SITE ASSESSMENT REPORT

LOWER LAKES
HANSEN DAM FLOOD CONTROL BASIN
LOS ANGELES, CALIFORNIA

Contract No. DACA09-01-D-0004, D.O. No. 0005

Prepared for:

U.S. Army Corps of Engineers
Los Angeles District
CESPL-ED-MI
911 Wilshire Boulevard
Los Angeles, California 90017-3401

Prepared by:

SOTA Environmental Technology, Inc.
16835 W Bernardo Dr., Suite 212
San Diego, California 92127

Version: Draft
May 19, 2003
SOTA Project No. 02HW013

Signature: _____ Date: _____
Yu Zeng, Ph.D., Project Manager

Signature: _____ Date: _____
Dakshana Murthy, Ph.D., P.E., Program Manager

Table of Contents

TABLES

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
COPC	Contaminants of Potential Concern
CRDL	Contract Required Detection Limit
CRWQCB	California Regional Water Quality Control Board
CWC	California Water Code
DHS	California Department of Health Services
D.O.	Delivery Order
DQO	data quality objective
EPA	(United States) Environmental Protection Agency
FCB	Flood Control Basin
GPS	Global positioning systems
HSA	Hydrographic Sub-Area
IWMB	Integrated Waste Management Board
LACDA	Los Angeles County Drainage Area
LARWQCB	Los Angeles Regional Water Quality Control Board
LEA	Local Enforcement Agency
MCL	Primary Maximum Contaminant Level (DHS, 1999)
NPDES	National Pollutant Discharge Elimination System
MSL	mean sea level
PARCC	precision, accuracy, representativeness, completeness and compatibility
PID	Photo Ionization Detector
PRG	Preliminary Remediation Goals (EPA Region IX, 1999)
QA	quality assurance
QC	quality control
PM	Project Manager
SOTA	SOTA Environmental Technology, Inc.
SOW	Scope of Work
SSHSP	Site Specific Health and Safety Plan
US	United States
USACE	United States Army Corps of Engineers
VOC	volatile organic compound
WDR	Waste Discharge Requirement

ENGINEER'S CERTIFICATION

I certify that the work performed and the report prepared herein was conducted under the direct supervision of the undersigned who is a Registered Civil Engineer and Registered Environmental Assessor in the States of California and Arizona.

_____

Dakshana Murthy, Ph.D., P.E., R.E.A.
California Registered Environmental Assessor #01046 Expires on 6-30-03
California Registered Civil Engineer #36331 Expires on 6-30-04
Arizona Registered Civil Engineer #29090 Expires on 6-30-04

EXECUTIVE SUMMARY

This Site Assessment (SA) summarizes the results of the December 2002 through March 2003 lake water, sediment, and soil sampling activities that occurred at the Lower Lakes, Hansen Dam Flood Control Basin (FCB), California. This report evaluates the nature of contamination present in and near the Large and Small Lower Lakes that may have resulted from the placement of material at those locations by the U.S. Army Corps of Engineers and potential adverse impacts to surface water, groundwater, and human health resulting from the placement of the material. The Site Assessment was conducted under contract with the United States Army Corps of Engineers (USACE), Los Angeles District.

Samples were collected from stockpiles of soil located near both Lower Lakes and analyzed for a number of constituents including VOCs, PCBs and perchlorate. None of these compounds were detected in the samples collected, except PCB-1260. PCB-1260, alpha-chlordane, gamma-chlordane, P,P'-DDD, P,P'-DDE, P,P'-DDT, and dieldrin were detected in soil stockpile samples near both lakes at concentrations below the industrial and residential Preliminary Remediation Goals (PRGs). TPH-gasoline, diesel, and motor oil, for which industrial and residential PRGs have not yet been established, were reported in one or more soil stockpile samples. Several priority pollutant metals were present at low levels comparable to background soil levels. These minerals appear to be naturally occurring at the project site. None of the metals detected in the soil samples, except arsenic and mercury, (in trace or estimated concentrations) exceeded the industrial or residential PRGs.

VOCs, perchlorate, NDMA, 1,2,3-TCP, gasoline and 1,4-dioxane were analyzed and not detected in sediment samples collected in both lakes. PCB-1260, alpha-chlordane, gamma-chlordane, P,P'-DDD, P,P'-DDE, P,P'-DDT, dieldrin, endrin aldehyde, heptachlor, and heptachlor expoxide were detected at levels much below industrial and residential PRGs in the sediment samples collected. Low levels (estimated concentrations) of TPH-diesel and motor oil were detected. Cadmium, chromium, copper, lead, nickel, selenium, silver, and zinc were detected at levels below the industrial and residential PRGs. Arsenic and mercury were detected (in trace or estimated concentrations), but are believed to be naturally occurring at the site.

The water quality data suggest that lake water quality is relatively good. No VOCs, pesticides, PCBs, or perchlorate were found in lake water samples. TPH-gasoline (estimated concentrations) was present in the water in both lakes. Gasoline was also detected at the same level in the up gradient background surface water samples. Several metals were detected at low or estimated levels in the water in both lakes and were below the Maximum Contaminant Levels (MCLs). Most of the detected metals (cadmium, chromium, copper, nickel, selenium, zinc and mercury) were also found in the up gradient background surface water samples.

The SA activities and laboratory analysis indicate no evidence of elevated levels of organic or inorganic compounds in the soil, sediment, or water samples that were collected from the Lower Lakes, except for diesel detected in one stockpile sample collected near the Small Lower Lake. It should be noted that no diesel was found in water or sediment samples collected in the Small Lower Lake.

The Site Assessment results suggest that there has been no significant release of hazardous substances from the materials placed in and adjacent to the Lower Lakes into the water at either site. Further, sediment samples collected from the Lower Lakes indicate that lake sediment was not impacted by the materials placed in either lake. Thus, it appears unlikely that groundwater at the site has been adversely impacted by the placement of materials in and near the Lower Lakes. It is therefore our conclusion that the materials placed in and near the Lower Lakes pose no significant risk to human health or to the environment, and may be disposed on-site following approval and proper permitting by the RWQCB and the City of Los Angeles, Local Enforcement Agency. Following regulatory approval and disposal of the remaining *Arundo*/soil stockpile located to the north of the Small Lower Lake in an approved landfill, SOTA recommends No Further Action at the Hansen Dam FCB.

1.0 INTRODUCTION

SOTA Environmental Technology, Inc. (SOTA) has been contracted by the United States Army Corps of Engineers (USACE), Los Angeles District, to conduct surface water, sediment, and soil sampling associated with site assessment activities, under Contract No. DACA09-01-D-0004, D.O. No. 0005, in accordance with the Scope of Work (SOW) dated September 4, 2002. The site assessment activities took place at the Large and Small Lower Lakes at Hansen Dam Flood Control Basin (FCB), California. The site location map is presented in Figure 1.

The Site Assessment (SA) is performed to characterize *Arundo donax* (a type of reed) mixed with soil, stockpiled to the north of the Small Lower Lake, and native soil stockpiled on the northwest corner of the Large Lower Lake at Hansen Dam Flood Control Basin (FCB). The SA is intended to provide data that will be compared to various regulatory guidance documents that address water quality and solid waste requirements. The approved Work Plan (WP), along with the Site Specific Health and Safety Plan (SSHSP), comprised all the project-related documentation.

Prior to the SA, SOTA prepared the WP and SSHSP, dated October 28, 2002, and submitted for approval by USACE and Los Angeles Regional Water Quality Control Board (LARWQCB), the lead regulatory agency.

1.1 Objectives

The assessment is intended to provide a preliminary characterization of soil, sediment, and surface water at the site. Specifically, the proposed SA activities are intended to help fulfill the following objectives:

- Characterize the types of contaminants, if any, present at the site, as a result of *Arundo Donax* mixed with soil, which were stockpiled at the smaller lake and native soil stockpiled at the larger lake
- Delineate the distribution of contamination, if any, related to the soil stockpiles among the soil stockpile areas, nearby surface water, and sediment in the Lower Lakes
- Characterize the potential migration paths of any subsurface contamination, and
- Identify and assess the potential adverse effects to public health and the environment

1.2 Scope of Work

The scope of work for this project includes the following activities:

- After the regulators approved WP and SSHSP, sampling of nine source and soil samples, five sediment samples, and the collection of nineteen surface water samples
- Laboratory analysis of the samples collected, and
- Preparation and presentation of a report summarizing the results, conclusions, and recommendations of the SA activities at the subject site.

1.3 Report Format

The Lower Lake SA Report is organized as follows:

- Section 1 - Introduction
- Section 2 - Site Background and History
- Section 3 - Field Sampling Activities
- Section 4 - Laboratory Analyses
- Section 5 - Analytical Results
- Section 6 - Discussions and Conclusions
- Section 7 - References

Tables and Figures are included at the end of section 7. Appendices are attached with the following information:

- Appendix A Laboratory Analytical Reports
- Appendix B Photo documentation Logs
- Appendix C Analytical Laboratories Certifications
- Appendix D Sections of the 1999, 2000, 2001 RWQCB Water Quality Monitoring Results

2.0 SITE BACKGROUND AND HISTORY

2.1 Site Location and Description

The Large and Small Lower Lakes are located within Hansen Dam FCB in Los Angeles County, California. The geographic coordinates are 34° 16' 6.18" N latitude and 118° 23' 7.92" W longitude for the Large Lower Lake and 34° 16' 6.1" N latitude and 118 22' 27.9" W longitude for the Small Lower Lake. To reach the site, travel northwest from Los Angeles approximately 0.2 miles from the intersection of the 210-freeway and Foothill Drive.

Hansen Dam was constructed between September 1939 and September 1940 as part of the general system of flood control for the Los Angeles County Drainage Area (LACDA). It was constructed primarily for the purpose of flood control for the lower portions of the San Fernando Valley and the City of Los Angeles. The Dam is located on the northern edge of the San Fernando Valley in Tujunga Wash just below the confluence of the Big and Little Tujunga Creeks, approximately four miles west of the town of Sunland, California (Figure 1). The City of Los Angeles Department of Recreation and Parks leases 1,437 acres within the Hansen Dam Flood Control Basin and operates several recreational facilities on the property.

The climate of Hansen Dam is characteristically temperate; summers are warm and dry with daily temperatures reaching 90° F or higher, and winters are generally mild with daily average temperatures 55° F to 65° F. Mean annual rainfall is 12 inches.

2.2 Site History

In the 1990s, U.S. Army Corps of Engineers or Corps' contractors removed accumulations of sand and gravel to restore flood control storage capacity lost due to sediment buildup from the Big Tujunga and Little Tujunga Washes. The excavations resulted in the creation of "borrow pits." Over time, the pits filled with water and appeared like natural lakes. Currently, there are two such lakes (Large and Small Lower Lakes); they contain fish, are surrounded by vegetation, and have become important resources for birds and other wildlife.

The USACE contractors placed various materials in or adjacent to the Lower Lakes at Hansen Dam FCB. During the SA activities, two source areas were identified in these two artificially created lakes. One source area is composed of approximately 2,200 cubic yards of native soil that was excavated from beneath the re-constructed swim lake and placed above approximately 1,650 cubic yards of construction debris that was comprised mostly of crushed concrete and other clean fill in the northwest corner of the Large Lower Lake. The majority of this material is beneath the water surface with the exception of a small disposal pile of native soil near the northwestern edge of the Large Lower Lake. The other source area is approximately 900 cubic yards of *Arundo donax* (a type of reed) mixed with soil from Sepulveda Dam FCB and approximately 300 cubic yards of *Arundo donax* mixed with soil from Whittier Narrows Dam FCB. All this was placed in the northeastern embankment of the Small Lower Lake. The stockpile locations are presented in Figure 2.

The public raised concerns regarding potential threats to public health and the environment because of the materials placed in and near the Lower Lakes at Hansen Dam FCB. The City of Los Angeles, Local Enforcement Agency (LEA), contacted the Corps of Engineers concerning the piles of *Arundo donax* and soil stockpiled to the north of the Small Lower Lake. The LEA regulates solid waste in the City of Los Angeles on behalf of the California Integrated Waste Management Board (IWMB). The Los Angeles District Army Corps of Engineers has contracted with SOTA to characterize the fill material and determine whether or not the filling activities were conducted in compliance with LARWQCB General National Pollutant Discharge Elimination System (NPDES) Permits, Waste Discharge Requirements (WDR), and other applicable regulatory requirements.

2.3 Local Hydrology

The two lakes are located at approximately 1000 feet above mean sea level (MSL) in the Los Angeles River watershed. The nearby upstream surface water includes Haines Canyon Creek and the Big and Little Tujunga Washes. No drinking water intakes are within three downstream miles of the site. Although the site is not a residential area, it is a public recreational facility.

The Los Angeles River Watershed is shaped by the path of the Los Angeles River, which flows from its headwaters in the mountains eastward to the northern corner of Griffith Park where the channel turns southward through the Glendale Narrows, around the Hansen FCB, before it flows across the coastal plain and into San Pedro Bay near Long Beach. The upper portion of the Los Angeles River Watershed is covered by forest or open space, while the remaining watershed is highly developed with commercial, industrial, or residential uses. The Los Angeles River Watershed has impaired water quality in the middle and lower portions of the basin due to runoff from dense clusters of commercial, industrial, residential, and other urban activities. The Clear Water Act 1998 Section 303d lists impairments in a majority of the watershed are due to point and nonpoint sources. These impairments include pH, ammonia, a number of metals, coliform, trash, scum, algae, oil, chlorpyrifos, as well as other pesticides, and volatile organics.

The site is located in the Tujunga Hydrological Area of the Los Angeles-San Gabriel Hydrological Unit (RWQCB, 1995). LARWQCB has designated the surface water in this area with current and potential beneficial usage. The Hansen Dam floodplain behind the Dam supports open coastal sage-scrub vegetation in the Los Angeles area. The Hansen Dam area is valuable as a wildlife corridor. The Hansen Dam FCB and lakes are within the Big and Little Tujunga Wash. The existing beneficial usage of the surface water is to supply groundwater recharge, provide contact and non-contact water recreation, habitats for warm, cold, wild and rare threatened or endangered species, and the potential beneficial usage is to supply groundwater for municipal and domestic purposes. Furthermore, the existing beneficial usage of the groundwater in this area is for municipal and domestic supply, industrial process, services, and agricultural supply.

2.4 Contaminants of Potential Concern (COPC)

Based on preliminary information provided to SOTA regarding the origins of the stockpiled waste, the contaminants of potential concern for this area include emergent chemicals, Total Petroleum Hydrocarbons (TPHs), Polychlorinated Biphenyls (PCBs), and general water quality parameters. All of the COPCs are listed as follows:

Emergent Chemicals

- Volatile organic compounds (VOCs) included methyl tertiary-butyl ether (MTBE)
- Pesticides
- Perchlorate
- Priority Pollutant Metals
- N-nitrosodimethylamine (NDMA)
- 1,4-Dioxane
- 1,2,3-Trichloropropane (1,2,3-TCP)
- Chromium(VI)

Total Petroleum Hydrocarbons and PCBs:

- TPHs such as gasoline, diesel, and motor oil
- PCBs

General Water Quality parameters

- Biological Oxygen Demand (BOD)
- Nitrate
- Nitrite
- Sulfate
- Sulfide
- Chloride
- Total and Fecal Coliform

3.0 FIELD SAMPLING ACTIVITIES

From December 2002 through March 2003, field sampling activities were conducted for the Large Lower Lake and the Small Lower Lake under phased planning activities with the approval of regulators. The sampling activities included collecting soil, water, and sediment at the site and collecting background soil and surface water samples. The completed field activities were in general accordance with the Work Plan and Health and Safety Plan (SOTA, 2002) that were approved prior to the fieldwork by USACE and LARWQCB. The plans defined the field, analytical, Quality Assurance/Quality Control (QA/QC), and health and safety procedures that were implemented during the SA.

Fieldwork began with a site reconnaissance in the morning to verify that the planned sample locations were appropriate and accessible. During the reconnaissance, ambient air was monitored with PID. All field activities were performed under the direct supervision of a California-registered geologist and overseen by the Project Manager from USACE. All field personnel attended daily health and safety meetings, called "tailgate safety meetings". Tri-County Drilling, Inc., San Diego, provided drilling/sampling equipment and a tow boat.

3.1 Sample Locations

The locations and depths for stockpiled soil, background soil, sediment, and water samples were selected based on the approved Work Plan and the comments dated December 17, 2002 and e-mail dated Feb. 11, 2003 from LARWQCB. Consideration was given to the nature of suspected contaminants, and the nature of potentially- contaminated media. Global positioning system (GPS), which uses satellite telemetry, was used to locate the actual sampling points; sample locations are indicated in Figure 3. The actual latitudes and longitudes of the sample locations are listed in Table 1.

According to the work plan, eight stockpiled soil samples were collected and analyzed for COPCs. Four samples (SS-1 through SS-4) were collected from the graded area on the northwest corner of the Large Lower Lake; the sampling location was as close as possible to the fill material. Three samples (SS-5 through SS-7) were collected from the large debris pile located in the north corner of the Small Lower Lake. For quality control purposes, one field duplicate (QC-1) was collected along with SS-3. Also, one sample was collected from the stockpile at the Small Lower Lake, then sorted and weighted for the trash/physical components based on soil (2,000 g), *Arundo donax(*141 g*)*, and plastics, glass and others (3 g). The weight percentage of the trash/physical components are approximately 92 percent soil, 7 percent *Arundo donax,* and 1 percent plastics, glass and others.

One background soil sample (BG-1) was collected from an area outside of the Large Lower Lake not impacted by dumping.

Samples were collected at all possible lake water targets identified as primary targets during the SA. Eighteen samples were collected at the Large Lower Lake and Small Lower Lake to investigate possible contamination. Seven lake water samples (SW-1 through SW-3 at different depths) from the north corner of the Small Lower Lake and nine water samples (SW-4 through

SW-6 at different depths) from the northwest corner of the Large Lower Lake were collected. These water samples were obtained at random locations. Two field duplicate lake water samples (QC-2 and QC-3) from the Large Lower Lake (QC-3) and the Small Lower Lake (QC-2) were collected for quality control purposes. QC-3 was collected along with SW-6-3, and QC-2 was collected along with SW-1-1.

Five surface sediment samples (SD-1 through SD-4) were collected in March 2003 at the Small Lower Lake and Large Lower Lakes to evaluate the surface water pathway. Two sediment samples (SD-1 and SD-2) were collected at sample points directly tangent to the periphery of the fill material on the northeast corner of the Small Lower Lake, and two sediment samples (SD-3 and SD-4) were collected at sample points directly tangent to the periphery of the fill material on the west corner of the Large Lower Lake (Figures 4 and 5). One field duplicate sediment sample (SD-QC-1) was collected along with SD-4 at the Large Lower Lake for quality control purposes.

Four surface background water samples (BG-SW-1 through BG-SW-3) were collected from upstream of the Lower Lakes to determine background levels, originating from the upper watershed of Big and Little Tujunga Washes at the following locations: 1) Big Tujunga Wash, 2) Haines Canyon Creek, outflow from Tujunga Ponds, and 3) Haines Canyon Creek, inflow to Tujunga Ponds, along with one field duplicate sample (BG-SW-QC1) at Haines Canyon Creek, inflow to Tujunga Ponds.

3.2 Sampling Procedure

The following subsection describes sampling procedures that were followed during the collection of soil, sediment and surface water samples.

3.2.1 Soil Sampling

On December 10 and 11, 2002, seven borings (SS-1 through SS-7) were advanced and sampled by Tri-County Drilling Inc. The soil samples were collected from the stockpiled materials using a hand auger at spatially disparate areas. These locations were chosen to identify possible hazardous substances at the site. The soil sample locations are shown in Figures 4 and 5. The samples were collected at horizontal intervals of 2 feet, 5 feet, and 10 feet from the edge of the stockpile and at depths of 2 feet, 6 feet, and 8 feet below the top of the stockpiled materials. This sampling procedure followed LARWQCB directions of 3 vertical and 3 horizontal samples at the Small Lower Lake with dredged soil and vegetative fill material. Similar sampling procedures were followed for the stockpiled soil placed above demolition debris at the Large Lower Lake.

The lead sample was prioritized for all VOCs and TPH-gasoline analyses and transferred to En Core® samplers, in accordance with EPA Method 5035. Then, the end sample was transferred to a stainless steel liner from each sampling interval and was sealed with Teflon® sheets and plastic caps. En Core® samples and liners containing soil samples were labeled properly and submitted for laboratory analysis.

A background soil sample (BG-1) was advanced and sampled by Tri-County Drilling Company at the site, approximately 100 feet from the source area near the Large Lower Lake to evaluate the background soil concentrations.

3.2.2 Sediment Sampling

On March 25, 2003, two surface sediment samples (0-12 inches) at the Small Lower Lake and three surface sediment samples (0-12 inches) at the Large Lower Lake were collected using Navy diver sampling technique. Grab core samples were collected using pre-cleaned dedicated acetate liners. The lead sample was prioritized for all VOCs, TPH-gasoline, and 1,2,3-TCP analyses and transferred to En Core® samplers, in accordance with EPA method 5035 and a laboratory- supplied pre-cleaned 4-ounce glass jars with a Teflon-lined lid. Then, the end sample was sealed with Teflon® sheets and plastic caps. En Core® samples, liners and glass jars containing sediment samples were labeled properly and submitted for laboratory analyses.

3.2.3 Lake Water Sampling

On December 10, 11, 2002 seven lake water samples (SW-1 through SW-3) and nine lake water samples (SW-4 through SW-6), along with two field duplicate samples (QC-2 and QC-3), were collected and sampled by Tri-County Drilling Inc. Lake water samples were taken to determine whether any release to lake water occurred, and whether the release impacted the fishery in Wildlife Creek, and habitats of endangered species associated with the lakes. To collect samples at distinct depth per sample point, a slow speed peristaltic pump (18 grams/liter/minute) was used at three different locations that were spaced laterally in both the Small Lower Lake and the Large Lower Lake. Surface and subsurface water samples at different desired depths were collected using a peristaltic pump and the sample flows were directed into the laboratory-prepared sample containers.

At Small Lower Lake, the samples were collected at three different sample depths (near surface - ~ 3" below the water surface, midway to the bottom, and near the bottom of the lake). The water depths at the lake range between 3 to 3.5 feet at each sample location.

At the Large Lower Lake, due to the observations made during the sampling of the shallow depth of the water body, the samples were collected at three different sample depths (near surface -3" below the water surface, midway to the bottom, and near the bottom) in one location, and at two different depths (near surface -3" below the water surface, and near the bottom) in two locations. The water depths at the lake range from 10 to 13 feet at each sample location. The LARWQCB was notified the change of the sample depths and concurrence was obtained in the field. The samplers were labeled properly and submitted for laboratory analysis.

3.2.4 Background Surface Water Sampling

On March 26, 2003, three background surface water samples (BG-SW-1 through BG-SW-3) along with one field duplicate sample (BG-SW-QC1) were collected with a pre-cleaned dip sampler. The background surface water samples were collected upstream of the probable points of entry. The water samples were then transferred into laboratory-supplied sample bottles.

All sample containers were labeled, and immediately placed in a cooler with ice at 4 ± 2 degrees Celsius. SOTA field personnel delivered all samples to the laboratory immediately after sample collection to meet analytical holding times. Upon receipt by the laboratory, samples were stored and analyzed in accordance with the analytical methods and quality assurance/quality control (QA/QC) procedures established in the Work Plan.

3.3 Equipment Decontamination

All drilling and sampling equipment were thoroughly cleaned prior to initiating any site work and between sample locations. Decontamination of equipment other than soil, sediment, or surface water samplers included the following:

- Hand washing of sample rods using a laboratory grade non-phosphate detergent potable water and scrub brushes, followed by a potable water rinse.

All soil, sediment, or surface water sampling equipment which directly contact sample media, were cleaned between samples according to the following procedure:

- Potable water and non-phosphate detergent wash (using brushes)
- Potable water rinse
- Distilled water rinse
- Air dry and storage in clean aluminum foil or plastic until used

4.0 LABORATORY ANALYSIS

Soil, sediment, and water samples that were collected during the proposed assessment activities were submitted to the fixed-based analytical laboratories for analyses. The analytical laboratories selected for this program (Applied P & Ch Laboratory (APCL), Chino, California; Fruit Growers Laboratory, Inc. (FGL) of Santa Paula, California; Maxxam Analytics, Inc. (Maxxam) of Ontario, Canada) are certified or accepted by the California Department of Health Services (DHS) Environmental Laboratory Accreditation Program. APCL has been validated by the U.S. Army Corps of Engineers Hazardous, Toxic and Radioactive Waste Center of Expertise. FGL and Maxxam are referred by CADHS for the low-level 1,2,3-TCP and NDMA analyses. The laboratory certifications are presented in Appendix C. Laboratory analyses were compliant with the requirements described in the LADPW *Guidelines for Report Submittals* (LADPW, 1991) and LARWQCB's updated laboratory testing requirements (LARWQCB, 2000).

4.1 Analytical Methods and Requirements

The analytical methods selected for the soil, sediment, and water samples are based on the DQO process discussed in the work plan's Section 4.0. The selected analytical methods reflect the types of contaminants of potential concern for the sampled medium and current regulatory agency guidelines.

Soil samples were submitted to the laboratory and analyzed for the following parameters:

- VOCs (including fuel oxygenates) by EPA method 5035/8260B
- TPH-gasoline by EPA method 5035/8015M
- TPH-diesel by EPA method 8015M
- Organochlorinate Pesticides by EPA method 8081A
- PCBs by EPA method 8082
- Perchlorate by EPA 314, and
- Metals by EPA method 6010/7471

Additionally, three soil samples were analyzed for TCLP metals by EPA method 6010/7470.

Sediment samples were submitted to the laboratory and analyzed for the following parameters:

- VOCs (including fuel oxygenates) by EPA method 5035/8260B
- TPH-gasoline by EPA method 5035/8015M
- TPH-diesel by EPA method 8015M
- Organochlorinate Pesticides by EPA method 8081A
- PCBs by EPA method 8082
- Perchlorate by EPA 314

- Metals by EPA method 6010/7471
- Chromium (VI) by EPA method 7199
- 1,4-Dioxane by EPA SIM 8270C
- 1,2,3-TCP by EPA 8260B, and
- NDMA by EPA 1625C

Additionally, one sediment sample was analyzed for TCLP metals by EPA method 6010/7470.

Lake water samples and background surface water samples were submitted to the laboratory and analyzed for the following parameters:

- VOCs (including fuel oxygenates) by EPA method 8260B
- TPH-gasoline and diesel by EPA method 8015M
- Organochlorinate Pesticides by EPA method 8081A
- PCBs by EPA method 8082
- Perchlorate by EPA 314
- Dissolved Metals by EPA method 6010/7470, and
- General Chemistry including nitrate, nitrite, sulfate, sulfide, chloride, Total Dissolved Solid, Total Settable Solid, pH, Total and Fecal Coliform by Various EPA or Standard Methods.

Additionally, the background surface water samples were analyzed for the following parameters:

- 1,4-Dioxane by EPA SIM 8270C
- Chromium (VI) by EPA method 218.6
- 1,2,3-TCP by EPA 504.1, and
- NDMA by EPA 1625C

4.2 Field and Laboratory Quality Control Samples

Five field duplicate samples (QC-1, QC-2, QC-3, SD-QC-1, and BG-SW-QC1) and trip blank (TB-1) were collected. The QC samples were handled and transported in the same manner as the primary samples. Field and laboratory quality control samples (including surrogate compound, laboratory control and duplicate) are presented in Section 5.5.

4.3 Data Validation and Verification

The purpose of data verification and validation is to ensure that the collected data meet the data quality objectives (DQOs), and that the data are of sufficient quality to meet the objectives outlined in the work plan (SOTA, 2002).
The overall quality of tasks performed for the SA was assured by conformance to protocols established for sample collection, analytical procedures, and data management following the

precision, accuracy, representativeness, completeness and compatibility (PARCC) criteria. The following procedures were used for data quality control during the proposed assessment activities at the subject site.

- Field procedures outlined in Section 3 were used during field data collection and sampling activities.
- Field data (e.g., GPS data), as well as calculations, were subjected to an in-house review by qualified staff. Calculations and notes were reviewed for internal consistency. No discrepancies were found. All geologic work was performed under the direction of a California-registered geologist.
- Electronic laboratory data deliverables were used to generate the result tables and were subjected to 100 percent verification against hard-copy reports.
- The proposed assessment and the data quality evaluation were performed in general accordance with the procedures in the project quality assurance requirements.

All collected data were subject to internal data verification. Consistent, systematic data verification was followed to determine whether the data were collected in accordance to the specification of the project quality assurance requirements (i.e., compliance, correctness, consistency, and completeness). Non-technical errors in the data package that can be corrected (e.g., typographical errors) were also checked, and sample identifiers on laboratory reports (hard copy) were matched with the chain-of-custody record.

5.0 ANALYTICAL RESULTS

This section summarizes the results of the SA activities, including soil, sediment, surface water and background soil and surface water analytical results. The analytical results are presented in Tables 2 through 5 along with the project regulatory criteria. The detected concentrations are also presented in Figures 4 and 5 for the samples that were collected along the Large Lower Lake and Small Lower Lake.

5.1 Soil Sampling Results

Table 2 summarizes the analytical results from the stockpiled soil sampling efforts for the Large Lower Lake and Small Lower Lake along with the EPA Region 9 Industrial and Residential PRG (EPA, 2002).

5.1.1 Large Lower Lake

VOCs in soil samples were analyzed and none of the volatile organic compounds (including MTBE) was detected above the laboratory detection limits, except that trace levels of acetone and methylene chloride were detected in a few samples. However, acetone and methylene chloride are commonly found as laboratory contaminants.

PCBs and perchlorate were analyzed in all samples that were collected, and none of them were detected above the laboratory detection limits.

Pesticides such as alpha-chlordane, gamma-chlordane, P,P'-DDD, P,P'-DDE, P,P'-DDT, and dieldrin were detected in one or few samples (SS-1 through SS-4) at trace levels much below the industrial and residential PRGs (Table 2). None of the pesticides was detected in the background soil (BG-1), or surface water samples (SW-1 through SW-3). However, trace levels of alpha-chlordane, gamma-chlordane, P,P'-DDD, P,P'-DDE, P,P'-DDT, and dieldrin were present in sediment samples (SD-3 and SD-4) with additional pesticides. Detailed discussion about the sediment is included in Section 5.2.

Estimated concentrations of TPH-gasoline, diesel and motor oil were present in all samples, except that gasoline was below the detection limit in SS-1 and diesel was below the detection limit in SS-3. No industrial and residential PRGs exist for gasoline, diesel, and motor oil. Similar levels of concentrations for TPH-gasoline (0.07J mg/kg), diesel (1J mg/kg) and motor oil (30 mg/kg) were also found in the background sample (BG-1).

Thirteen priority pollutant metals were analyzed in all samples. Arsenic, cadmium, chromium, copper, lead, nickel, zinc, and mercury were present in all four samples (SS-1 through SS-4) at low levels, which were comparable to the background soil levels (BG-1). However, cadmium was not detected in the background sample. None of the detections exceeded the industrial or residential PRGs except arsenic and mercury. These detected metals may be occurred naturally in Hansen Dam soils.

5.1.2 Small Lower Lake

VOCs in soil samples were analyzed and none of the VOCs were found in samples (SS-5 through SS-7), except that trace levels of acetone and methylene chloride were detected in a few samples. Acetone and methylene chloride are common laboratory contaminants.

Perchlorate was analyzed in all samples collected, and none was above the laboratory detection limits.

Alpha-chlordane, gamma-chlordane, P,P'-DDD, P,P'-DDE, P,P'-DDT, and dieldrin were detected in one or few samples (SS-5 through SS-7) at levels much below the industrial and residential PRGs. Background soil sample BG-1, sediment samples (SD-1 and SD-2) and surface water samples (SW-4 through SW-6) contained none of these substances.

PCB-1260 was detected in all three samples (SS-5 through SS-7) at estimated concentrations, which were below the industrial and residential PRG. Background soil sample BG-1 contained none of the PCBs.

Estimated concentrations of TPH-gasoline were present in all three samples (SS-5 through SS-7). Elevated levels of diesel and motor oil were also found in all samples with the maximum concentrations of 1,970 mg/kg for diesel and 250 mg/kg for motor oil. Lower concentrations of TPH-gasoline (0.07J mg/kg), diesel (1 mg/kg) and motor oil (30 mg/kg) were found in the background sample (BG-1). No industrial or residential PRGs exist for gasoline, diesel and motor oil. The samples collected from the Large Lower Lake had lower TPH concentrations compared to samples that were collected from the Small Lower Lake. Additional samples of the materials stockpiled near the Small Lower Lake suggest that the elevated diesel and motor oil concentrations initially detected are not representative of those materials. The results will be included in the Draft Final Report.

Thirteen priority pollutant metals were analyzed in all samples. Antimony, arsenic, cadmium, chromium, copper, lead, nickel, selenium, silver, zinc and mercury were present in one or all samples (SS-5 through SS-7) at low levels, which were slightly higher than the background soil levels (BG-1). However, antimony, cadmium, selenium, silver were not detected in the background sample, and none of the concentrations exceeded industrial or residential PRGs except trace or estimated levels of arsenic and mercury which are believed to be naturally occurring.

5.2 Sediment Sampling Results

Table 3 summarizes the analytical results from the sediment sampling efforts for the Large Lower Lake and Small Lower Lake along with the EPA Region 9-established Industrial and Residential PRG values (EPA, 2002).

5.2.1 Large Lower Lake

VOCs, perchlorate, NDMA, 1,2,3-TCP, and 1,4-dioxane were analyzed in all collected samples, and none of them were detected above the laboratory detection limits in two sediment samples (SD-3 and SD-4).

Alpha-chlordane, gamma-chlordane, P,P'-DDD, P,P'-DDE, P,P'-DDT, and dieldrin, , endrin aldehyde, heptachlor, and heptachlor expoxide, were detected in all samples (SD-3 and SD-4) at trace levels much below industrial and residential PRGs.

PCB-1260 was detected in both samples at estimated levels much below industrial and residential PRGs.

Estimated concentrations of TPH-diesel were present in both samples. Low levels of motor oil were detected, with maximum concentrations of 68 mg/kg for motor oil. No industrial and residential PRGs exist for diesel and motor oil.

Thirteen priority pollutant metals were analyzed in all samples. Arsenic, cadmium, chromium, copper, lead, nickel, selenium, silver, zinc and mercury were present in both samples at levels below the industrial and residential PRGs except arsenic and mercury.

5.2.2 Small Lower Lake

VOCs, pesticides, PCBs, perchlorate, NDMA, 1,2,3-TCP, TPH-gasoline, diesel, motor oil, and 1,4-dioxane were analyzed and none of them were detected above the laboratory detection limits in both sediment samples (SD-1 and SD-2).

Thirteen priority pollutant metals were analyzed in all samples. Trace amounts of arsenic, cadmium, chromium, copper, lead, nickel, zinc and mercury were present in both samples at levels below the industrial and residential PRGs except arsenic and mercury.

5.3 Lake Water Sampling Results

Table 4 summarizes the analytical results from the water sampling efforts for the Large Lower Lake and Small Lower Lake along with the Primary Maximum Contaminant Levels (MCLs) from the California Department of Health Services (DHS).

5.3.1 Large Lower Lake

The general water quality was tested in eight surface water samples (SW-1 through SW-3) at different depths. The BOD test indirectly measured the amount of readily-degradable organic compounds in water. The BOD readings were relatively low in all samples. Chloride, TDS, and sulfate were below the surface water quality objectives of 250 mg/L, 500 mg/L and 250 mg/L, respectively. Sample pH of 6.5 to 8.5 was within the acceptable range for surface water. Nitrate and nitrite concentrations were below the primary drinking water standards of 45 mg/L and 1 mg/L. Total and fecal coliform were used to indicate the likelihood of pathogenic bacterial in surface water. The fecal coliform concentrations were below the water quality objective for water designated for contact recreation of 200 MPN/100 ml.

VOCs, pesticides, PCBs, and perchlorate were analyzed in all samples that were collected, and none of them were detected above the laboratory detection limits.

Estimated concentrations of TPH-gasoline and diesel were present in one or more samples. No MCLs values exist for gasoline and diesel.

Thirteen priority pollutant metals were analyzed in all samples. Antimony, arsenic, cadmium, chromium, copper, lead, nickel, selenium, silver, thallium, zinc and mercury were present in one or all samples at low or estimated levels, which are comparable to the background surface water levels. Although antimony, arsenic, lead, silver, and thallium were not detected in background samples, all of the detected concentrations were below the MCLs.

5.3.2 Small Lower Lake

The general water quality was tested in ten samples (SW-4 through SW-6) at different depths. The BOD readings were very low in all samples. Chloride, TDS, and sulfate were below the surface water quality objectives at 250 mg/L, 500 mg/L and 250 mg/L, respectively. pH of 6.5 to 8.5 in collected water samples were within the acceptable range for surface water. Nitrate and nitrite concentrations were below the primary drinking water standards of 45 mg/L and 1 mg/L. The fecal coliform concentrations of 200 MPN/100 ml were below the water quality objective for water designated for contact recreation.

VOCs, pesticides, PCBs, and perchlorate were analyzed in all samples that were collected and none of them were detected above the laboratory detection limits.

Estimated concentrations of TPH-gasoline and diesel were present in one or more samples.

Thirteen priority pollutant metals were analyzed in all samples. Antimony, arsenic, chromium, copper, lead, nickel, selenium, silver, thallium, zinc and mercury were present in all samples at low or estimated levels, which are comparable to the background surface water levels. However, antimony, arsenic, lead, silver, and thallium were not detected in background samples. All of the detected concentrations were below the MCLs.

5.4 Baseline Ambient Water Quality

Table 5 summarizes the analytical results from the background surface water sampling efforts for the three offsite locations along with the Primary Maximum Contaminant Levels (MCLs) from the California Department of Health Services (DHS).

The water quality at the three locations was evaluated as relatively good by RWQCB, based on their annual monitoring program from 1999 to 2001 (Appendix D).
The general water quality was tested in four background surface water samples (BG-SW-1 through BG-SW-3) by SOTA in March 2003. Compared with the on-site samples, the BOD readings were slightly higher. Chloride, TDS, and sulfate were below the surface water quality objectives of 250 mg/L, 500 mg/L and 250 mg/L, respectively, and were comparable to the on-

site samples. In all Samples, pH of 6.5 to 8.5 was within the acceptable range for surface water. Nitrate and nitrite concentrations were below the primary drinking water standards of 45 mg/L and 1 mg/L, respectively. The coliform concentration of 200 MPN/100 ml was below the water quality objective for water designated for contact recreation, and the total coliform in two locations were slightly higher than the on-site samples, except sample SW-2-2 that was collected in the Large Lower Lake.

VOCs, 1,2,3-TCP, pesticides, PCBs, NDMA, perchlorate and 1,4-dioxane were analyzed in all collected samples, and none were detected above the laboratory detection limits, except estimated concentrations of methyl isobutyl ketone and methylene chloride which are likely laboratory contaminants.

Estimated concentrations of TPH-gasoline were present in all samples and the concentrations were comparable to the lake water samples results.

Thirteen priority pollutant metals were analyzed in all background surface water samples. Cadmium, chromium, copper, nickel, selenium, zinc and mercury were present in one or all samples at low or estimated levels.

Compared with the background general water quality data, the water quality in surface water at both lakes was relatively good. No VOCs, pesticides, PCBs, and perchlorate were found in all collected surface water samples. Estimated concentrations of TPH-gasoline were present in the surface water in both lakes. However, gasoline was also detected at the same level in the up gradient background surface water samples. Several priority metals were detected at low or estimated levels in the surface water in both lakes. All of them were below the MCLs. Chromium does not have federal or state regulatory criteria. Most of the detected priority metals (cadmium, chromium, copper, nickel, selenium, zinc and mercury) were also found in the up gradient background surface water samples.

5.5 Field and Laboratory QA/QC Sample Results

All field QA/QC sample results were within the project quality control limits. The trip blank was non-detect for VOCs. The temperature in each cooler was within 4 ± 2 degrees Celsius.

All laboratory QA/QC samples were within the project quality control limits. Results of surrogate compounds, laboratory control samples and duplicates, laboratory MSs, MSDs, and method blank analyses were within the project quality control limits.

6.0 DISCUSSIONS AND CONCLUSIONS

The USACE requested SOTA evaluate the nature of any contamination present as a result of the placement of material in and near the Lower Lakes and potential adverse impacts to surface water, groundwater, and human health. Waste and environmental samples were collected and analyzed to characterize the types of substances deposited at the site and potential migration pathways. The stockpiled material was adequately characterized. Analytical results of sampling are presented in Tables 2 through 5 and Figures 4 and 5.

At the stockpiled soil locations, VOCs, PCBs and perchlorate were not found in any samples, except for an estimated concentration of PCB-1260 at the Large Lower Lake. Several pesticides such as alpha-chlordane, gamma-chlordane, P,P'-DDD, P,P'-DDE, P,P'-DDT, and dieldrin were detected in some samples in both lakes. None of the pesticides that were detected exceeded the industrial or residential PRGs. Estimated and elevated concentrations of TPH-gasoline, diesel, and motor oil were reported in one or more samples. No industrial and residential PRGs exist for gasoline, diesel, and motor oil. Several priority pollutant metals were present in all samples at low or estimated levels. However, these values are comparable to the background soil levels (BG-1), indicating that these minerals are naturally occurring at the project site. None of the metal detections exceeded the industrial or residential PRGs, except naturally occurring arsenic and mercury.

Sediment samples collected from both lakes indicated no presence of VOCs, perchlorate, NDMA, 1,2,3-TCP, gasoline or 1,4-dioxane in the lake sediment. In the Large Lower Lake, trace amounts of PCB-1260 and the pesticides alpha-chlordane, gamma-chlordane, P,P'-DDD, P,P'-DDE, P,P'-DDT, dieldrin, endrin aldehyde, heptachlor, and heptachlor expoxide were detected in samples at levels much below industrial and residential PRGs. Low or estimated levels of TPH-diesel and motor oil were detected. Arsenic, cadmium, chromium, copper, lead, nickel, selenium, silver, zinc and mercury were present in samples at levels below the industrial and residential PRGs. Low or estimated levels arsenic and mercury were also detected.

By evaluating water samples in various strata in the lakes, the water quality was found to be of relatively good quality. No VOCs, pesticides, PCBs, or perchlorate were found in any water samples. Estimated concentrations of TPH-gasoline were present in the water in both lakes. Gasoline was also detected at the same level in the up gradient background surface water samples. Several metals were detected at low or estimated levels in the water in both lakes. All of the detected metals were found in concentrations below the MCLs. Most of the detected metals (cadmium, chromium, copper, nickel, selenium, zinc and mercury) were also found in the up gradient background surface water samples. Therefore, it is concluded that these minerals are naturally occurring at the project site.

The SA activities and laboratory analysis indicate no evidence of elevated levels of organic or inorganic compounds in the soil, sediment, or water samples that were collected from the Lower Lakes, except for diesel, which was detected in one stockpile sample collected near the Small Lower Lake. It should be noted that no diesel was found in water or sediment samples collected in the Small Lower Lake.

The Site Assessment results suggest that there has been no significant release of hazardous substances from the materials placed in and adjacent to the Lower Lakes into the water at either site. Further, sediment samples collected from the Lower Lakes indicate that lake sediment was not impacted by the materials placed in either lake. Thus, it appears unlikely that groundwater at the site has been adversely impacted by the placement of materials in and near the Lower Lakes. It is therefore our conclusion that the materials placed in and near the Lower Lakes pose no significant risk to human health or to the environment, and may be disposed on-site following approval and proper permitting by the LARWQCB and the City of Los Angeles, Local Enforcement Agency. Following regulatory approval and disposal of the remaining *Arundo*/soil stockpile located to the north of the Small Lower Lake in an approved landfill, SOTA recommends No Further Action at the Hansen Dam FCB.

7.0 REFERENCES

California Department of Health Services, 2000, *Drinking Water Standards, Primary Maximum Contaminant Levels (MCLs) and Lead and Copper Action Levels*, May 23.

California Regional Water Quality Control Board, Los Angeles Region, 1994, *Water Quality Control Plan for the Los Angeles Region (4)*, September 8.

LADPW *Guidelines for Report Submittals*, dated March 1991 and revised June 1993. CRWQCB – Los Angeles Region memoranda dated March 30, 2000, June 22, 2000 and June 28, 2001.

SOTA, 2002, Work Plan and Health Safety Plan, Lower Lakes, Hansen Dam FCB, CA

State of California, California Regional Water Quality Control Board, Los Angeles Region, WDR Order No 91-93, *Non-Hazardous Contaminated Soils and Other Wastes in Los Angeles and Santa Clara River Basins,* June 12, 1991

State of California, California Regional Water Quality Control Board, Los Angeles Region, *General Information Form for Waste Discharge Requirements, NPDES Permit*

United States Environmental Protection Agency, 2000 *Guidance for the Data Quality Objectives Process, EPA QA/G-4*, August.