conducted by the Air Monitoring Specialist approximately three times a week during each week of construction activity involving earthwork (*e.g.*, excavation, loading, screening, backfilling, and transporting).

6.3.1 Dust

Dust was measured as PM_{10} and each station was equipped with a Thermo Electron model pDR-1200 meter and air pump that provided average 15-minute PM_{10} measurements. The meters were typically operated from 7:30 a.m. to 3:30 p.m. for an approximate sampling duration of 8 hours. Initial calibration of the

pDR-1200 was performed by the manufacturer. The calibration of the pDR-1200 was verified weekly with a zeroing filter that filtered the sampling air stream of detectable aerosols.

Pre-construction PM_{10} monitoring was conducted on six days: July 1, July 28, August 13, 21, and 28, and October 10, 2008. During these pre-construction monitoring events, 15-minute PM_{10} measurements at all locations ranged from 0 to 62 micrograms per cubic meter (µg/m^3) with a mean of 10.2 µg/m^3 as summarized in Table 6-4. Daily 8-hour PM_{10} (*i.e.*, mean of all 15-minute measurements during the 8-hour sampling period) ranged from 2 to 24 µg/m^3. These measurements provide an indication of baseline concentrations of PM_{10} from other sources near the Site prior to the start of construction. Note that the pre-construction period mean of 10.2 µg/m^3 represented approximately 6.8% of the 150 µg/m^3 PM_{10} action level.

Construction PM_{10} monitoring was conducted on 75 days. During the construction period, 15-minute PM_{10} measurements ranged from 0 to 406 µg/m^3 with a mean of 20.6 µg/m^3 as summarized in Table 6-4. Daily 8-hour PM_{10} ranged from 1 to 109 µg/m^3. Both the 15-minute and daily 8-hour maxima during construction start-up were greater than during pre-construction. A total of three 15-minute PM_{10} measurements out of 7,453 total (0.04%) were above the action level of 150 µg/m^3. The occurrences when the dust action level was exceeded are discussed below.

- <u>December 9, 2008</u>: the maximum 15-minute PM_{10} measurement during the project of 406 µg/m^3 occurred at 8:53 p.m. at AM-2. The two previous measurements at AM-2 were 78 and 143 µg/m^3, and the two following measurements 310 and 95 µg/m^3. This 75-minute spike appeared to be an isolated incident based on maximum 15-minute PM_{10} measurements at stations AM-1 and AM-4 during the same day of 93 and 61 µg/m^3, respectively. Wind was negligible during the 75-minute period (less than 1 mph) and blew from the north-northeast. Daily 8-hour PM_{10} at the three stations was similar with a range from 41 to 55 µg/m^3.

- <u>April 15, 2009</u>: AM-3 had a maximum 15-minute PM_{10} measurement of 167 µg/m^3 at 2:38 p.m. The values measured by AM-3 right before and after were 5 and 9 µg/m^3, respectively. This 15-minute spike was quickly corrected by the CQA Manager as discussed below.

When the action level was exceeded, the CQA Manager immediately instructed the Construction Contractor to implement additional dust suppression measures (*e.g.*, increase water application) and/or modify work practices as necessary to control dust emissions.

6.3.2 Metals

For metals analysis, the pDR-1200 meters also sampled a 37-mm diameter Teflon filter cassette at a flow rate of approximately 1 L/min over a duration of 8 hours. Samples were analyzed at Chester LabNet in Tigard, Oregon by X-ray fluorescence (XRF) spectroscopy per EPA Method IO-3.3. Per the Air Monitoring Plan, metals were analyzed from the filter set that corresponded with the highest PM_{10} measurements for the week. If any metals were above action levels from the selected filter set, then metals were also analyzed from the filter sets collected prior to and after the selected filter set.

Metals were analyzed from four of the six pre-construction monitoring event filter sets on July 1, July 28, August 28, and October 10, 2008. During these pre-construction monitoring events, all 16 metals were detected at least once as shown in Table 6-5. Four metals (arsenic, cadmium, mercury, and nickel) had maximum detections between 54 and 88% of their respective action levels. The remaining metals had maximum detections that were 14% or less of their respective action levels. Detections of airborne metals prior to construction indicate that other sources near the Site represented a significant portion of the action level for arsenic, cadmium, mercury, and nickel.

Metals were analyzed from filter sets on 47 days throughout the construction period. During the construction period, all 16 metals were detected at frequencies ranging from 7 to 68% as shown in Table 6-5. Four metals (arsenic, cadmium, cobalt, and nickel) had maximum detections at or above their respective action levels as discussed below. The maximum detection for mercury was 54% of its action level which was the same as during the pre-construction period. The remaining metals had maximum detections that were 37% or less of their respective action levels. The occurrences when metal action levels were exceeded are discussed below.

- <u>Arsenic</u>: detected in 12 of 161 air samples and ranged from 0.0014 to 0.029 µg/m^3 with a mean of 0.013 µg/m^3 and a CV of 0.75. No samples had an arsenic concentration above the action level of 0.03 µg/m^3; however, AM-1 had an arsenic concentration of 0.29 µg/m^3 on July 25, 2009 that was within 97% of the action level. Note that pre-construction measurements of arsenic were significant and represented between up to 73% of the action level.

- <u>Cadmium</u>: detected in 83 of 161 air samples and ranged from 0.0016 to 0.27 µg/m^3 with a mean of 0.055 µg/m^3 and a CV of 0.89. A total of five samples had a cadmium concentration above the action level of 0.13 µg/m^3: AM-3 at 0.16 µg/m^3 on March 30, 2009; AM-1 at 0.16 µg/m^3 and AM-4 at 0.14 µg/m^3 on May 21, 2009; AM-3 at 0.27 µg/m^3 on July 15, 2009; and AM-2 at 0.24 µg/m^3 on July 16, 2009. With the exception of the two day period July 15 to 16, 2009, analysis of the

filter sets collected prior to and after the days with cadmium exceedances indicated that nickel was below the action level. Note that pre-construction measurements of cadmium were significant and represented between up to 63% of the action level.

- Cobalt: detected in 50 of 161 air samples and ranged from 0.0014 to 0.088 µg/m^3 with a mean of 0.034 µg/m^3 and a CV of 0.63. A total of three samples had a cobalt concentration above the action level of 0.069 µg/m^3: AM-4 at 0.088 µg/m^3 on May 9, 2009; AM-1 at 0.071 µg/m^3 on May 13, 2009; and AM-1 at 0.079 µg/m^3 on May 23, 2009. Analysis of the filter sets collected prior to and after these days with cobalt exceedances indicated that cobalt was well below the action level. Note that pre-construction measurements of cobalt were insignificant with only one detection that represented 6% of the action level.

- Nickel: detected in 50 of 161 air samples and ranged from 0.0011 to 0.064 µg/m^3 with a mean of 0.020 µg/m^3 and a CV of 0.82. A total of two samples had a nickel concentration above the action level of 0.05 µg/m^3: AM-1 at 0.063 µg/m^3 on March 18, 2009 and AM-4 at 0.064 µg/m^3 on March 27, 2009. Analysis of the filter sets collected prior to and after these days with nickel exceedances indicated that nickel was below the action level. Note that pre-construction measurements of nickel were significant and represented between up to 88% of the action level.

When the action level was exceeded, the CQA Manager reviewed the construction activities and dust suppression measures that occurred on that day as well as on monitoring days prior to and after the day with the exceedance. The CQA determined if the Construction Contractor should implement additional dust suppression measures and/or modify work practices as necessary to control dust emissions.

6.4 Data Interpretation

Data interpretation consisted of evaluating dust control measures and performing an upwind/downwind evaluation. Statistical analyses (using SPSS version 15.0 statistical software) such as Student's *t*-test and analysis of variance were performed to assist with the data interpretation and the statistical report is provided in Appendix J.

6.4.1 Evaluation of Dust Control Measures

To evaluate the effectiveness of dust control measures, PM_{10} measurements during the construction were compared to PM_{10} measurements during the pre-construction period. All 15-minute PM_{10} measurements at all locations were pooled together during the pre-construction period and during the construction period. The statistical analysis indicated that the PM_{10} means are significantly

different with the construction period mean of 20.6 µg/m^3 about twice as high as the pre-construction period mean of 10.2 µg/m^3. It can be inferred that construction activities temporarily raised the PM_{10} levels on-site by approximately 10 µg/m^3 above baseline levels. However, the construction period mean of 20.6 µg/m^3 was well below the action level of 150 µg/m^3 indicating that dust control measures have been effective.

A similar pre-construction and construction period comparison was conducted on arsenic, cadmium, cobalt, mercury, and nickel. These five metals were selected because they had maximum detections near or above their respective action levels during pre-construction and/or construction. For each metal, all results at all locations were pooled together during the pre-construction period and during the construction period. The statistical analysis considered non-detected results as half the detection limit. Mean construction period metals concentrations in air samples were significantly higher than pre-construction period concentrations for some metals (arsenic and cadmium), but not significantly different for other metals (cobalt, mercury, and nickel). This suggests that construction activities temporarily increased mean concentrations for arsenic and cadmium in air above pre-construction levels.

6.4.2 Upwind /Downwind Evaluation

An upwind/downwind evaluation was performed on Site air quality data generated to quantify Site emissions that may be transported off-site. The difference in concentration between downwind and upwind stations yields an “adjusted concentration” that represents the contribution of Site emissions to the total downwind concentration. As mentioned previously, wind blew predominantly across the Site at low speeds from the southwest to the northeast; therefore, the upwind station is typically AM1 and the downwind station is typically AM4.

All 15-minute PM_{10} measurements at AM1 were pooled together for the construction period. The process was repeated with AM4 readings. The statistical analysis indicated that PM_{10} measurements at AM1 were significantly different than those at AM-4; however, the mean of each data set differed only by 2 µg/m^3. At a range of 21 to 24 µg/m^3, the mean construction period PM_{10} measurements for both AM1 and AM-4 were well below the action level of 150 µg/m^3. This suggests that dust generated from construction activities during the project was generally contained on-site and was not transported off-site in any appreciable quantity.

6.5 Summary

Air monitoring was conducted during the project according to the Air Monitoring Plan and was an effective means for the CQA Manager to evaluate the effectiveness of the Construction Contractor’s dust control measures. During the project, wind blew predominantly across the Site from the southwest to the

northeast at low speed (*i.e.*, less than 5 mph) with AM-1 as the upwind station and AM4 as the downwind station. When wind speed reached 10 mph to the project maximum of 16.5 mph, the wind typically changed direction and blew from the northwest to the southeast with AM2 and AM3 as the downwind stations. There were no detections of methane, VOCs, hydrogen sulfide, and airborne asbestos fibers during monitoring at the excavation.

During the construction period, 15-minute PM_{10} measurements ranged from 0 to 406 µg/m^3 with a mean of 20.6 µg/m^3. A total of three 15-minute PM_{10} measurements out of 7,453 total (0.04%) were above the action level of 150 µg/m^3. Construction activities temporarily raised the PM_{10} levels on-site by approximately 10 µg/m^3 above baseline levels indicating that dust control measures were effective.

During the construction period, action levels for cadmium, cobalt, and nickel were exceeded; however, the exceedances were infrequent and typically isolated with concentrations below action levels at other monitoring stations on the same day. Dust control measures were effective given that metals concentrations were below action levels during a monitoring event following a day with an exceedance. Note that these metals were present at baseline levels at 63 to 88% of their respective action levels indicating there are off-site sources.

7.0 DATA QUALITY REVIEW

The quality of the analytical data was reviewed per the quality assurance specifications included in the Clean Closure Work Plan and individual analytical results were qualified accordingly. The percentage of results that are qualified as estimated or rejected due to quality control deficiencies is an indication of the overall data quality for a given analytical method. During evaluation of the data, the following qualifiers were used:

- U – the analyte was not detected at the method detection limit;
- J – the reported concentration is estimated either due to QC deficiencies or because it is between the practical quantitation limit and the method detection limit;
- UJ – the analyte was not detected at an estimated detection limit; and
- R – the data was rejected and is not usable for any purpose.

7.1 Soil Data Quality Review

Table 7-1 provides a summary of the data quality review of stockpile soil sampling and confirmation soil sampling data. Overall, the quality of the data was excellent: out of a total of 23,758 analytical results, 23,748 results (99.96%) were usable and 23,012 results (96.8%) were quantitative. The following is a summary of the 746 results that were qualified and 10 results that were rejected for various quality control deficiencies. Note that the 746 qualified results were still usable for comparison to cleanup goals.

- Holding Time: samples analyzed out of method holding times are usable, but qualified as estimated values. Two samples for SVOCs, one for herbicides, and five samples for TPH were analyzed out of method holding times resulting in a total of 52 results qualified as estimated.

- Surrogate Recovery: surrogate (*i.e.*, non-target) chemicals are spiked into primary samples to determine the accuracy of analytical results. If surrogate recoveries are outside method control limits, then the results are typically usable, but may have a low or high bias and are qualified as estimated. A total of 10 herbicide results were qualified as estimated with a low bias due to low surrogate recoveries. A total of seven VOC results were qualified as estimated with a high bias, due to high surrogate recoveries.

- Method Blank Contamination: method blank samples are used to determine if there is any contamination present in analytical containers and instrumentation. If a chemical is detected in a method blank, then any associated primary result within five times the detected concentration is qualified as not detected with an estimated detection limit. A total of 449

results were qualified as not detected with an estimated detection limit, due to the presence of chemicals in associated method blanks. Chemicals most often detected in method blanks were GRO (93), molybdenum (51), naphthalene (44), selenium (36) and methylene chloride (33).

- Laboratory Control Sample Recovery: target chemicals are spiked into a laboratory control sample (LCS) to determine the accuracy of analytical results. If LCS recoveries are outside method control limits, then the results are typically usable, but may have a low or high bias and are qualified as estimated. A total of 28 results were qualified as estimated with low (26) or high (2) bias due to LCS recoveries outside the limits.

- Matrix Spike Recovery: target chemicals are spiked into a selected primary sample matrix to determine the accuracy of analytical results. If matrix spike (MS) recoveries are outside method control limits, then the results are typically usable, but may have a low or high bias and are qualified as estimated. A total of 158 results (mostly metals) were qualified as estimated with low (102) or high (56) bias, due to matrix spike recoveries below or above the method control limits.

- Field Duplicate Precision: one field duplicate was analyzed for every 20 primary samples (*i.e.*, 5% frequency) to determine the precision of analytical results. If the primary/duplicate results have a relative percent difference (RPD) higher than the 50%, both the primary and duplicate results are qualified as estimated. A total of seven primary/field duplicate sample pairs had a RPD higher than the 50% limit for seven chemical categories: metals, nitrate, sulfate, VOCs, specific conductance, moisture and DRO. These 42 results were qualified as estimated. Both the primary and duplicate sample results were compared to cleanup goals to determine if a stockpile was to be disposed off-site or backfilled on-site.

- MS/MSD and LCS/LCSD Precision: matrix spike duplicates (MSD) and laboratory control sample duplicate (LCSD) are used to compare RPD with MS and LCS results, respectively, to determine the precision of analytical results. A total of two results (1 lead, 1 DRO) were qualified as estimated due to MS/MSD precision outside method control limits. One result for benzoic acid was qualified as estimated due to LCS/LCSD precision outside method control limits.

- Other Issues: additional results were qualified as estimated for first column/second column precision outside the limits (6 herbicide results), and column performance check problems (3 pesticide results).

- Rejected Results: a total of 10 non-detected herbicide/pesticide results were rejected. Nine due to low LCS and MS recoveries and one because of interferences present during analysis.

7.2 Air Data Quality Review

Quality control was evaluated through the collection and analysis of field and laboratory blank air filters. One field blank was analyzed for metals and asbestos fibers for every 20 primary samples (*i.e.*, 5% frequency). Field blank media was selected randomly from the same lot as the primary sample media. Field blanks accompanied primary samples at all times on Site and during shipment to and from the laboratory. Field blanks were not taken out of their individual packaging. Laboratory blanks were analyzed for metals for every filter media lot used during the project.

A total of 13 field blanks and 2 laboratory blanks were analyzed for metals and the results are summarized in Table 7-2. All field and laboratory blanks had at least one metal detected which is typical for air sampling filter media (Graening et al, 2008). As opposed to the soil and water sampling, it is not typical to qualify associated primary sample results since trace detections of metals in filter media is common. Detections of metals in blank filters represented a small, but measurable portion of the action level for arsenic, cadmium, mercury, and nickel.

A total of five field blank filters were analyzed for asbestos fibers. None of the field blanks had detections of asbestos fibers.

Analytical method quality control was evaluated through various instrument accuracy and precision checks specified in each analytical method as summarized in the following table.

Analytical Method Quality Control				
Method	**Quality Control Element**	**Frequency**	**Acceptance Criteria**	**Corrective Action**
XRF Metals IO-3.3	Calibration verification	Weekly	Within NIST uncertainties	Re-calibrate
	Instrument precision	Once per batch up to 15 samples	90 to 110% recovery	Batch re-analysis
	Inter-excitation condition check	100%	Within analysis uncertainty	Determine cause; remedy
	Sample replicate precision	10%	Within analysis uncertainty	Determine cause; remedy

8.0 CLEAN CLOSURE CERTIFICATION

This section describes the restoration of the Site and post-closure land use and provides a certification of clean closure activities.

8.1 Site Restoration

After the confirmation sampling was complete, the Construction Contractor proceeded with final grading of the Site. Excavated areas were graded to ensure that drainage was adequate to prevent ponding or erosion. A small ditch was constructed on the eastern margin to accommodate minor weeps from the bluff. At the southwest corner of the Site, a portion of the storm water detention basin was preserved since the Site has a gentle 1 to 2% slope to the southwest. Three as-built drawings are provided as documentation of the project:

- Figure 8-1: Existing Conditions October 2008, Beginning of Clean Closure;
- Figure 8-2: As-Built, Excavation; and
- Figure 8-3: As-Built, Final Grade.

After final grading was complete, the fencing was repaired in several sections along the western perimeter of the Site. The Site was hydro-seeded with a three step process (seeding, straw cover, and tackifier). The Construction Contractor installed erosion protection measures including a continuous silt fence along the western perimeter. The City will implement BMPs and conduct storm water inspections as required by the SWPPP until the vegetation is sufficiently established. At that time the City will file a Notice of Termination with the RWQCB.

8.2 Post-Closure Land Use

Post-closure land use in the near term will be restricted to vehicle parking and equipment storage. Future land use is unknown at this time, and any proposed use will be subject to the requirements of the City General Plan and Historic District Design and Development Guidelines.

8.3 Certification of Clean Closure

The City and Brown and Caldwell certify that the clean closure of the Corporation Yard Landfill met the requirements of 27 CCR §21090(f) and §21810 as detailed by the RWQCB in the Updated WDRs (RWQCB, 2008b) and by the CIWMB in the LEA Clean Closure Advisory (CIWMB, 1994). The completed requirements include the following:

- Characterizing the Site (*e.g.*, test pits, borings, and soil/groundwater sampling) to develop a CSM and to define nature/extent of waste;
- Preparing a Clean Closure Work Plan and engineering plans and specifications;
- Obtaining regulatory agency permits and notice to proceed;
- Developing target parameters for various environmental media and cleanup goals based on a future residential land use scenario;
- Conducting the project in a manner that protected human health and the environment;
- Providing a full-time, on-site CQA Manager;
- Involving regulatory agencies and the public in both the planning and execution phases of the project;
- Excavating fill and segregating waste and recyclables from soil;
- Conducting stockpile and confirmation soil sampling;
- Conducting excavation and perimeter air monitoring;
- Disposing contaminated soil at an off-site Class II disposal facility;
- Final grading and restoring the Site; and
- Preparing this detailed Clean Closure Certification Report that includes documentation of waste removal, characterization, and disposal.

The City requests that the regulatory agencies respond by letter with concurrence that:

1. Clean closure was completed in accordance with requirements in the Updated WDRs and other identified regulatory requirements; and

2. The Site is suitable for future unrestricted land use including residential.

9.0 REFERENCES

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BC, 2008d. *2008 Annual Monitoring Report, Corporation Yard Landfill, Folsom, California.* January 30.

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